inspect America

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AI in Agriculture: Weed Out the Waste

SPS: The Premiere Automation Show makes its Way to the US

Streamlining Inspection Processes with Laser Projection

Non-contact Infrared Pyrometers for Automation Technology

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Two real trade fair highlights are coming up

How can you tell that the holidays are finally over and fall is beginning? Of course, by the fact that the last issue of inspect America is being published. Okay, just kidding. In fact, the fall trade shows mark the last highlight of the year. This year, SPS Atlanta is a brand-new event. As an offshoot of the leading automation trade fair SPS in Nuremberg, Germany, it is generating high expectations right from the start. It will take place on September 16-18.

About a month and a half later, from November 4 to 6, the next highlight follows: Embedded World North America. After moving to Anaheim, California, the second edition of this trade fair aims to build on the success of the previous year. With over 250 exhibitors and 5,000 expected visitors, it could well succeed.

But of course, this issue of Inspect America has much more to offer. This includes an application article on how artificial intelligence and machine vision can reduce herbicide use by 90 percent.

The article on contactless thermography is also one of the most exciting articles in this issue. These pyrometers are used, for example, in car painting facilities.

The third and final article I would like to recommend to you is about a single sensor with two lenses. This allows stereo 3D vision to be achieved with a comparatively simple sensor and thus a compact overall system.

Enjoy reading this issue!

David Löh
Editor-in-Chief of inspect
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Change in Management at Stemmer Imaging

Arne Dehn, who has been CEO of Stemmer Imaging for over six years, is stepping down from his position. Under his leadership, the company has transformed itself from a distribution company into a recognized system provider in the field of machine vision. Stemmer Imaging expanded into Europe, North America, and Latin America and broadened its portfolio to meet growing demand.

Dehn's achievements include the company's entry into the regulated Prime Market, a successful leveraged buyout by MiddleGround Capital, and the subsequent delisting. John Stewart, Chairman of the Supervisory Board, praised Dehn's contribution to the transformation of the company. Effective September 1, 2025, Paul Scholten will lead the company as interim CEO, supported by CFO Per Sundqvist and an experienced management team.

A New President on the 25th Anniversary

Pleora Technologies has appointed Anis Hanna as president. With experience in operations, supply chain, sales, IT, engineering, and professional services, Hanna takes on the role after serving in various leadership positions at Pleora since 2014, most recently as chief operating officer. He has led strategic initiatives that have improved operational efficiency, strengthened customer relationships, and supported growth in industrial, defense, and medical sectors.

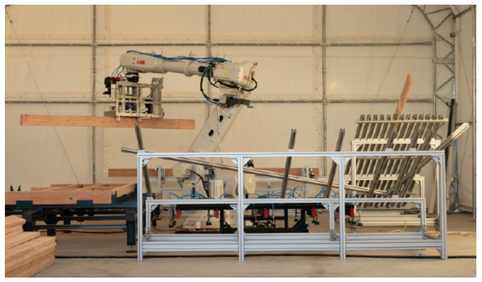
Outgoing President Harry Page is retiring but will remain on the board of directors. As it celebrates its 25th anniversary, Pleora is introducing new solutions, including external frame grabbers to optimize computing resources and embedded video interfaces to simplify design. The eBUS SDK 7 offers enhanced features and user experiences. CEO George Chamberlain praises Hanna's operational expertise and customer focus, while Hanna emphasizes the continuation of innovative solutions.

Position Paper on Humanoid Robots

The new position paper from the International Federation of Robotics highlights the future of humanoid robots, which are considered the next major innovation in robotics. China plans to mass-produce such robots, while tech companies in the US and Europe are making major investments. Humanoid robots are set to become universal helpers based on human mechanics. Takayuki Ito, president of the IFR, emphasizes that humanoids will complement existing technologies rather than replace them. In the US, the focus is on practical applications in logistics and manufacturing, not on social companions.

China sees humanoids as key to its robotics strategy, especially in the service sector. Japan is developing social robots for education and care, while Europe emphasizes ethical implications and human-centered design. Humanoids are suitable for complex tasks, but their widespread use as household helpers is unlikely in the short term.

AI Robots Help Rebuild Southern California after Wildfires



A mobile microfactory in Pacific Palisades enables houses to be built 70 percent faster and 30 percent cheaper than conventional methods.

ABB and Cosmic Buildings are using AI-powered robots to make rebuilding in Southern California more efficient. The combination of ABB's IRB 6710 industrial robot, digital twin software, and Cosmic's AI-driven Building Information Model (BIM) optimizes the construction process.

