

SCANAhead Technology

A Process Accelerator for Additive Manufacturing

SCANahead – Innovative Scanner Control

High-End Systems for Additive Manufacturing

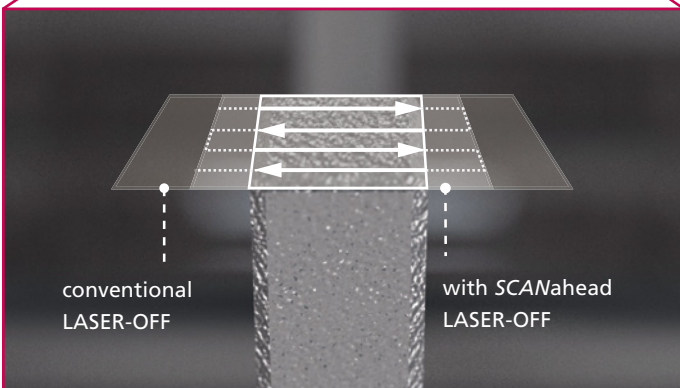
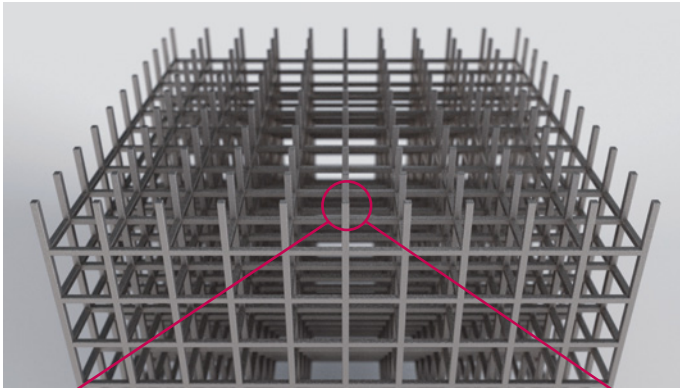
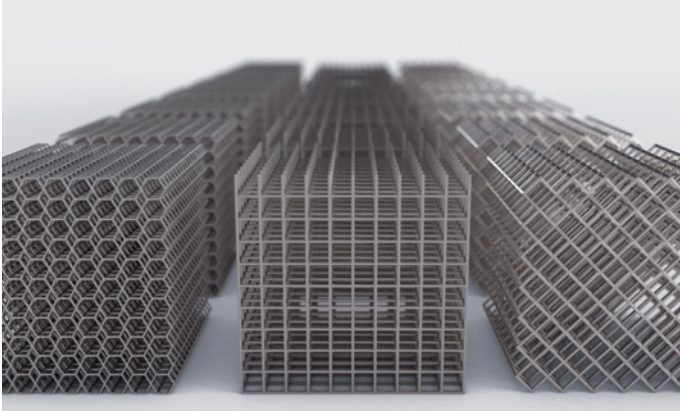
Powder-based 3D printing offers maximum component-design flexibility. It enables fabrication of modern, lightweight structures, such as used in the automotive and aerospace industries.

Industrial laser processing systems for additive manufacturing have long relied on SCANLAB scan systems to guide the focused laser beam precisely and with high dynamics across a powder bed, thereby melting defined areas.

SCANahead Control Boosts Productivity

Faster 3D printing throughput is conventionally achieved by utilizing multi-head systems or higher laser power. But additional potential is offered by modern technologies such as SCANLAB's SCANahead servos, which can significantly cut process time via much shorter LASER-OFF periods. This effect is particularly pronounced for filigree component structures.

Grid structures are typically fabricated by guiding the laser focus in bidirectional scan vectors over the numerous small areas to be processed. The large number of short scan vectors requires a high proportion of acceleration and braking periods (LASER-OFF). SCANahead control enables much higher dynamic performance than conventional servos. The result is shorter paths during LASER-OFF times (see figure lower left).



SCANahead control shortens acceleration and deceleration paths

High Throughput Thanks to High Acceleration

SCANahead control allows scan systems to deliver full acceleration independent of the scan speeds (i.e. with minimum acceleration duration t_a). The galvos' dynamic performance potential is optimally utilized.

