PRIMES

# PRODUCTS FOR LASER BEAM ANALYSIS
IN AUTOMOTIVE INDUSTRY

# Stay Ahead in Industry 4.0 with PRIMES Laser Beam Diagnostics

Tomorrow's manufacturing demands are already today's reality: smart, adaptive, efficient, and sustainable. As product life cycles shrink and customization accelerates, production systems must be more flexible than ever. And in a world where quality can't be compromised, early detection of deviations is mission-critical.

Stopping equipment in a tightly integrated 24/7 production line? That's not just downtime—it's a costly disruption. Especially when it comes to laser-based processes, beam quality directly affects cycle time reliability. But lasers are precision tools—susceptible to wear, misalignment, or thermal drift. Even the slightest beam irregularity can lead to part defects, costly rework, or material waste.

With PRIMES' automated laser beam diagnostics, you gain the ability to detect changes before they impact your process. Regular focus and beam analysis allows for predictive maintenance and precise root-cause identification—whether it's beam waist shift, symmetry loss, alignment errors, or thermal effects.

Industry 4.0 doesn't always look like a cleanroom. Real-world production environments are often harsh, space-constrained, and exposed to constant mechanical loads. That's why PRIMES solutions are designed for durability and adaptability. From rugged housings that protect sensitive optics in contaminated environments to ultra-compact devices and custom-tailored optical components designed for tight spaces—we've got you covered.

From laser OEMs to automotive giants, industry leaders across the high-power laser value chain rely on PRIMES for consistent quality, process flexibility, and maximum uptime. Make smart diagnostics part of your smart factory.

# Fast, reliable and highly accurate – PowerMeasuringModule PMM

**The industrial standard for power measurements of high power lasers – fully integrated in your automated production.**


The PRIMES PowerMeasuringModule PMM sets the benchmark for power measurements in high-performance laser applications. Engineered for use in demanding industrial environments, the PMM delivers rapid, accurate, and repeatable results — making it the go-to solution for inline quality assurance and real-time process control. Thanks to robust design and standardized interfaces, the PMM integrates seamlessly into automated production lines. Based on the calorimetric principle, it performs high-precision power measurements in under 3 seconds, enabling immediate evaluation even during component changeovers.

With the PMM, manufacturers can detect process deviations caused by faulty components early on—reducing scrap, optimizing service scheduling, and cutting costs in highly competitive production settings.

The PMM also supports low average powers and pulsed laser sources, as well as extended wavelength compatibility in the blue and green spectral ranges —ideal for copper processing and battery production in the e-mobility sector.

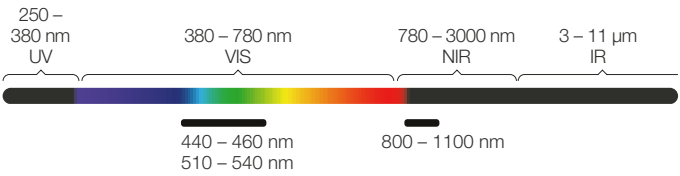
For even more demanding applications, the PMM AP³sM variant features an integrated micro lens array, enabling power measurements at intensities up to 200 kW/cm² near the focus—perfect for compact installations without compromising performance.


Caustic Power Beam profile Focus shift

Fiber and disc laser

Diode laser

Ultrashort pulse laser




| | PMM |
|---|---|
| POWER RANGE | 400 W – 12 kW |
| BEAM DIAMETER | Up to 30 mm |
| HIGHLIGHT | Accuracy ± 3 %<br>Reproducibility ± 1 % |
| INTERFACES | PROFINET, PROFIBUS, DeviceNet®, Ethernet/IP™, EtherCAT® |

## Conclusion

With unmatched speed, precision, and durability, the PowerMeasuringModule PMM is a smart, easy-to-integrate solution for industrial laser diagnostics. It comes equipped with common industry-standard interfaces, ensuring seamless communication with your production systems. Trusted by manufacturers worldwide—with over 5,000 units installed—the PMM is your reliable partner for laser-based process control in modern manufacturing.

# Autonomous and durable – FocusParameterMonitor FPM

**Real-time 2-in-1 beam characterization: laser power and caustic – engineered for seamless inline integration.**

The FocusParameterMonitor FPM is a compact, autonomous inline sensor that delivers real-time measurements of laser power, power density distribution, and beam caustic—all without disrupting your production flow. Designed for full integration into automated manufacturing, it performs ultra-fast measurements during non-productive phases like part changeovers, making it the ideal tool for continuous laser station monitoring.

The FPM conducts caustic measurements in accordance with ISO 11146, ensuring standardized and traceable results. It requires no external cooling and works with short laser pulses that closely mimic high-precision welding processes—such as remote welding of battery modules or hairpin welds in electric motors.

By detecting beam irregularities before they impact part quality, the FPM helps reduce scrap and ensures stable process conditions. With full traceability and documentation capabilities, it's especially valuable in high-value manufacturing environments, like battery and fuel cell production, where quality and reliability are paramount.

Caustic Power Beam profile Focus shift

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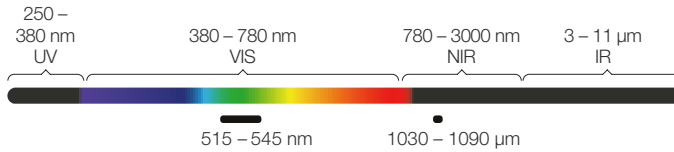


| | FPM |
|---|---|
| **POWER RANGE** | 400 W – 8 kW |
| **BEAM DIAMETER** | 75 µm up to 2000 µm |
| **HIGHLIGHT** | Automatic beam characterization and TCP verification |
| **INTERFACES** | PROFINET, PROFIBUS |

## Conclusion

The FocusParameterMonitor automatically captures key laser parameters—power, power density distribution, and focus characteristics—and transmits the data directly to your machine‘s PLC. This enables real-time monitoring, easy storage, and seamless integration into your quality assurance workflow.

Configurable warning thresholds allow early detection of drift or degradation, helping to prevent defects before they occur. Built on proven PRIMES technology, the FPM features a robust, compact design, is virtually maintenance-free, and delivers dependable performance in tough industrial environments.

# Competence in Laser Beam Diagnostics

PRIMES offers innovative and process-optimized measurement devices for focus characterization and performance assessment of laser beams. Our comprehensive range of high-precision, durable products is essential in numerous industrial applications to realize the full potential of laser technology.

Our systems are highly regarded by researchers and developers in both industry and academia. With all hardware and software developed in-house, we deliver tailored solutions for a wide variety of laser measurement tasks, system characterization and failure analysis. Standardized interfaces ensure seamless integration of our instruments into production processes.

Since its founding in 1992, PRIMES has installed more than 35,000 systems worldwide, earning its reputation as a global pioneer in laser beam diagnostics.

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