Custom wall panels are manufactured with precision and delivered just in time. The houses are made of non-combustible materials and equipped with solar and water recycling systems. Cosmic plans to build 100 houses by 2027. The mobile factory reduces waste and increases construction quality, redefining housing construction in disaster areas. ABB and Cosmic are setting new standards for fast, safe, and affordable housing by integrating robotics and AI into the construction process.

V-Optics and Optocraft cooperate on measurement systems for the optical industry

The two measurement technology companies V-Optics and Optocraft will cooperate even more closely in future under the umbrella of Micro-Epsilon. The companies will remain independent. Optocraft, V-Optics, and Micro-Epsilon will now offer a measurement technology portfolio for the contact lens, intraocular lens, and eyewear industries, providing multifunctional solutions from a single source that combine precision and efficiency. V-Optics is known for products and technologies for defect detection in optical components. Optocraft is a supplier of wavefront sensors and measurement systems for the ophthalmic, optical, and laser industries.

In the precision optics and glass industries, such as consumer electronics, semiconductors, automotive, lasers, space technology, and sapphire, V-Optics will expand the Optocraft/Micro-Epsilon product range with an additional measurement modality. Users will benefit from greater process control, product quality, and more efficient production processes.

V-Optics will continue to operate from France, ensuring ongoing research and development, production, and customer support—an advantage for existing customer relationships and technological advances, the company is confident.

Image: Micro-Epsilon

They will be working more closely together in the future: Jean-Yves Hergott (left), Managing Director of V-Optics, and Dr. Johannes Pfund, Managing Director of V-Optics and Optocraft

Qioptiq Photonics becomes Excelitas Germany

Qioptiq Photonics GmbH & Co. KG has changed its name and legal form to Excelitas Deutschland GmbH, effective August 27, 2025. This renaming is part of the global consolidation of the Excelitas Group, a US-based provider of innovative technologies.


Image: Excelitas

Dr. Robert Vollmers

The German locations in Göttingen, Feldkirchen, and Regen will remain unchanged. Göttingen focuses on the semiconductor industry, Feldkirchen on medical technology and life sciences, while Regen manufactures round and micro optics. The transition to "One Excelitas" is intended to standardize the international market presence and strengthen internal processes and cooperation between the German locations. Dr. Robert Vollmers, Managing Director of Excelitas Germany, emphasizes the strategic importance and potential for growth and innovative solutions. Reinhold Zeiner adds that the new structure offers opportunities for the global market.

Optics and Photonics Industry Gathering at Optatec 2026

Optatec, the international trade fair for optical technologies will take place in Frankfurt am Main from May 5 to 7, 2026. This specialized event brings together experts, manufacturers, and users from the fields of optical engineering, precision optics, photonics, and image processing, promoting exchange between research and industry. The trade fair offers a platform for communication and knowledge transfer and is complemented by an attractive supporting program. Optical technologies, considered key technologies of the 21st century, are crucial for industries such as medical technology and automotive engineering.

Image: Schall

left to right: Fabian Krüger (P. E.Schall), Matthew Peach (Original Content), Robert Fisher (Optics.Org) and John Yoon (SPIE)

Optatec presents applications that address ecological, economic, and technical challenges. With around 1,000 companies and 190,000 employees, the German photonics industry is an important economic sector. The trade fair showcases cross-sectional technologies that drive innovation across industries in areas such as mechanical engineering and automotive engineering.

Opto Opens Branch Office in California

In July 2025, Opto opened a new branch office in the United States. Thomas Spieker is the Managing Director of Opto Microscopy Solutions. Thomas has a PhD in biology and 25 years of experience in the US microscopy market. In addition to supporting the sales partners and major customers, the company also plan to strategically expand it core business of imaging modules (an intelligent combination of camera, lighting and optics).


Image: Opto

Evosys Laser Celebrates 10th Anniversary

Evosys Laser, a company that develops and manufactures customized systems for laser welding of plastics, celebrates its 10th anniversary. Since its founding in 2015 under the name "Evosys" – a combination of "evolution" and "systems" – the company has established itself in Erlangen. Despite global crises, Evosys has expanded its technical expertise and written a success story. A significant milestone occurred in 2018, when Evosys expanded internationally through a joint venture, leading to the creation of locations in China and the USA, boosting exports to 70%. The move to Felix-Klein-Straße in Erlangen-Bruck provided modern facilities for further growth. Holger Aldebert, managing director, attributes Evosys's success to innovative technology and a dedicated team. Despite current market challenges, the company remains optimistic about future achievements. The Evosys Group now includes four companies, with operations in Germany, China, and the USA.


