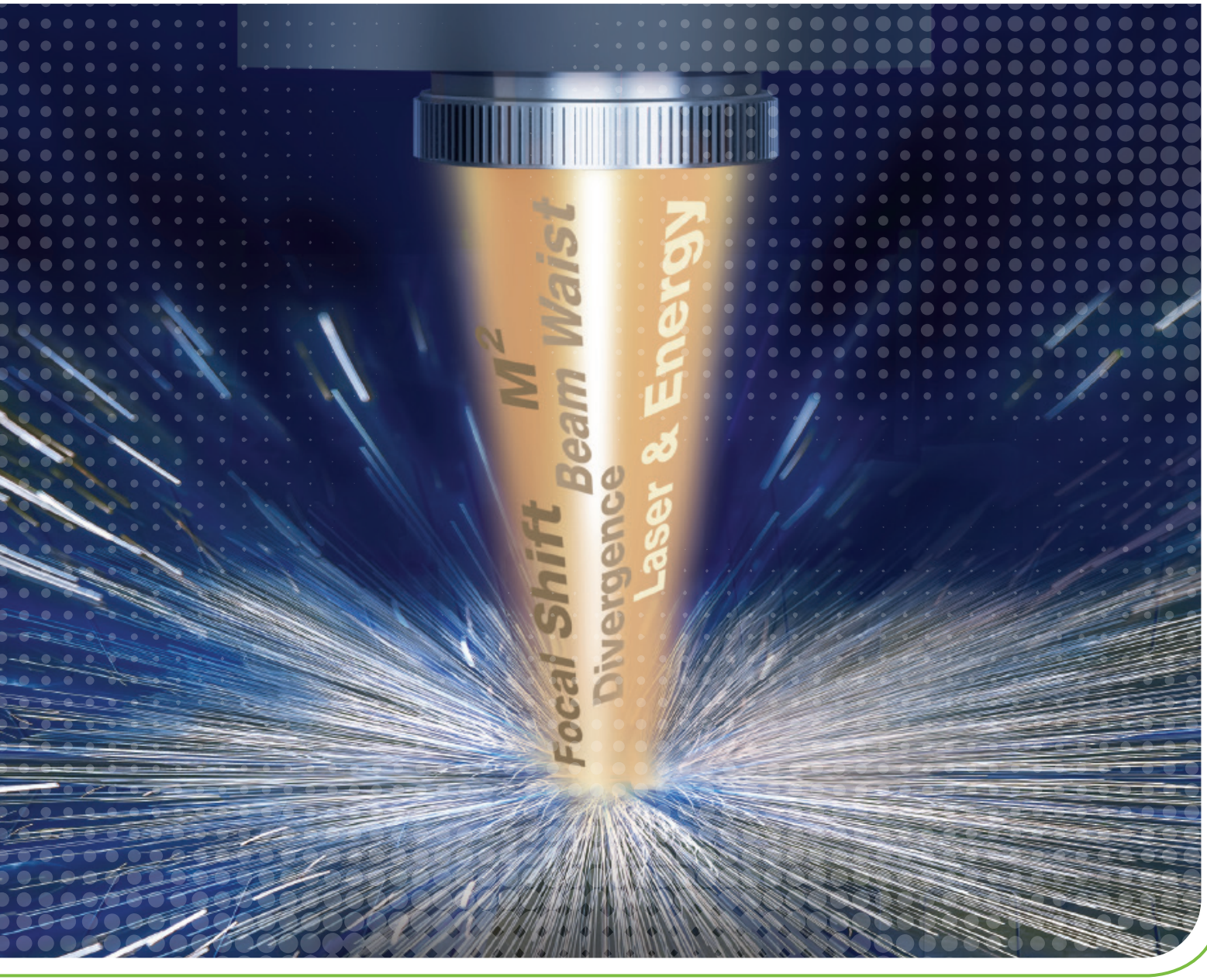
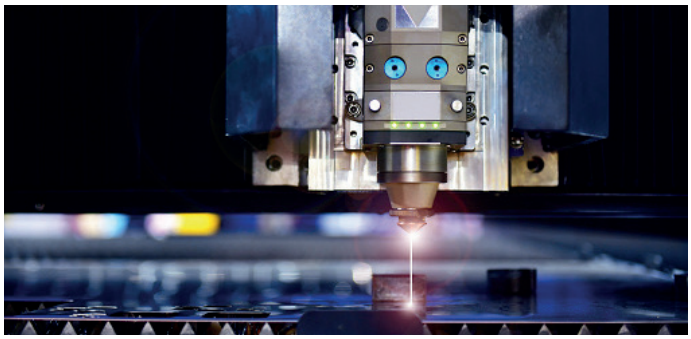
MEASURE HIGH POWER LASERS
IN INDUSTRIAL APPLICATIONS

