

Integrated scanning solutions for a scalable AM production

RAYLASE presents new scanning systems for efficient industrial additive production

Weßling, Germany - August 22, 2023 - RAYLASE, renowned market leader in laser technology, is expanding its portfolio of solutions for the AM market. Thereby RAYLASE focuses on matched complete solutions consisting of beam deflection unit and complementary products for further tasks around the exposure process.

Together, the products ensure that customers can exploit the full potential of their laser scanning solutions, enabling users to take the transition to scalable AM production.

At Formnext 2023 in Frankfurt, RAYLASE will be attending as an exhibitor to showcase its latest laser deflection units and scanning solutions. Interested visitors can learn there how their AM production can benefit from the new RAYLASE products.

Additive manufacturing is one of **RAYLASE's** focus markets. With this **focus on AM**, they are able to deal intensively with the challenges and wishes of the users and offer **suitable products and solutions**. As a solution provider, however, not only individual components are developed, but **complete integrated systems** that are **coordinated** with each other. These systems enable customers to get the most out of their AM system and thus build up **efficient additive production**.

On the heels of the success of the previous AM Modules and the AM Module NextGen, RAYLASE is now introducing the **next generation** of the scanning solution **developed specifically for additive manufacturing**: The **AM MODULE III**. It combines the experience from previous AM products with the know-how from the AXIALSCAN FIBER series. Key features of the new pre-focusing deflection unit include high productivity through **in-focus zoom**, an optical system designed for **beam shaping and high laser power**, the new **RAYVOLUTION DRIVE dynamic z-axis**, and a **multi-scan head design**.

In production, the AM Module III is **ideally complemented** by the **SCAN FIELD CALIBRATOR (SFC)**, the **PROCESS DATA ANALYZER (PDA)** and the **RAYSPECTOR**. These tools are exactly matched to the AM MODULE III and offer **efficient solutions for important tasks around the exposure process**, e.g. periodical scan field calibration, optimization of the scanning strategy or process monitoring.

AM MODULE III - READY FOR AM PRODUCTION

In additive production, a big issue is the efficiency of the production line. The aim is to keep the costs per part as low as possible to remain competitive with other manufacturing methods. Exactly this requirement is reflected in the AM-MODULE III.

HIGH POWER COMPATIBILITY FOR HIGH BUILDING RATES

The **dust-proof housing** and the production in an ISO Class 7 clean room allow the use of **stronger lasers with up to 2kW average power**. This additional power can be converted into a **higher scanning speed in the powder** and thus higher building rates. In particular, when **additional beam shaping**

ensures a **uniform distribution of energy in the focus**. In the AM Module III, this is made possible by the use of suitable optical elements. With this increase in productivity, additive manufacturing can become a genuine alternative to many more existing manufacturing methods.

ZOOM-FUNCTION OF THE AM MODULE III

The right brush width for every application – this becomes possible by the highly dynamic **zoom function of the AM-MODULE III**. One of the challenges in additive manufacturing is to keep the exposure time per plane as short as possible in order to be able to produce cost-effectively. For this reason, usually, the laser is defocused **to fill large areas** as this allows to cover larger area with each pass, **saving processing time**.

However, like a brush that is pressed on too hard, the shape of the laser spots is poorly defined outside the focus position.

The zoom function of the AM-MODULE III allows **dynamic in-focus adjustment by up to 2x the focus diameter**. So, even when the spot diameter is increased, the process continues in focus with an **undisturbed beam profile of the laser**. This also applies when using a ring or tophat profile.

In doing so, the **advantages of these alternative beam shapes** can be effectively combined with the time savings of a **larger spot diameter**. The AM MODULE III thus decisively contributes to a crucial issue in AM production, implementing **higher building rates** in the machine.

FASTER EXPOSURES DUE TO RAYVOLUTION DRIVE

To take advantage of a pre-focusing system and at the same time of the **full dynamics** of the XY deflection unit, **RAYVOLUTION DRIVE (RD) technology** was developed. It is based on the voice coil principle and enables **very fast movements** of the lens. As a result, it can follow even highly dynamic XY mirrors without delay and maintains a **stable z-position** of the focus during dynamic movements and long jumps.