Image: Evosys

left to right: Managing Directors Holger Aldebert and Frank Brunnecker, and from the Chamber of Industry and Commerce Elfriede Eberl, Manuela Achhammer, Knut Harmsen, and Robert Schmidt.

The Premiere Automation Trade Show makes its Way to the US

Preliminary Report of SPS Atlanta

The inaugural SPS – Smart Production Solutions Atlanta starts soon, marking a significant milestone in the evolution of the SPS brand.

A new era of smart manufacturing is dawning in North America with the inaugural SPS – Smart Production Solutions Atlanta, scheduled to take place from September 16–18, 2025, at the Georgia World Congress Center in Atlanta, Georgia. This launch heralds the North American debut of SPS, the globally acclaimed event dedicated to smart and digital automation. Renowned for its technical expertise, solution-focused exhibitors, and cross-industry appeal, SPS has established itself as a pillar within the global smart manufacturing landscape. The event is organized by Mesago Messe Frankfurt, the creators of the original SPS in Nuremberg, Germany, along with Messe Frankfurt Inc. and the Association for Manufacturing Technology (AMT). The Atlanta edition promises to deliver the same level of technical depth, innovation focus, and solution-oriented approach that has made SPS a cornerstone of the automation industry for over three decades.

Image: Messe Frankfurt

An Experience of Connectivity and Innovation

SPS Atlanta will offer an experience that mirrors the complexity and interconnectedness of modern manufacturing systems. Attendees will have access to a vibrant exhibit floor featuring leading automation and digitalization suppliers, live demonstrations of AI-driven controls, smart sensors, edge computing, cyber-physical systems, and integrated software solutions. Additionally, technology spotlights and on-floor education will offer deep dives into automation academic research and sustainability, while networking programs will connect engineers, integrators, solution providers, and C-suite decision-makers. Amanda Francis, Senior Show Manager of SPS Atlanta: "This show is designed to help companies of all sizes—from local integrators to multinational producers—navigate today's automation challenges and connect with technologies that will fuel their next stage of growth."

Who Should Attend SPS Atlanta 2025?

SPS Atlanta 2025 is a must-attend for professionals across the industrial production spectrum, including systems integrators looking to explore solutions that enhance operational efficiency, engineers eager to discover the latest in controls, robotics, and motion technology, and technicians and maintenance teams interested in learning how to implement and support modern systems.

With the debut of SPS Atlanta, North American industry professionals now have a platform to connect, collaborate, and shape the future of production—right in the heart of one of the world's most dynamic manufacturing regions.

CONTACTS
Messe Frankfurt Inc., Atlanta, Georgia, USA

Useful links

- Registration page
- Exhibitor list
- Floorplan
- Conference program

SPS – Smart Production Solutions Atlanta will take place from September 16–18, 2025, at the Georgia World Congress Center in Atlanta, Georgia

The World of Embedded Systems Comes to California

Preliminary report on Embedded World North America 2025

From November 4 to 6, 2025, the Anaheim Convention Center in California will become the heart of the international embedded community. Embedded World North America is entering its second round, building on last year's successful debut. With the move from Austin to Anaheim, the trade fair is moving even closer to the innovation centers of the US West Coast.

Embedded World North America sees itself as a transatlantic extension of the long-established Embedded World in Nuremberg. It offers a platform for developers, engineers, product managers, and decision-makers who are involved with the latest developments in the fields of embedded systems, IoT, artificial intelligence, cybersecurity, and industrial automation. More than 250 exhibitors and over 5,000 trade visitors are expected to attend, exchanging ideas on current trends and technologies across an area of more than 100,000 square feet.

High-caliber conference program

A central element of the event is the high-caliber conference program. International experts will present their perspectives on the future of embedded technologies in keynotes, panels, and technical presentations. This year, the focus will be on topics such as edge AI, software-defined vehicles, secure system architectures, and the increasing complexity of embedded software.

In addition to the conference program, the trade fair offers numerous networking opportunities. Whether in matchmaking sessions, start-up pitches, or informal evening events, the focus is on personal exchange. Young companies will also be given a platform to present their innovations to an international audience of experts.

Embedded World North America is aimed at a broad audience of experts, from hardware developers and software architects to decision-makers from industry, research, and politics.

