

Never work outside the specification ... never?

Ophir BeamWatch Integrated - Surprisingly flexible

Does it make sense to use a laser measurement system with a laser that doesn't fit the specification of the measurement device? Normally, we would answer this question with an emphatic "no". Surprisingly, our customers, working with Ophir sales experts, discovered things are different with BeamWatch Integrated. At first, the goal of the Ophir BeamWatch non-contact measurement system was to measure Gaussian beam profiles of high-power lasers in real time. Today, many different applications have successfully been used, such as those involving tophat laser beams or USP lasers, if their power and frequency are high enough. Let's have a look at what close cooperation with our customers revealed.

Non-contact beam measurement in automated manufacturing

Ensuring beam quality in automated industrial laser materials processing poses many challenges for measurement technology. MKS addressed these challenges by developing [Ophir BeamWatch Integrated](#). This measurement system is based on non-contact measurement technology Ophir developed with the [BeamWatch](#) system, but comes with additional functions that have been enhanced for the needs of the digital process chain: Ophir BeamWatch Integrated laser measurement systems add a robust housing and include either Profinet, Ethernet/IP, or CC-Link interfaces. All data collected is directly sent to the network and can be analyzed and stored, displayed in individually configurable reports, and displayed on a machine interface in a special configuration for operators. For the first time, it is possible to measure focus shift and focus spot size in real-time, with the full measurement ready in less than one minute. An integrated power meter measures the overall power and serves as a beam dump.

All these features make the system attractive, especially for new cutting and welding applications. Recently, a new BeamWatch Integrated with a longer distance was released (see fig. 1) - 500 mm instead of 250 mm between the BeamWatch optics and the power meter. This version is designed for use with single mode lasers with a low divergence, as found in battery welding, for example. All in all, there are six different models of the BeamWatch Integrated system available today, each serving different needs.



Fig. 1: Ophir BeamWatch Integrated Long Distance

New applications beyond the specifications

BeamWatch technology offers many advantages; as a result, users have adopted the technology to other applications beyond those initially specified. At first, the idea was to measure laser beams with a power density higher than 2 MW/cm^2 . Today we know that it is also possible to measure, for instance, a pulsed beam with average power densities as low as 60 kW/cm^2 . The challenge is that this type of beam doesn't have the preferred Gaussian beam profile, but a square shaped tophat. That is addressed by a smart beam orientation: Each measurement point of the system looks directly at one of the side views of the beam profile. That way the additional error for a non-Gaussian beam is negligible for the intended relative measurement and for the creation of trendlines of the beam parameters over time.

In materials processing, BeamWatch technology is also used to measure multi-beam lasers to gather 3-dimensional data in real-time. There are many more applications with different laser beams where the non-contact measurement technology can deliver fast and reliable measurements. Compared to measurements within the specified range, there might be slightly higher tolerances in absolute readings, but all measurements are reliable and repeatable. In production environments, where stability and repeatability of the process play key roles, the advantages of BeamWatch technology being a dynamic, very fast, and literally wear-less system for industrial requirements can also be put to use with other beam shapes or powers, beyond those initially defined.



Fig. 2: Ophir BeamWatch Integrated Short Distance delivers key beam parameters such as focal shift in real-time

USP-Laser and BeamWatch technology

Until recently, there was a strict break between high-power lasers and ultrashort pulse lasers (USP laser), as their power differed by a factor of 100 or more. Today, these technologies are continuously evolving; USP lasers reach out to power dimensions in the kW range and high-power lasers are sometimes used in pulsed mode (e.g. during the piercing phase within a cutting process). Thus, both technologies face the same challenge: How can laser beam parameters reliably being monitored? This is where users can turn to Ophir BeamWatch technology.

For the first time, Ophir invites customers to send their requests about how they would like to use the non-contact laser beam profiling out of spec. Ophir experts are happy to work with you to find ways to measure the USP or high-power laser, even if the application shows significant differences to the ones originally specified.

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