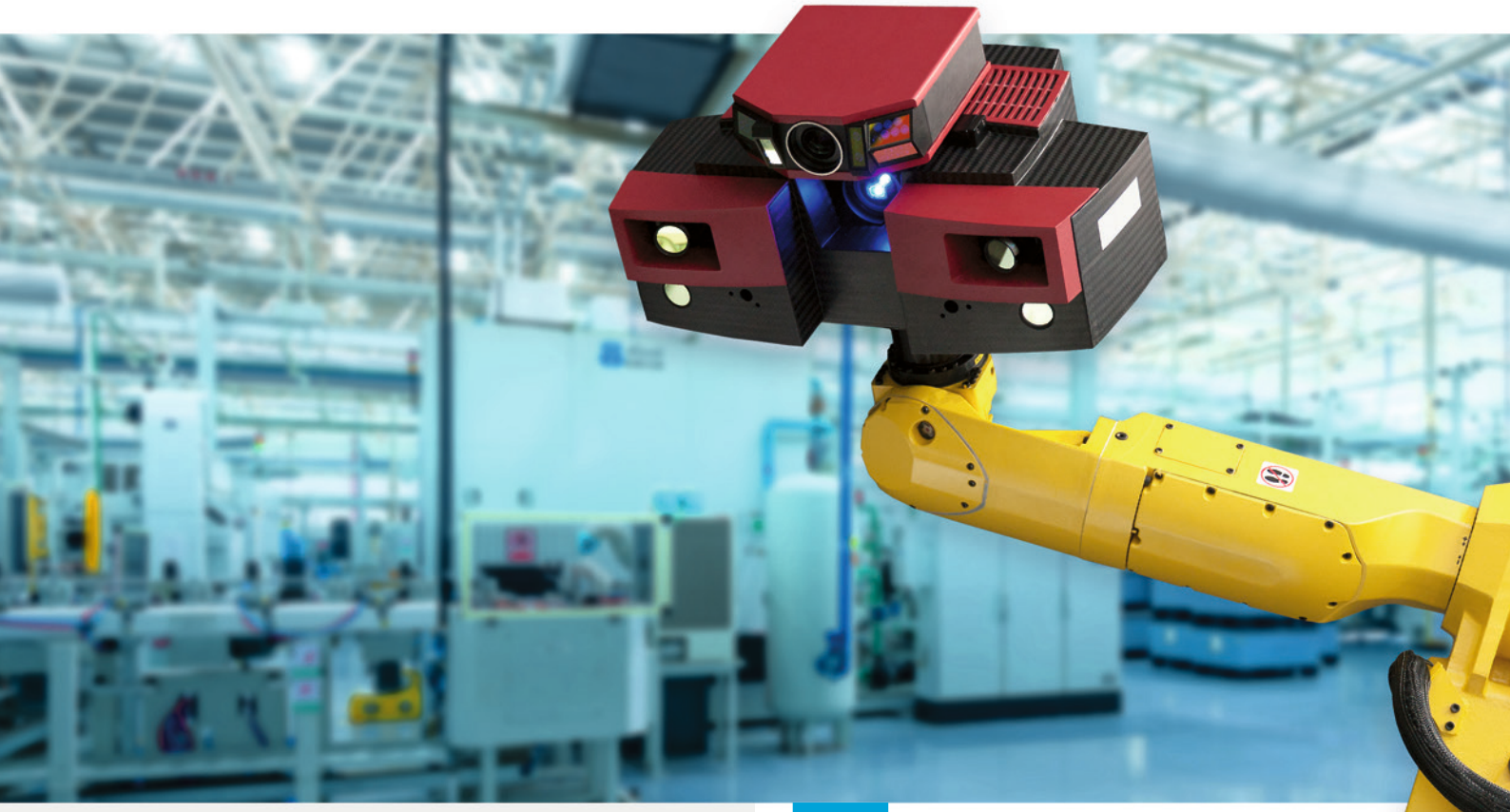
Machine vision



The challenge

Machine vision is becoming a core element of automated manufacturing and logistics, from robotic inspection to parcel handling and quality control. Vision systems must capture sharp, high-resolution images while objects and working distances change. Key limitations are:

- Variable distance causes fixed-focus optics to lose sharpness.
- High magnification reduces depth of field, limiting inspection of height-varying parts.
- Mechanical refocusing adds vibration, size, wear and calibration effort.

> *For example, a robotic inspection camera may need to refocus between surfaces at different heights while the robot continues moving and the production line stays at speed.*

Optotune's solution

Optotune's tunable optics bring dynamic focus and beam steering into machine-vision systems without moving camera assemblies.

Liquid lenses refocus within a few milliseconds across varying working distances; supported EL models deliver >1 billion cycles and excellent repeatability. ELM-T lenses preserve telecentricity and near-constant magnification, while fast steering mirrors can expand the field of view in constrained lines. This enables faster inspection, flexible viewpoints and reduced mechanical complexity.

Advantages

- **Fast focus adjustment:** 3-15 ms
- **High repeatability** over large temperature ranges
- **Long lifetime:** >1 billion cycles
- **ELM-T telecentric modules:** 0.133x-4x magnification, distortion-free imaging and no vignetting

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Robotic inspection

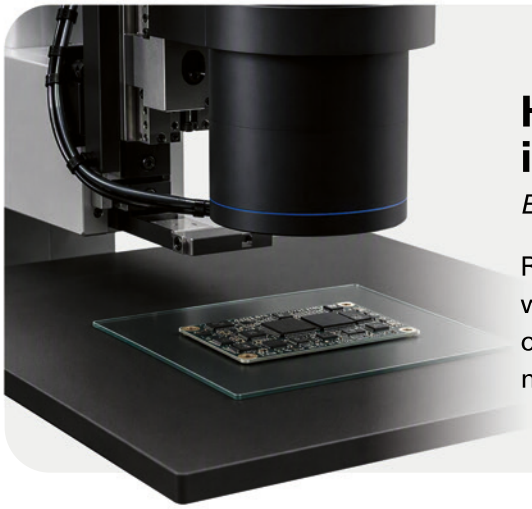
<10 ms refocus, >1 billion cycles

Shift focus electronically between focal planes, extending usable depth of field and avoiding vibration from motorized Z-focus.

Electronics inspection

Millisecond focus, vibration-free

Electronic refocusing shifts the focal plane across components at different heights, avoiding motorized z-axis motion and supporting higher throughput.



High-magnification inspection

ELM-T telecentric modules

Rapid focal-plane shifts enable image stacks within milliseconds for lens assemblies, glass or particles while preserving telecentricity and near-constant magnification.

Customer success story

A customer is using our mirrors for field of view expansion in a pharma and food inspection line. This enables a significant reduction of inspection time and increase in the production throughout.

<10 ms
Fast focus settling
with liquid lenses

<10 ms
High-speed beam steering
with large-angle mirrors

IR imaging compatible
seeing through complex material stacks

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