The RAYVOLUTION DRIVE technology thus ensures **optimum flat-field correction even at high scanning speeds** throughout the entire processing field of up to 650 x 650 mm². In addition, it allows **highly dynamic scanning strategies such as hatching with a constant focus position**. Together, these features make the AM-MODULE III the ideal solution for precise and highly dynamic AM applications.

SCAN-FIELD CALIBRATOR - PRECISE CALIBRATION OF MULTI-HEAD SYSTEMS

For the part quality of an AM machine, a **precisely calibrated processing field** is crucial. After all, poor calibrations can quickly render the product unusable, especially in aerospace or medical applications. In addition, **accurate and frequent calibration** ensures that the machine produces consistent parts across different batches and time periods. This is important for series production. But calibrating AM machines and especially AM multi-head systems is complex and time-consuming.

To support the user here, RAYLASE offers the SCAN-FIELD-CALIBRATOR (SFC). It **automatically measures** the processing field with up to **49 x 49 measuring points** and creates **optimized correction files for the deflection unit**. Thereby, the SFC offers an **average correction accuracy in the process field of ± 15 µm**, being comparable to coordinate measuring machines. The complete calibration process is carried out via a user interface with just a few clicks, preventing media discontinuity and thus **reducing potential sources of error**.

To also simplify the calibration of multi-head systems, RAYLASE is now adding the **multi-field option** to the SFC. This allows the SFC software to handle the **simultaneous calibration of multiple AM modules** and ensures **accurate and consistent calibration of adjacent scan systems, especially in the overlap area**. Thus, even the frequent calibration of multi-head systems in AM production becomes a comfortable routine.

RAYSPECTOR - IN-FOCUS PROCESS MONITORING

Seamless quality monitoring is becoming important in more and more AM applications. Especially critical application fields such as aerospace or medical technology are interested in integrating a **layer-by-layer process monitoring** into their production process. For this purpose, it is necessary to **collect measurement data during the exposure process and to link these with the position values in the image field**. Thereby, different sensors have different requirements for the beam deflection units.

While **pyrometers for melt pool monitoring** can typically be used directly via an **achromatic camera port**, such as the one installed in the AM MODULE III. However, camera solutions require for this task a **precise focus tracking** at the observation port, which must be able to follow the fast movements of the scan mirrors. Otherwise, the image becomes blurred, and analysis may be rendered impossible.

With the **RAYSPECTOR**, RAYLASE offers a **focus tracking that is optimally adapted to the AM MODULE III**. Thanks to highly dynamic lens shifting using RAYVOLUTION DRIVE technology, the process observation precisely follows the scan movement and **enables sharp images in the entire observation field**. This makes sophisticated image analysis possible and can thus be used for quality monitoring and even process control.

PROCESS-DATA-ANALYSER - PROCESS OPTIMIZATION WITH SCANNER POSITIONS

Optimizing laser processes can be time-consuming. Whether you need to adjust the **usual delays to synchronize the laser and deflection unit** or analyze **the effects of the laser beam on the material using optical sensors: The Process Data Analyzer (PDA)** is your tool to understand what's going on. Like a **digital oscilloscope**, the PDA can track every signal delivered by the control board to control the deflection unit and the laser. When using a digital deflection unit such as the AM MODULE III, the PDA can **read back the actual scan path** and compare it to the commanded path. This can help **optimize the dynamics of the deflection unit and the required delays** without consuming material.

With a pyrometer or other sensors connected to the deflection unit and control board, the PDA can **visualize the additionally recorded sensor data**. This helps to directly understand and optimize the process result.

CONCLUSION:

With its scan solutions designed for an industrial AM market, RAYLASE wants to contribute to **making its customers' additive production more efficient**. Thanks to the zoom function and fast RAYVOLUTION DRIVE z-axis, the new AM MODULE III enables a **significant increase in performance** and makes additive manufacturing attractive for many other applications. Using RAYSPECTOR, **precise process monitoring** remains possible even at these high dynamics, providing an important feature for critical application fields.

In addition, RAYLASE offers the SCAN FIELD CALIBRATOR (SFC) and the PROCESS DATA ANALYSER (PDA), two extensions that enable **optimal and convenient use of the AM MODULE III in everyday production**.