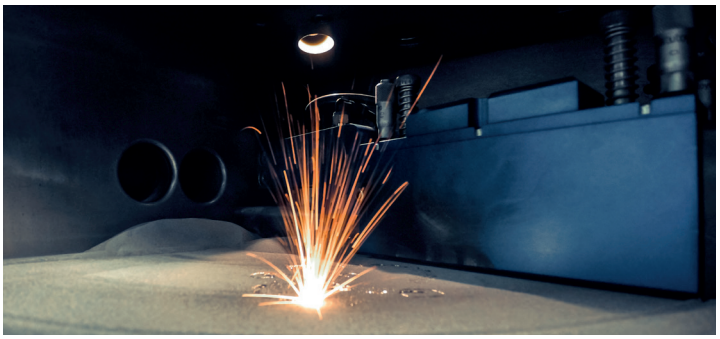


MAKING SURE YOUR LASER POWER IS SPOT-ON

Many highly competitive industries rely on laser systems. When you can weld or cut quickly and always at the same level of quality, it provides you real competitive advantages and cuts down tremendously on costs. However, slight deviations in the laser beam exert a massive effect on the entire process: The laser requires more time for a cut or weld and consumes more process gases, the heat-affected zone is larger and more waste is generated overall. In sensitive processes such as battery welding, deviations in laser performance can have a significant impact on the quality of the whole battery pack.

- ✓ AVOID SCRAP BY MEASURING YOUR LASER BEAM
- ✓ GET THE IMPACT OF THE LASER BEAM AT THE WORKING PLANE
- ✓ EASILY MEASURE DURING THE LOADING AND UNLOADING PROCESS
- ✓ GET RESULTS INCLUDING OK/NOK DISPLAY IN SECONDS





MULTIPLE WAYS TO MEASURE HIGH POWER

Ophir Power Sensors

Sensors designed for your application

The Ophir range of high power sensors spans from fan- or air-cooled thermopile sensors to water-cooled thermopile sensors that are able to measure up 120kW laser power. To match the measurement requirements, there are multiple options to choose from depending of the wavelengths, the power level and the type of laser. The sensor can be combined with the Ophir power meters or with software measurement solutions.

- Sensors are available for a wide range of wavelengths
- Measure power up to 120kW
- Water- or air-/fan-cooled sensors

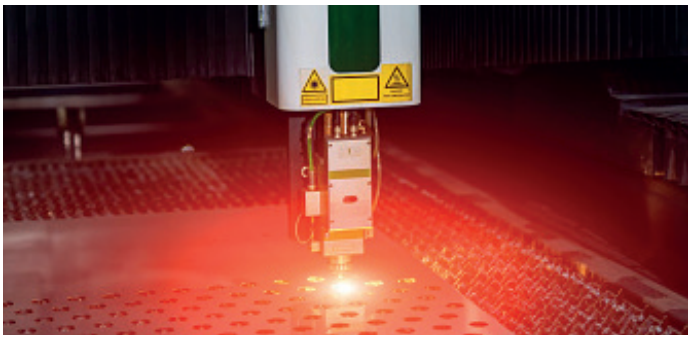
Ophir ARIEL

Stand-alone power measurement in confined spaces

Ariel is a self-contained, ultra-compact laser power meter for measuring high power industrial lasers up to 8kW. The robust, battery-powered device requires no water or fan cooling and is small enough to fit in the palm of your hand.