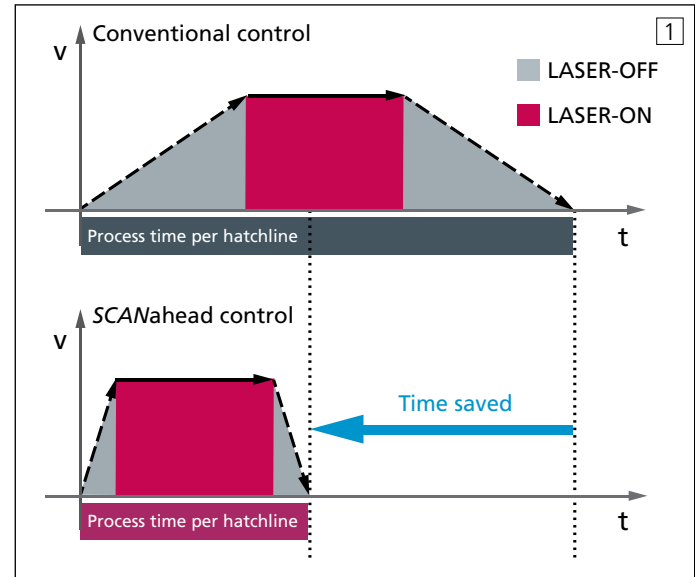
The rapid accelerations sharply shorten acceleration periods and braking periods. This significantly reduces the time during which the laser remains switched off at each hatch line (see diagram 1).

This cuts process time and also boosts productivity, without requiring changes to process parameters (process speed, laser power etc.).

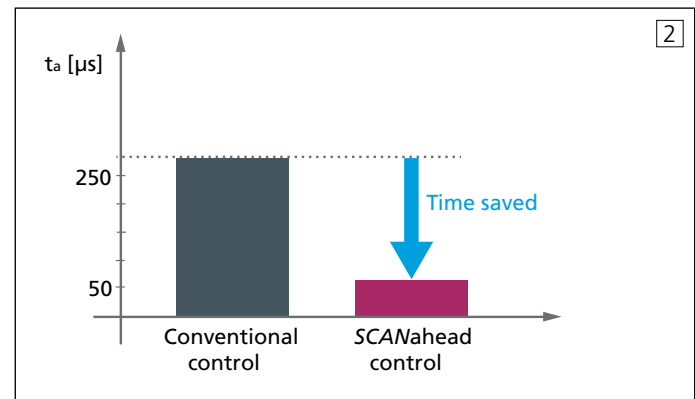
Compared to conventionally controlled scan systems, SCANahead servo control can reduce LASER-OFF time (= acceleration time t_a) by approx. 80% at a scan speed of $v_{scan} = 1\text{m/s}$ (see diagram 2).

SCANahead Control's Advantages in 3D Printing

- Boosts productivity via significantly shortened acceleration times
- Reduces process time with no need to change process parameters
- A universal tuning assures maximum user friendliness – no delay adjustments necessary!
- Highest accuracy (contour fidelity) and long-term stability thanks to the latest digital encoder technology – even for challenging scan jobs

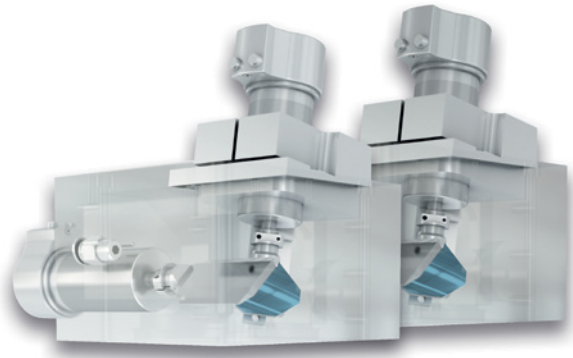


With unchanged LASER-ON times, SCANahead control significantly shortens LASER-OFF times (acceleration and braking).



Reduced acceleration time with SCANahead control*

*Simulation results are based on system with 14 mm aperture and $f=500\text{mm}$.



excelliSCAN 20 Coming soon!

Scan Systems with SCANahead Control

SCANLAB's high-end series will soon be extended by the **excelliSCAN 20**, the first larger-aperture variant to become available. Also planned is an excelliSCAN with 30-mm aperture.

On this technical platform, **customer-specific scan solutions in modular design** (without housing) are also possible.

With the new, large 20-mm aperture, excelliSCAN systems are also useable in applications requiring the following characteristics:

- High-power compatibility
- Large working volumes
- Small spot size

Advantages of excelliSCAN:

- Enhanced thermal management
- Best long-term stability
- Highest dynamics and precision
- Comprehensive status querying (e.g. mirror temperature, real position, real speed etc.)
- Easy, flexible deployment