Thus, the RAYLASE offers a **complete solution for the AM market**, and it enables AM users to take the next step in the industrial production environment: The step from rapid prototyping to fast additive production!

At Formnext 2023, RAYLASE will present its latest innovations for the AM market and offer visitors the opportunity to experience the products and talk to our industry experts.

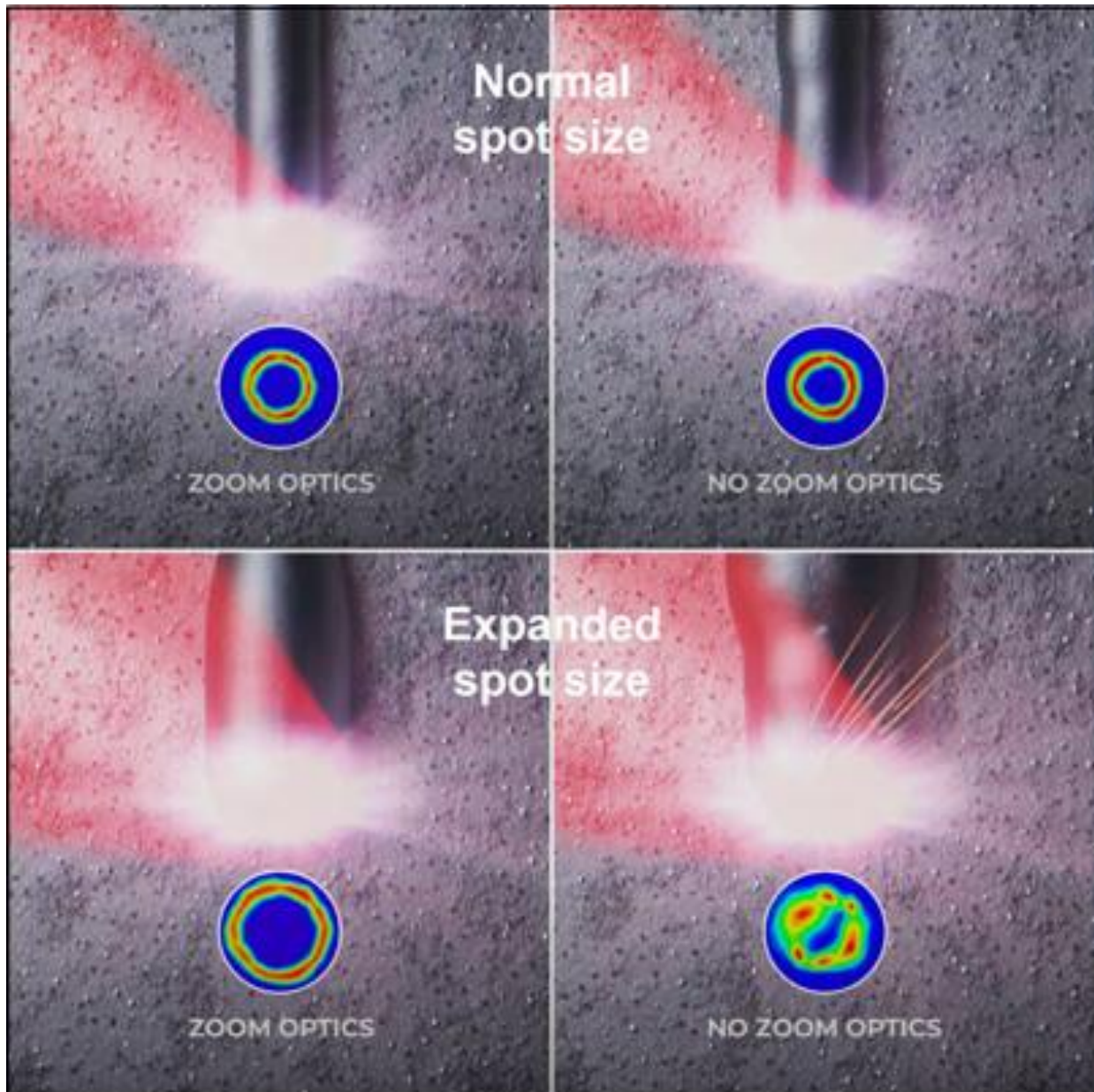
About RAYLASE

RAYLASE GmbH is the solution provider for laser applications in industrial environment. Since 1999, the Bavarian company from Wessling near Munich, provides innovative laser deflection systems for precise and efficient laser material processing. By combining opto-mechanical scanners with sensor technology and intuitive software, it enables optimized laser systems that are made for industrial production.