The Ariel™ industrial power meter combines two modes of operation to deliver a large measurement range of 200mW to 8kW: Measurement of the energy of a short time exposure for high power lasers up to 8kW, and longer CW power measurements for lower powers up to 500W. A detachable diffuser allows measurement of high power density beams.

- Versatile and durable device
- Robust, dust-proof and water-resistant housing
- Bluetooth, USB-C interface
- Stand-alone mode with LCD display



SMART DEVICES TO ANALYZE
YOUR HIGH POWER BEAM PROFILE

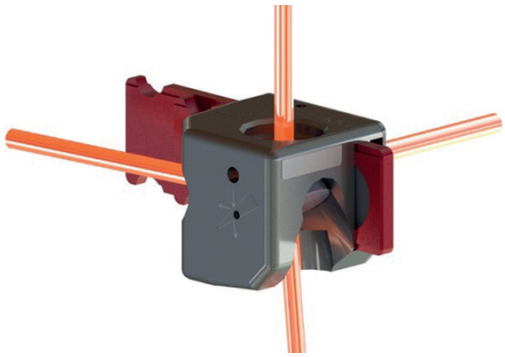
Ophir BeamPeek

Integrated beam analysis and power measurement

The BeamPeek® device allows real-time beam profiling including focal spot size and position monitoring, delivers the beam caustic, and measures the power of the laser beam. The compact, ruggedized tool measures powers up to 1kW for two minutes for both green (532nm) and NIR wavelengths (1030-1080nm). All active components (electronics, optics, camera, and power meter) are protected in a robust chamber whose temperature rise is not more than 2.5°C per minute at 1kW. The system includes an innovative beam dump designed as a replaceable tray that eliminates the need to waste time letting the system cool down. This allows measurements to be repeated immediately, allowing for sustained work cycles. The BeamPeek system is supported by a range of Ophir software options including a dedicated software for field-technicians that allows for easy and fast beam analysis.

- Fast, accurate, real-time measurement of lasers
- Green and NIR wavelengths
- Measures power up to 1kW

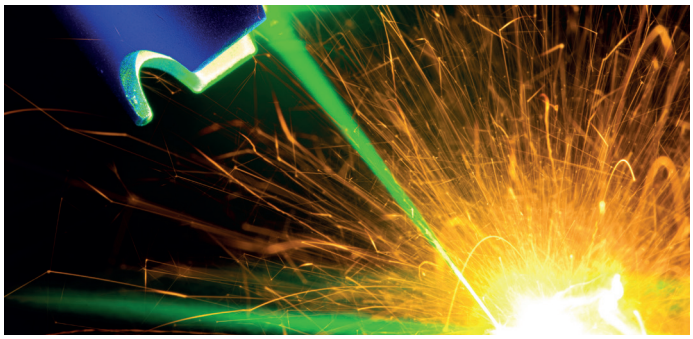
Ophir LBS-300HP/NIR



Beam splitter enables camera-based beam profiling

The LBS-300HP-NIR is a sophisticated beam splitter for high power lasers that allows measuring NIR (~1064nm) focused or collimated laser beam profiles up to 5kW or 15 MW/cm². It operates by reflecting a fraction of the incoming beam through the front surface of each of a pair of orthogonally oriented wedges. Less than 0.0001% of the beam is reflected towards the Beam Profiler Camera.

