



## Inexpensive APDs and PLDs in Abundance

### Multi-junction PLDs in a TO Housing

The range of pulsed laser diodes (PLDs) manufactured by LASER COMPONENTS Canada continues to grow and can be optimally customized for each application. With our tested and proven multi-junction laser technology, which contains several epitaxially integrated emitters, peak powers up to 75 W can be achieved at a wavelength of 905 nm. This technology is available with a variety of emitter sizes, so that pulse powers of 25 W can be achieved using an 80  $\mu\text{m}$  x 10  $\mu\text{m}$  emitter. The somewhat larger 6 mil chip (160  $\mu\text{m}$  x 10  $\mu\text{m}$ ) has a power of 50 W at a pulse length of 150 ns and a duty cycle of 0.1%. Due to its smaller emitting area the power provided by this laser can be more easily coupled into a fiber and combined with micro-optics. The new 9 mil version (235  $\mu\text{m}$  x 10  $\mu\text{m}$ ) delivers a peak power of 75 W from a single multi-junction chip.

In order to utilize all of the technical advantages of these PLD chips, they are integrated into a hermetically sealed TO housing. This housing is extremely reliable, delivers an excellent overdrive performance, and has a very precise chip alignment. In addition to the multi-junction devices, single-chip lasers for power levels from 6 – 19 W are also offered in the same low-cost, high quality metal package.

#### **Suitable Receivers – Si APDs at 905 nm**

We also have suitable Si avalanche photodiodes available which can be delivered with



PLDs as inexpensive samples upon request. In the new SARF500F2 series, a 905 nm band-pass filter comes already integrated into the modified TO-46 housing. The 500  $\mu\text{m}$  APD chip is likewise optimized for the 905 nm wavelength allowing optimal performance in connection with the above-mentioned PLDs. The advantages of the SARF500F2 series are quite obvious: cost savings (i.e. since an external filter and additional assembly steps are no longer required), a small design, and optimal system properties at a measurement wavelength of 905 nm.

**Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)**  
**Product Code: 041**

## High Quality at an Attractive Price

### Inexpensive Blue 405 nm Laser Diode Module

With the FP-40-EM series blue laser diode modules are now available at a very reasonable price.

This module delivers 3 mW with a round beam and 7 mW with an elliptical beam. The laser wavelength is 405 nm. The beam can be focussed or collimated with an adjustable optic. A digital or analogous modulation of the module is available as an option.

Compared to the blue laser diode modules previously available on the market, the price of the FP-40-EM series has been reduced by 40% - at the same optical performance level. These blue modules are used in optical memory and measurement technology, the medical field, and fluorescence excitation.

**Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)**  
**Product Code: 074**

## Excelsior

Although distribution is a strong part of our business, the highest added value we can offer our customers comes from in-house production. We, therefore, seek to ever expand our capabilities and to stay ahead at the technological forefront.

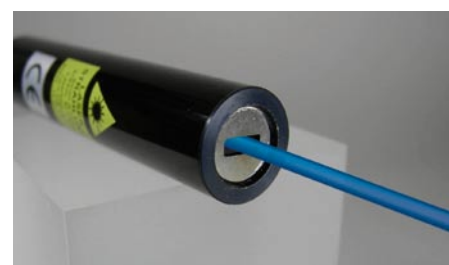
Our optical coatings feature some of the highest damage thresholds available on the market and require substrates that push production limits. We require the best possible surface properties as well as competitive pricing. Despite our worldwide sourcing efforts, this combination is hard to come by – which can easily lead to long delivery times.

Therefore, in order to strengthen our core coating business and to enter new markets, while at the same time gaining more independence from external substrate suppliers, we have invested significantly in state-of-the-art grinding and polishing machines “made in Germany” to expand our optics production by adding the capability of manufacturing spherical substrates for laser applications. This new production center will become a major supplier of our in-house coating facility. A fully automated ultrasonic cleaning system complements this expansion. You can read an in-depth article on page three about it with more to come in the near future. Enjoy the issue!