CONTACTS
NürnbergMesse North America,
Smyrna, Georgia, USA

Useful links for visitors

- Website
- Tickets
- Exhibitors & floor plan
- Visitor Info
- Conference Program

Weed Out the Waste

AI-Powered Precision Weed Control in Agriculture

A vision-based system cuts usage of herbicidese in agriculture by up to 90 percent. This solution enhances precision weed control, reduces costs, and minimizes environmental impact, while ensuring easy integration with existing farm machinery.

Image: Lucid

Herbicides are indispensable in agriculture.

Modern agriculture faces mounting pressures to balance productivity with sustainability. One of the most persistent challenges is effective weed control—essential for protecting crop yields, yet often reliant on widespread herbicide application. Traditional broadcast spraying treats entire fields regardless of the presence or location of weed, leading to excessive chemical use, high costs, and environmental harm. It also contributes to herbicide resistance and can reduce crop health and yields.

Challenge

To address the challenges around weed control, many farmers are turning to smarter, automated solutions. One company that is helping farmers do this is Dimensions Agri Technologies (DAT), based in Norway. DAT has created a machine vision-based system for targeted spraying—reducing herbicide use by up to 90% while improving both efficiency and sustainability.

In developing this solution, DAT faced several key technical challenges:

- Integration with farm machinery: Ensuring seamless compatibility with the ISOBUS protocol across different brands and equipment generations.
- Hardware durability: Delivering reliable performance in demanding agricultural environments, where equipment is exposed to dust, vibration, and weather extremes.


Phoenix
Module Camera

- AI detection accuracy: Accurately distinguishing between crops and weeds across a variety of field conditions and geographies.

Solution

To power its weed detection system, DAT selected Lucid's Phoenix PHX051S-CC 5.0 MP camera featuring Sony's IMX568 sensor. Compact and board-level, the Phoenix camera delivers the speed, image quality, and versatility required for high-precision weed detection in the field.

Key features of the solution:

- High-speed, detailed imaging for real-time weed identification using AI algorithms.
- Reliable in-field performance, enclosed in DAT's ruggedized housing with integrated LED flash.
- Seamless software integration, with DAT's custom software leveraging Lucid's API for camera control and data acquisition.
- Broad ISOBUS compatibility, allowing plug-and-play operation across new and legacy farm machinery.

Conclusion

By integrating Lucid's Phoenix camera into its AI-driven sensor system, DAT created a robust and scalable solution for precision weed control. Farmers benefit from up to 90% reduction in herbicide use, lowering input costs and minimizing chemical stress on crops. This leads to more robust crop yields, reduced environmental impact, and better long-term farm management through data-driven insights.

The system's compatibility with existing machinery ensures ease of adoption, making advanced precision agriculture accessible to a wide range of operations. With Lucid's camera technology at its core, DAT delivers smarter tools that support the future of sustainable farming.

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Shining a Light on Quality

Streamlining Inspection Processes with Laser Projection

In advanced manufacturing, precision is paramount—especially in sectors like aerospace, energy, and heavy industry, where submillimeter accuracy is critical for inspecting and assembling large components. The combination of 3D scanning with laser-guided projection meets these demands. This integration enables operators to move seamlessly through the Scan > Analyze > Project workflow.

An inspection process that can be carried out in any location

The Laser Projection Add-on introduces a streamlined and highly integrated workflow that enhances dimensional inspection and rework processes. It truly transforms how operators interact with inspection data and physical parts.

The process begins with a 3D scan of the part using Creaform's metrology-grade scanners. Whether using the Handyscan 3D Max Series for large, complex geometries or the Metrascan 3D for shop floor applications, the system captures the complete surface geometry with exceptional accuracy. These scanners are designed to operate in real-world manufacturing environments, accommodating part movement, vibration, and varying surface finishes without compromising data quality.

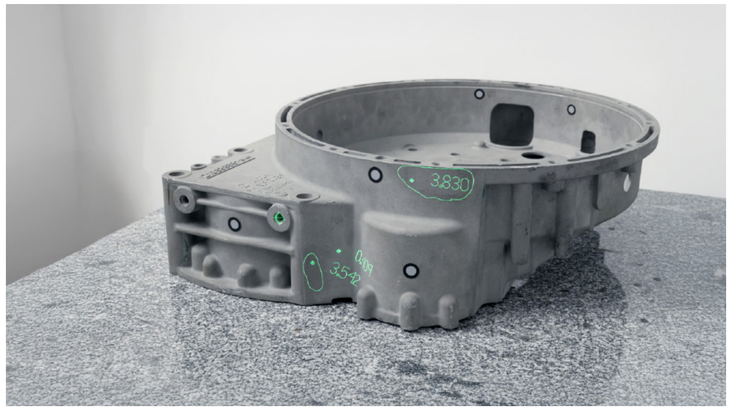
Once the scan is complete, the Inspection module of the Creaform Metrology Suite processes the data, comparing it against the nominal CAD model. Deviations are identified and visualized within the software, allowing users to isolate non-conformities and define corrective actions. This analysis phase is tightly integrated with the projection system, enabling a seamless transition to the next step.