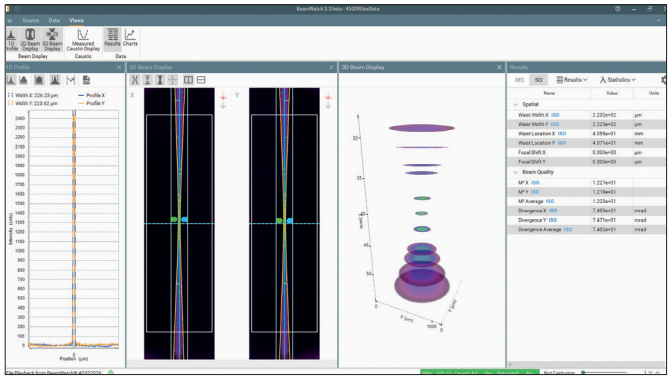
- Uniform attenuation of any beam shape
- Preserves the polarization and overall profile
- High-end beam profiling in combination with camera and the Ophir BeamGage software



Ophir BeamWatch/BeamWatch Plus

Contactless measurements of the beam profile in real time

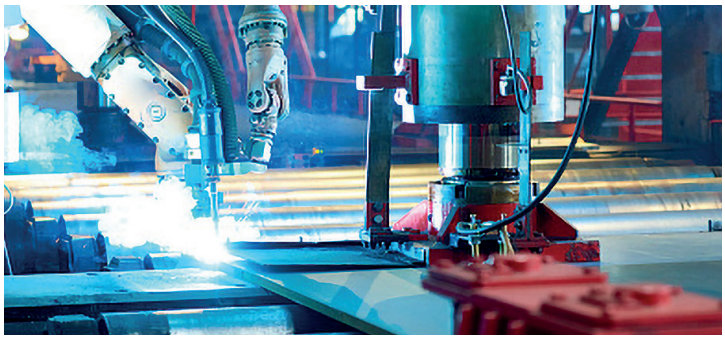
BeamWatch® beam characterization systems provide a precise picture of the beam caustic and all relevant beam parameters without ever touching the laser beam and without the meter requiring water cooling. Within just a few seconds, a camera detects the Rayleigh scattering of the focused beam and registers every shift in focus. Because the complete laser cycle for a weld or cut is simulated, the beam can be tested under real process conditions.



Any shift in the beam focus due to thermal effects can be detected immediately. This allows for remedial measures to be taken right away and, if necessary, for follow-up on potential effects: The quality of the laser process remains at a consistently high level. In addition to the BeamWatch system that covers the NIR wavelengths (950-1100nm), BeamWatch Plus is able to measure green and blue wavelengths (420-635nm) and can measure focus spot sizes down to 45µm.

If desired, all information can also be saved to a central repository via the gigabit ethernet interface. BeamWatch includes a software package designed to assist the laser technician by displaying the relevant measurement values in real time.

- No power limitation; no wear and tear
- Focus shift in real time
- Easy to use
- Compact and portable



MEASURING HIGH-POWER LASERS
IN AUTOMATED PRODUCTION

Ophir Helios Plus

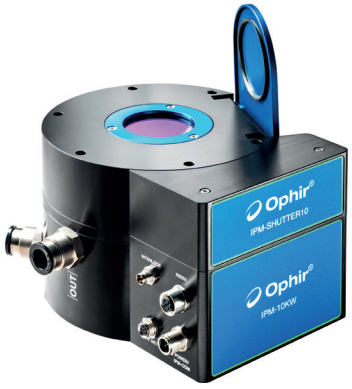
Automated power measurement in seconds

The Helios™ Pro laser power meter has been specially designed for use in industrial applications. In just a few seconds, it measures laser powers of up to 12kW without requiring any cooling. The compact measuring device is suited for blue/green lasers and for NIR lasers. It can be easily integrated into laser systems or production cells in order to automate performance measurements for the entire optical laser system.

By regularly and frequently measuring the laser power, slight deviations from setpoints can be detected immediately. This makes it possible to take remedial measures right away, ensuring consistently high production quality.