Sincerely,

  
Sven Schreiber  
Export Manager

[s.schreiber@lasercomponents.com](mailto:s.schreiber@lasercomponents.com)



## Detecting Even the Smallest Amount of Light

### APD Receiver Modules

Avalanche photodiodes (APDs) are particularly well suited for detecting small amounts of light. They are used in many applications such as, for example, in range-finding and the medical field. Measurement sensitivity is often limited by the connected electronics. An appropriate amplifier has to be used in order to achieve optimal performance.



The newly developed H series hybrid detectors by LASER COMPONENTS offer users an integrated amplifier in a compact, hermetically sealed housing. The particularly low-noise H1 series comes in a 12-pol TO-8 housing (see fig.) and has a built-in temperature sensor. The maximum bandwidth ranges from 1 MHz to 30 MHz.

The H2/H3/H4 series hybrids are suited for even faster measurements. Here, depending on the model, the bandwidth can range up to 470 MHz. These receivers come in a small TO-46 housing. This makes them suitable for devices in which very little space for optical components is available – one example of such a device is handheld rangefinders.

All receivers are available with both silicon and InGaAs APDs and thus cover the ranges 400 to 1100 nm and 1000 to 1650 nm.

With the new ABC550 series we also have a suitable high voltage power supply for each APD receiver available in our delivery program.

Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: **035**

## Temperature Stabilized

### High Voltage Modules for the Operation of APDs

ABC550 (ABC: APD bias controller) series high voltage modules are particularly well suited for the operation of avalanche photodiodes (APDs). The output voltage can be precisely adjusted in the range from  $\pm 10$  V to  $\pm 550$  V and has the required stability. The temperature coefficient of the output voltage can be adjusted to match the properties of a particular APD exactly. Both discrete APDs and APD modules, also with an integrated temperature sensor, can be operated. The output power is restricted to a safe setting to protect the APD effectively against overloading. A precise reference voltage source is built into the system. The output voltage can be adjusted with a simple voltage divider or control voltage. An additional control voltage makes it possible to either adjust the amplifica-



tion of the APD in a closed circuit or modulate it selectively. The ABC550 series has a wide operating voltage range from 10 V to 18 V. A temperature-dependent resistor serves as the temperature sensor.

Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: **055**

## Meet the Bestsellers!

### CW Laser Diodes



LASER COMPONENTS offers a large variety of cw laser diodes, in particular in the red wavelength range. Due to the large number of units available in stock, a selection of bestselling laser diodes can be offered at very reasonable conditions!

To ensure that you obtain your laser diodes and all required accessories from one source, the drive electronics and plastic collimator lenses are also available at bargain prices.

Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: **049**

## Universal IR Conversion Screen

### LDT-1064BG

The universal IR conversion screen LDT-1064B is now available as a BG version. Here, the edges of the active material are covered by the aluminum holder, making it shock proof.

Optical Features:

- IR radiation (800 nm to 1700 nm) is converted to visible green light.
- Damage threshold:  $> 10$  kW/cm<sup>2</sup> at 1064 nm, cw
- Minimum intensity:  $< 100$  mW/cm<sup>2</sup> at 1064 nm, cw
- Size of the active material: 23 mm x 23 mm



Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: **051**



## We Should All Go Through It... – Wellness for Optics!

### New Ultrasonic Cleaning System Now in Effect

One qualitative feature of products in the optics industry is surface cleanliness. Only extremely clean surfaces can be used when refining or coating optical substrates.

LASER COMPONENTS can, therefore, look upon the acquisition of its ultrasonic cleaning system for optics with pride. This cleaning system is a multi-frequency system that operates in the range from 30 kHz to 120 kHz. With this

system even sensitive optical substrates can be cleaned gently.

From this point on, all optics coated inhouse go through (prior to further processing) the nine-step cleaning process with both diluted and 100% chemical solutions. Substrates delivered to us in the past which had to be refused due to residual polishing agents can now also be cleaned inhouse. This has proven beneficial to delivery time and planning reliability.



#### Excellent Quality and Speed

Continuous cycles provide for even more constant results in production. Due to high operational capacity, the speed of processing has increased enormously. Depending on the dimensions of the substrates, a large amount of them can be cleaned simultaneously in up to nine baskets. These nine immersion baths have a holding capacity of 60 liters each in which substrates of 10 mm to 8" can be processed.