Integrated within the inspection module, the Laser Projection Add-on enables users to select and project the required data.

Bridging Digital Precision and Physical Excellence

The final step, projection, is where the Laser Projection Add-on truly distinguishes itself. Using the same reference targets as the scanners, the Virtek Iris 3D projector overlays inspection results directly onto the physical part. Operators receive real-time, visual guidance on where to rework or adjust, eliminating the need for manual marking or interpretation of inspection reports. Features like FlashAlign and multi-tasking support further reduce setup time and increase throughput, especially in high-mix, low-volume production environments.

This unified workflow not only accelerates inspection and rework but also enhances repeatability and reduces operator dependency. By closing the loop between digital inspection and physical correction, manufacturers gain a powerful tool for improving quality, reducing waste, and maintaining tight tolerances across complex assemblies.



The features and measurements displayed on the piece remain accurately positioned, regardless of any movement of the part.

The Handyscan 3D Max Series and Metrascan 3D provide high accuracy and portability for scanning large, complex parts, with the Handyscan offering precision down to 0.0030 in and the Metrascan ensuring stability in challenging environments. The Virtek Iris 3D projector enhances the workflow by projecting accurate templates quickly and efficiently, supporting remote operation and multi-tasking across workstations.

Reworking Castings with Confidence

The Laser Projection Add-on transforms the rework of high-value castings by providing real-time visual guidance directly on parts, eliminating manual marking errors and reducing setup time. This method enhances precision by aligning rework with CAD data, improving part quality, and shortening production cycles. Built on trusted technologies like Handyscan, Metrascan, and Virtek's Iris 3D, along with Creaform's robust software, this solution integrates seamlessly into existing workflows, offering reliable performance in demanding environments.

The combination of two technologies: Creaform 3D scanners + Virtek laser projector

Conclusion

In an era where manufacturing complexity is increasing and tolerances are tightening, Creaform's Laser Projection Add-on offers a compelling solution. By uniting high-precision scanning with real-time laser projection, it enables a streamlined, repeatable, and operator-friendly approach to inspection and rework. Whether aligning raw materials for machining, installing components in aerospace assemblies, or reworking castings on the shop floor, this solution delivers measurable improvements in speed, accuracy, and quality. It's not just about doing things differently, it's about doing them better, with confidence backed by proven technology.

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all images: Creaform

Versatile Illumination for Precision Vision Systems

High-performance ring lights with adjustable light characteristics

Machine vision ring lights are used in bright-field applications requiring a compact layout. The illumination's geometry and light characteristics are crucial for full coverage of the inspection area, depending on parameters like the distance to the object, the area-of-interest (AOI), and the mounting options on the lens and camera.

Lumimax ring lights of the LRHP series

Lumimax has now updated its existing ring lights – with the LRHP High Performance Series, both current and future challenges in image processing can be successfully met.

The four lighting sizes in the LRHP series offer solutions for a wide range of applications. LRHP45 and LRHP66 (the number indicates the free inner diameter) are designed to be particularly compact and can be mounted directly on the protective tubes of many camera models. For applications requiring larger working distances, extended inspection areas, or larger dimensioned vision systems, the LRHP100 or LRHP160 models are ideal. The LRHP160, for example, is particularly well-suited for positioning on laser heads.

Compact Design, optimized Performance

All variants feature a compact yet performance-optimized design. Two rows of high-power LEDs are driven to peak performance by the integrated controller technology – in strobe mode, brightness levels of up to 4 million lux can be achieved. This is made possible by efficient power electronics combined with optimized thermal management. While the performance is impressive, size and weight are kept to a minimum, making mechanical integration easier. In addition, all series include a 3D cable outlet, allowing flexible routing of the

The LRHP series includes thermal management, many mounting options, and a space-saving design

power supply line. Proven Lumimax high power features such as the M16 connector, robust aluminum housing, and IP64 protection rating remain unchanged.