- No air or water cooling required
- IR (900-1100nm) and blue/green (450-550nm)
- All standard industrial interfaces
- Robust housing
- Fast measurement with only 3 secs response time

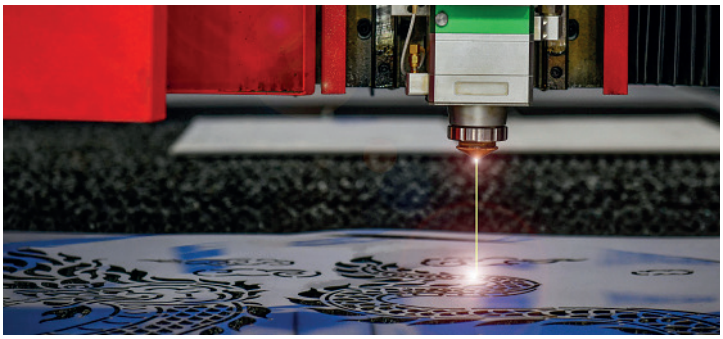
Ophir IPM-10KW



Modular power measurement device

The modular concept of the IPM-10KW laser power sensor enables users to configure a device suited to their individual requirements. Users can mix and match four easy-to-clean and simple-to-maintain components based on application needs. Regardless of the combination chosen, the IPM-10KW sensor delivers high accuracy and repeatable measurements in rough production environments. Thanks to its water cooling the IPM-10KW sensor is able to check laser stability over longer lasing times. The device measures powers from 100W to 11kW for wavelengths from 900 to 1100nm and 10.6µm.

- ISO17025 NIST and PTB traceable power sensor
- Optimal price offering with modular get-what-you-need concept
- Suited for NIR and CO_2 lasers
- Additional sensor protection with automated shutter incl. field replaceable window
- Measures power up to 11kW



Ophir BeamWatch Integrated

Superior beam analysis in harsh environment

BeamWatch Integrated is a fully automated laser measurement solution that enables the measurement of critical laser beam parameters on industrial production lines. BeamWatch Integrated provides real-time beam analysis of lasers that are typically too powerful for direct readings, as they would damage the equipment. Instead, BeamWatch systems are the industry's first to measure Rayleigh scattering using a pass-through beam measurement technique. An additional power sensor serves both, as a beam dump and for measuring the laser power. Beam parameters measured include focal shift, focus spot width and location, centroid, M2, divergence, beam parameter product, Rayleigh length, beam tilt angle, and absolute power.

BeamWatch Integrated is available in two versions: Ophir BeamWatch Integrated 150 has been developed for multi mode high power YAG, fiber, and diode lasers in the 980-1080nm range. The Ophir BeamWatch Integrated 500 industrial beam characterization system is designed for applications that work with single mode lasers using long focal lengths, up to 500mm from focal point to power meter, as used for example in contact welding in battery production.

- Laser power, caustic and focus shift in real time
- Support multi-mode lasers
- Fully automated operation
- Trend analysis with good/bad signal
- Detailed report with time stamp
- Ability to work with different types of welding heads w/o changes to the measurement system

WHY MKS?

CRITICAL TECHNOLOGIES

World-class technology and development capabilities for leading-edge processes

PROVEN PARTNER

Recognized leader delivering innovative, reliable solutions for our customers' most complex problems

OPERATIONAL EXCELLENCE

Consistent execution across all aspects of our business

COMPREHENSIVE PORTFOLIO

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Why choose Ophir products? Ophir® is a brand within the MKS Photonics Solutions division. The Ophir product portfolio consists of laser and LED measurement products including laser power and energy meters, beam profilers, high-performance IR thermal imaging lenses and optics for CO_2 and high-power fiber laser applications.

- **Variety of products** – The range of Ophir products includes sensors to measure laser power and energy; beam profilers to measure focus shift and beam quality, including industry-leading non-contact measurement systems.
- **Individuality** – In addition to the continuously growing portfolio of standard sensors, MKS develops customer-specific Ophir OEM solutions for individual application requirements.
- **Service** – For the Ophir product line, MKS offers service and calibration centers worldwide that are ISO17025 certified or are in the process of accreditation.

For further information please visit **www.ophiropt.com**