#### High Degree of Automation

For the most precise regulation possible, the cleaning and subsequent infrared drying processes are controlled and monitored using an SPC. Loading and unloading occur automatically, just as transportation within the machine does as well. This system is completely closed. Flow boxes inside the machine create excess pressure which, in turn, provides for a particle-free environment. Through this clean environment optics can be sent without further treatment to the coating chamber, where they subsequently undergo a 100% final inspection.

#### Periphery

Another way to guarantee extreme cleanliness in this system is through periphery devices such as filter aggregates or even a complex water conditioning unit, which can be seen on the right-hand side of the photo. They provide for both environmentally friendly and economically sound cleaning processes.

## Free Literary Compilation

### Spectra Catalog

It is a familiar problem in high resolution spectroscopy: You would like to spectroscopically analyze a certain molecule, but you do not know the exact position. You should be able to find it, for example, in the HITRAN database with the help of the MOLSPEC software. However, the number of molecules is limited here. In addition, generated spectral data may not be free of errors. A spectrum that is ascertained with experiments is more revealing, but more difficult to obtain.

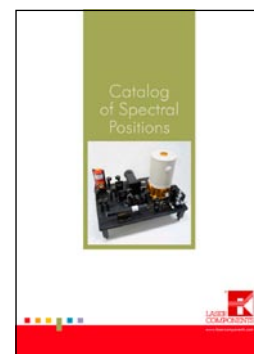
LASER COMPONENTS created a literary compilation as an aid; this compilation can be downloaded for free. The Spectra catalog contains spectra from 37 molecules or molecule radicals, which are measured using TDLAS (tunable diode laser absorption spectroscopy) and often have more than one spectral

position per species. The measured spectrum of each spectral position is depicted on one page together with the citation. May the "Catalog of Spectral Positions" find as many users as possible!

Remarks:

- This catalog currently only exists in PDF format (approx. 4 MB) and can be downloaded for free.
- The spectroscopic community is called upon to actively partake in the updating of this database. Scientists are asked to provide us with their current publications and measurement data at any time and we will continue to integrate this information into the catalog.

- The basic principles of TDLAS are explained in the application report that goes by the same name. This report is also available for download.



Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: 083

## Infrared Spectroscopy Using Laser Diodes

# L5830: Controller with Integrated Frequency Generation



Fig. 2: Laser diode controller L5830

Today, TDLAS (Tunable Diode Laser Absorption Spectroscopy) is a scientifically and industrially recognized measurement technology for the determination of molecule concentration. The process is calibrated and allows for both very sensitive detection and detection with a large dynamic range. Because of the small laser line widths, additional information such as temperature and pressure of the measured group can also be determined. The outline of a general test setup with tunable laser diodes in absorption spectroscopy is shown in Figure 1.

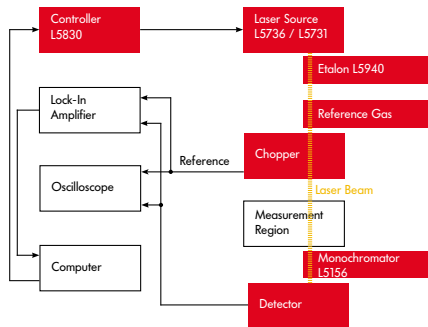


Fig. 1: Schematic test setup – absorption spectroscopy  
Red background: available at LASER COMPONENTS

Different configurations can be implemented with LASER COMPONENTS' spectroscopic systems.

The highest sensitivities, such as those needed in the detection of trace elements in the ppb range, are achieved through a method called derivative spectroscopy. Although this method is not new, it is still used in too few laborato-

ries. Why? Perhaps it is still too unknown? For this reason, we would like to make a point of mentioning the derivative principle and recalling it to memory: in addition to the laser diode controller, a lock-in amplifier and a computer are used. A modulation current with amplitudes in the % range is added to the direct current of the laser diode. This is achieved by the modulation module of the LASER COMPONENTS-made controller L5830 (Figure 2). The generation of an additional external frequency is not necessary. Perhaps one reason that the derivative method is not prevalent is the fact that most of the laser diode controllers do not have an integrated frequency generation and the derivative method can therefore not be inferred. Phase sensitive detection is set up according to a reference and the signal is read out on the computer. The profile of the absorption line can be recorded with a series of different currents, preferably with small increments, applied to the laser diode. When using a Taylor series development, a relationship between the detected signal and the mathematical derivatives is demonstrated, which produces absorption lines as exhibited in Figure 3.