Customisable Light Characteristics for Demanding Applications

The dual-row LED layout not only increases brightness compared to previous models but also minimizes the appearance of LED hotspots – especially when used with frosted ALD diffusers. Using front optics, the light field width can be tailored to the object size and working distance. These optics are pre-assembled in lens arrays for easy replacement. The light characteristics can also be adapted using polarizing filters or diffusers, depending on the surface properties of the inspected object. Dome attachments for LRHP45 and LRHP66 offer especially diffuse, homogeneous illumination of highly reflective or curved surfaces. The three-dimensional diffuser scatters light from all angles of the hemisphere onto the inspection object. Thanks to active backlighting with high-power LEDs, these lights are significantly brighter than conventional dome lights, while also being suitable for use in confined spaces.

The LRHP ring lights are available in white, red, blue, green, and infrared, and support continuous, switched, or strobe operation.

CONTACTS
IIM AG, Suhl, Germany

All images: IIM

Stereo Vision in a Smaller Package

Single-Sensor Stereo Imaging in Robotics

As robotics and automation systems grow increasingly compact, intelligent, and power-efficient, the supporting vision technologies must evolve in parallel. One area undergoing rapid growth and innovation is single-sensor stereo imaging, where two optical channels converge onto a single CMOS sensor.

Sunex DXM Direct Imaging camera leveraging SXM pre-aligned and interchangeable dual-optics heads

This architectural shift offers a powerful blend of reduced physical footprint, lower power consumption, improved synchronization, color-matching, and overall cost efficiency. Originally explored for space-constrained applications, the concept is now gaining momentum across a diverse set of platforms, including Autonomous Mobile Robots (AMRs), Automated Guided Vehicles (AGVs), humanoid robots, manufacturing automation, and even multi-modal vision systems.

The Architecture: Two Optical Channels, One CMOS Sensor

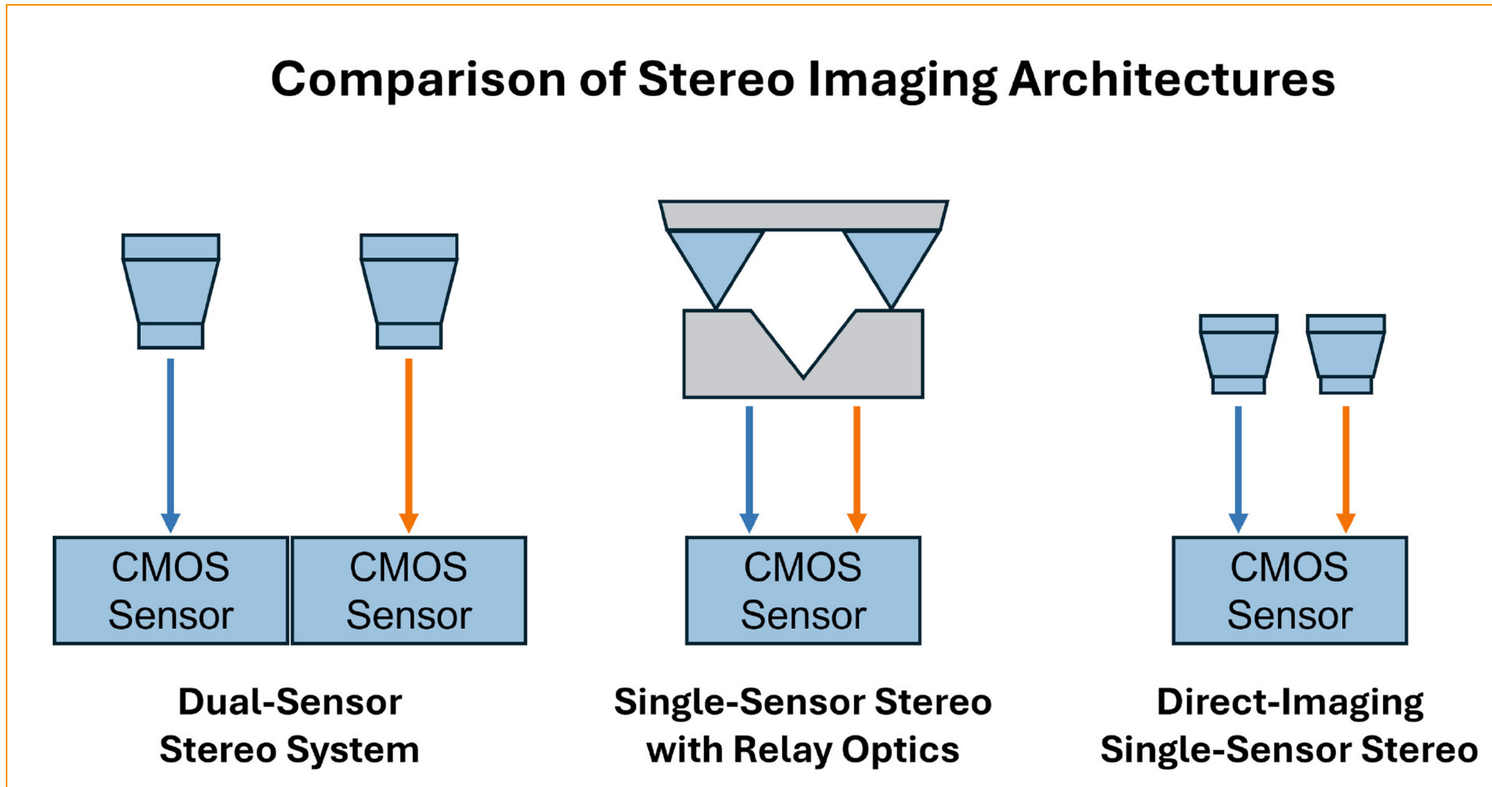
A single-sensor stereo imaging system consists of two independent optical channels, based on two different base architectures:

- Relay-prism or mirror systems, which allow a longer baseline (distance between the optical channels), enabling better depth perception at mid-to-long ranges.
- Direct-imaging optics, where two small lenses with a shorter baseline directly image adjacent scenes onto the same CMOS sensor.

The result in either case is a stereo image pair captured simultaneously, pixel-aligned, and temporally consistent, without the need for a second sensor.

Compact Design and Space Efficiency

The compactness of single-sensor stereo systems is obviously one compelling feature.



Comparison of stereo imaging architectures

This opens the door to new designs for low-profile AGVs, slim robotic arms, or humanoid head units, where stereo vision must be integrated without adding bulk or weight. Building on experiences in designing and manufacturing miniaturized optics for automotive and medical systems, the DXM direct imaging solution enables tighter baselines without sacrificing image quality or manufacturability.

Power Efficiency in Battery-Operated Systems

In battery-powered robots, energy is often the most limited resource. A conventional two-sensor stereo setup not only doubles sensor power draw but also adds thermal and processing load for synchronizing and handling dual video streams. With a single-sensor system, all duplicate overhead is eliminated.

Perfect Synchronization and Simplified Calibration

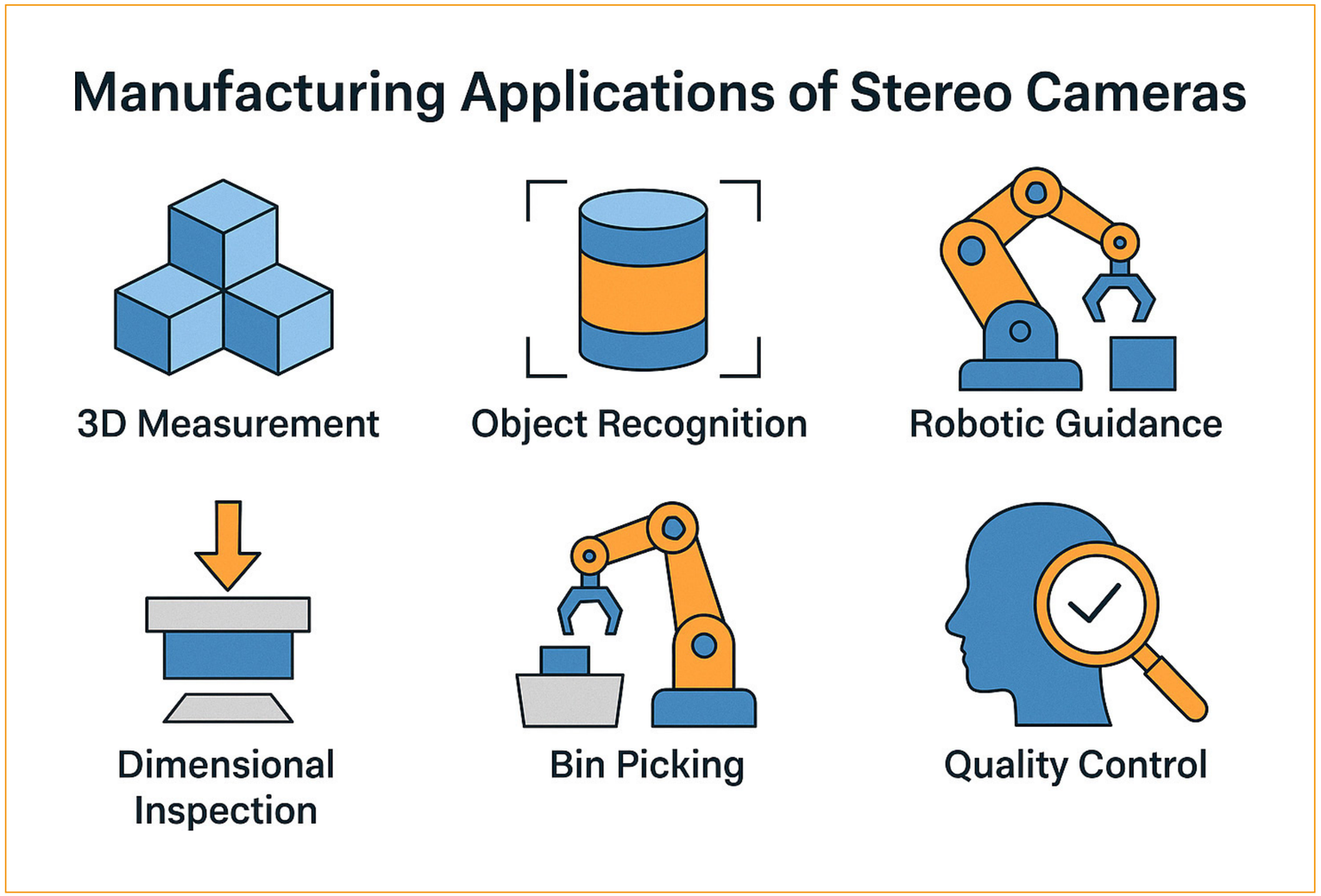
Another major advantage of single-sensor stereo imaging is zero latency synchronization, paramount for fast-moving robotic systems or dynamic environments. Both images are captured on the same sensor die in the same exposure cycle. This eliminates the need for complex software-level synchronization or dual-sensor calibration routines, or even sensor-to-sensor alignment

Sunex DXM for wide baseline requirements

Cost Efficiency: Fewer Components, Lower BOM

Reducing component count directly translates to lower costs, not just in materials, but also in assembly, calibration, and quality control. A single-sensor stereo system uses one sensor, a shared image processing pipeline, fewer connectors, cables, and serializers, and simplified housing and optical alignment.