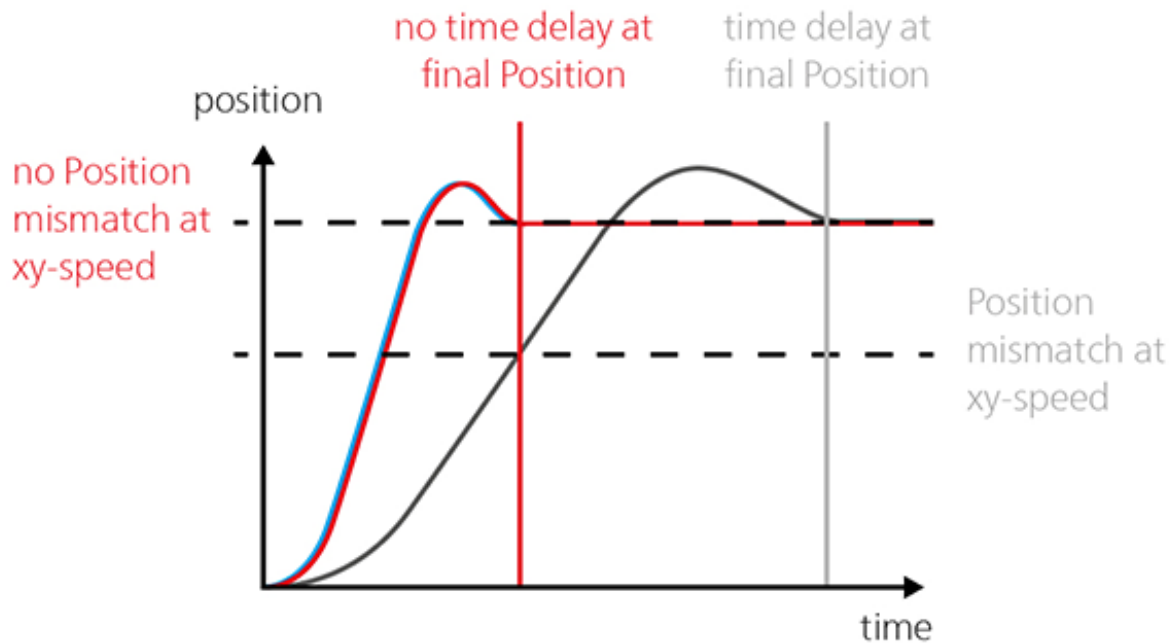
RAYLASE has its focus in the e-mobility and AM market as well as in the solar and electronic sector. With its subsidiary and its own additional production facility in Shenzhen, China, it offers a high production depth and optimized delivery times. Together with several international representatives in the US, Italy, Japan, Korea, and Taiwan, the RAYLASE group with its 170 employees supports customers worldwide with industrial solutions for laser cutting, laser welding and laser surface processing.



The AM MODULE III is the next evolutionary step in deflection units for the additive manufacturing market. With its consistent focus on industrial manufacturing, it enables users to achieve high productivity, both in terms of exposure time and overall system availability. With the AM MODULE III, the step from rapid prototyping to fast additive manufacturing is now possible!