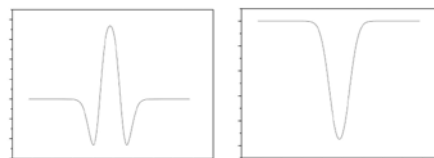


Fig. 3: Directly measured absorption line  
Derivatively measured absorption line

Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: 088

## CW Operation at Room Temperature

# Quantum Cascade Lasers at 5 to 10 $\mu\text{m}$

With its QCW-XXXX-GMP series LASER COMPONENTS now also offers continuously emitting multi-mode QCLs at room temperature. Available wavelengths include 5.25  $\mu\text{m}$ , 6.1  $\mu\text{m}$ , 7.75  $\mu\text{m}$ , and 9.7  $\mu\text{m}$ . These lasers come mounted on a submount measuring 7 x 19 mm. Here, the typical cw output power ranges between 15 mW (6.1  $\mu\text{m}$ ) and 30 mW (5.25  $\mu\text{m}$ , 9.7  $\mu\text{m}$ ).

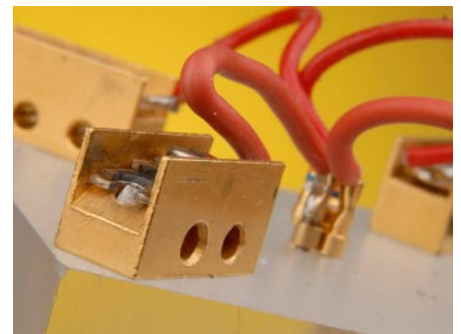


Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: 183

## IR Laser Diodes

# Extended Wavelength Range

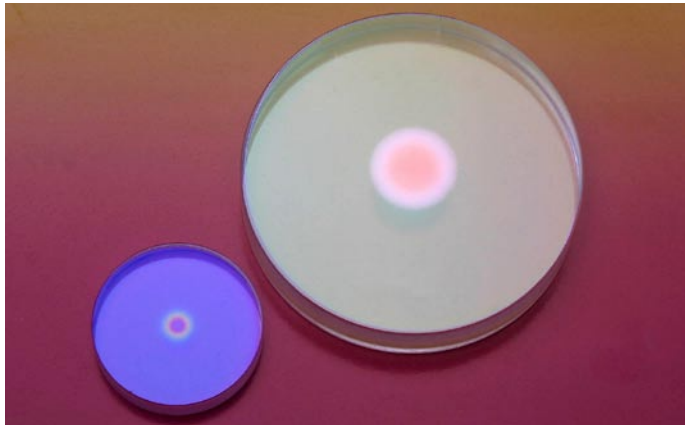
Through improvements in SPECILAS® lead-salt-based infrared lasers it was possible to shift the low end of the emission range from a former 3.1  $\mu\text{m}$  by 150 nm in the direction of the short wavelengths. LASER COMPONENTS' website offers an extensive overview of its selected stock of IR lasers. This includes lead salt and quantum cascade lasers. Currently, the measurement protocols for 100 lasers in stock are available.



Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: 075

## Precise Documentation in Production

# Measuring Station for Gaussian Mirrors



### Area of Application

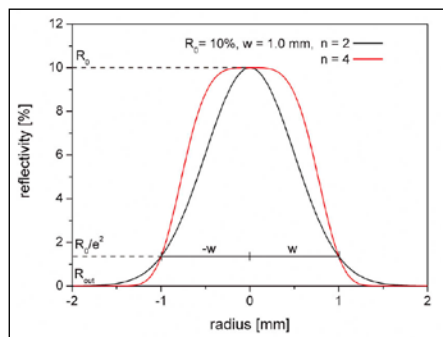
The primary area of application of Gaussian mirrors is in unstable laser resonators. Using a Gaussian mirror the output power can be increased and the spatial beam profile simultaneously improved. In frequency-doubled laser systems the pump efficiency can also be increased.

As one of just a few suppliers worldwide, LASER COMPONENTS manufactures, in addition to standard laser optics, mirrors in which the reflectivity changes radially. Such components are also referred to as variable reflecting mirrors (VRM). One particular type of VRM is a Gaussian mirror. In Gaussian mirrors, the reflection profile  $R(r)$  across the mirror is described by the Gaussian function

$$R(r) = R_0 \cdot \exp[-2(r/w)^n] + R_{out}$$

Here  $R_0$  refers to the maximum reflectivity in the center of the mirror,  $R_{out}$  refers to the reflectivity at the edge of the mirror,  $w$  refers to the width (distance to the center of the mirror at which the reflectivity drops to  $R_0/e^2$ ), and  $n$  refers to the exponents and thus the form of the Gaussian function. Two typical examples can be seen in Fig. 1.

There are very few limitations when choosing the parameters of the mirror, the appropriate wavelength, and the substrate.



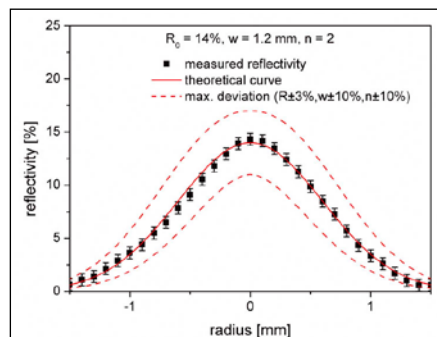
Gaussian mirrors are most commonly used in Nd:YAG lasers and at wavelengths of approximately 1  $\mu\text{m}$ ; however, other wavelengths, such as 694 nm or 800 nm, can also be manufactured.

### Measuring Gaussian Mirrors

Gaussian optics are manufactured not only with precision according to customer specifications, but are measured and characterized with great detail. With a new measurement setup we have increased the accuracy of our measurements, which ensures the high quality of our optics and the precise observation of desired specifications. Moreover, measurement at a variety of wavelengths is now possible. In this way, exact measurement and analysis of the reflection profile can be achieved for Gaussian optics at non-standard wavelengths.

Detailed measurement diagrams of our optics are also available (Fig. 2).

Data sheets at: [www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: **001**



## New Outfit for Quick Power Meters

# Laser Power Measurement on a Shoestring Budget

Starting now quick power meters (QPMs), which are used to determine laser power levels, are available at a significantly reduced price.

QPMs come in six different models: up to 50 W, 200 W, 500 W, 1.5 kW, 5 kW, and 10 kW. They are designed for YAG and CO<sub>2</sub> lasers on a standard basis, but can be calibrated for all other wavelengths upon request.

Not only the power and the operating wavelength are displayed on the large LCD display, but the temperature of the sensor and information as to whether another measurement can be performed are displayed as well. Several measurements can be carried out successively as long as the maximum temperature of the sensor has not been reached.

The quick power meter is the right choice if you are looking for a simple, inexpensive measuring device to monitor your laser quickly!

A recalibration can be performed at any time by our calibration laboratory.



Data sheets at:  
[www.lasercomponents.com](http://www.lasercomponents.com)  
Product Code: **071**



LASER COMPONENTS GmbH  
Werner-von-Siemens-Str. 15  
82140 Olching/Germany

fon: +49 8142 2864-0  
fax: +49 8142 2864-11

[www.lasercomponents.com](http://www.lasercomponents.com)  
[info@lasercomponents.com](mailto:info@lasercomponents.com)

General Managers: Günther Paul, Patrick Paul  
Commercial Register in Munich HRB 77055

This Photonics News, including all written and visual entries, is protected by copyright. With the exception of specific cases permitted by law, use of this material without the consent of Laser Components GmbH is punishable by law.

Despite thorough research, Laser Components GmbH will not accept responsibility for any inaccuracy of content. Technical material is subject to change without notice.