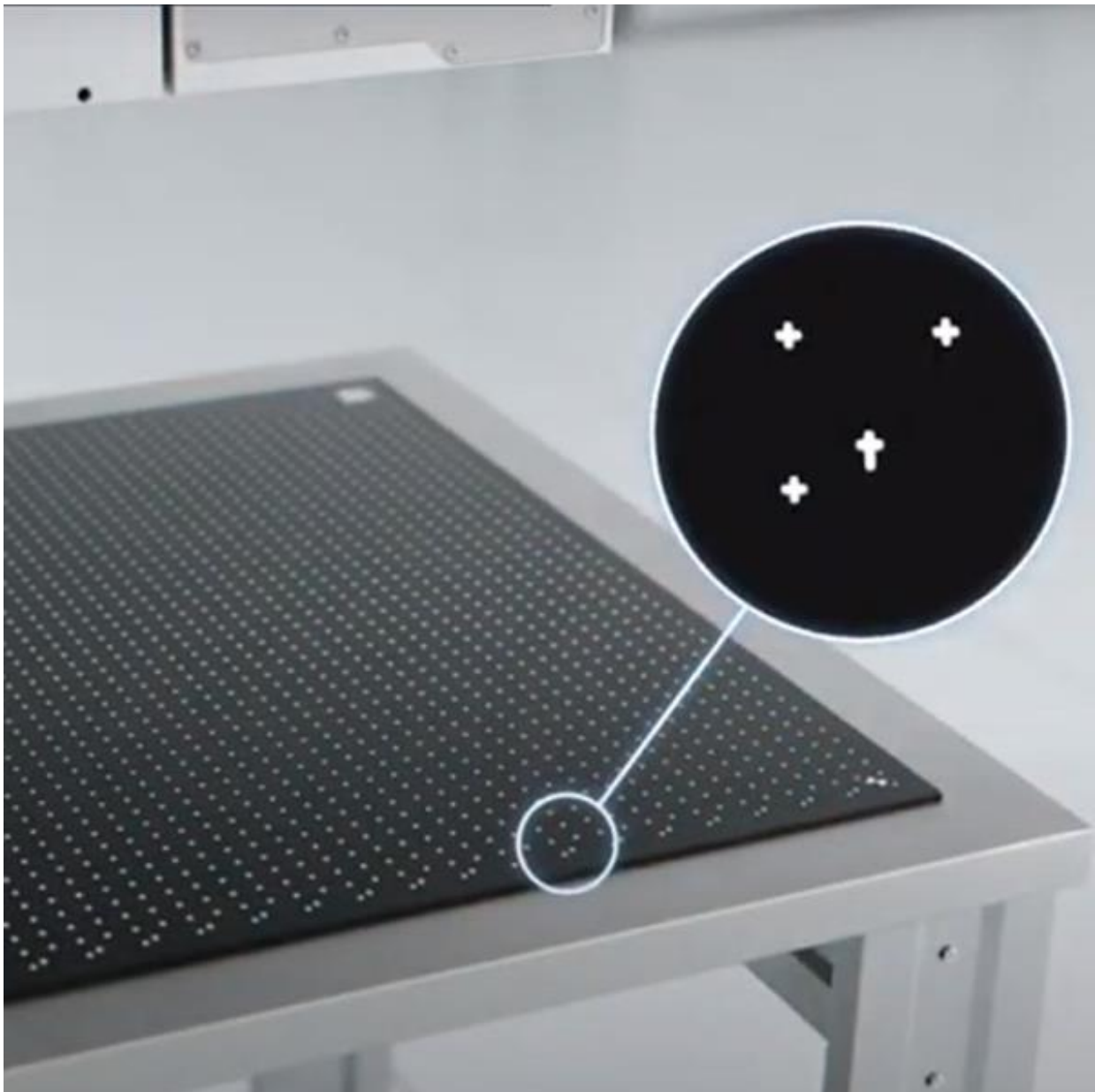


The in-focus zoom function of the AM MODULE III allows the spot diameter to be varied by up to 2x. In contrast to defocusing the spot, the beam shape is preserved when zooming. This is especially important when the beam quality of the laser is good and when using beam shaping like ring mode or tophat.



- xy-mirrors
- RAYVOLUTION DRIVE
- Standard z-Axis

RAYVOLUTION DRIVE: Pre-focusing beam deflection units like the AM-MODULE III use a combination of moving and fixed lenses in front of the scan mirrors to focus the laser. To keep the focus in a constant z-plane, the movable lens and thus, the focal length adjusted with each movement. Compared to a standard z-axis, the RAYVOLUTION DRIVE follows the xy-mirrors without time offset, ensuring synchronous motion in space.



The SCAN FIELD CALIBRATOR simplifies and speeds up the calibration process for laser systems. It provides fast and accurate calibration in x,y and z direction and significantly reduces the time and effort required to obtain a stable and reliable process. In a multi-field calibration, marks are placed in the overlap areas with all deflection units. These are then automatically measured and translated into aligned correction files.