However, single-sensor stereo systems come with trade-offs. The baseline is limited by the optics and sensor size, affecting depth resolution and range, suitable for near-field applications (0.2 – 2 meters). Relay optics can extend baseline distance but add complexity and risk alignment drift. Reduced per-channel resolution means each stereo view uses only half of the pixel array, which may be insufficient for high-precision tasks and could require shifting to higher resolution sensors.



Example of industrial applications for possible Sunex DXM

Despite these limitations, single-sensor systems offer opportunities in specific applications. In AGVs and AMRs, they provide cost-effective depth perception for obstacle avoidance and navigation in structured, well-lit environments. For humanoid and consumer robots, they offer reliable depth awareness for facial tracking and object manipulation, with compact designs. In manufacturing automation, they efficiently deliver functions like bin picking and assembly inspection, with simplified calibration and reduced cabling for easier deployment and less downtime.

Expanded Use Cases Beyond Stereo Imaging

The architecture for stereo vision can be adapted for multi-modal imaging by varying optical paths or filters, unlocking new applications. Dual Field of View (FOV) Imaging allows one channel for wide-angle awareness and the other for narrow-angle detail, useful in security robots, agricultural drones, and logistics. Simultaneous Visible and Infrared (RGB/IR) Imaging uses one lens for RGB and the other for near-IR, enabling day/night vision in medical robotics, food processing, and smart agriculture. Extended Exposure HDR uses two lenses optimized for different F/#s to capture a wider dynamic range and control depth of field, applicable in robotics, machine vision, and security. Stereo Content Capture eliminates discrepancies in color and illumination for AR/VR, content capture, and video conferencing.

Conclusions

As robotic and machine vision applications demand smaller, smarter, and more integrated systems, single-sensor stereo imaging emerges as a viable and even preferable alternative to traditional dual-sensor architectures. As the boundary between form factor and functionality continues to shrink, vision systems like these will be key to enabling the next wave of intelligent automation.

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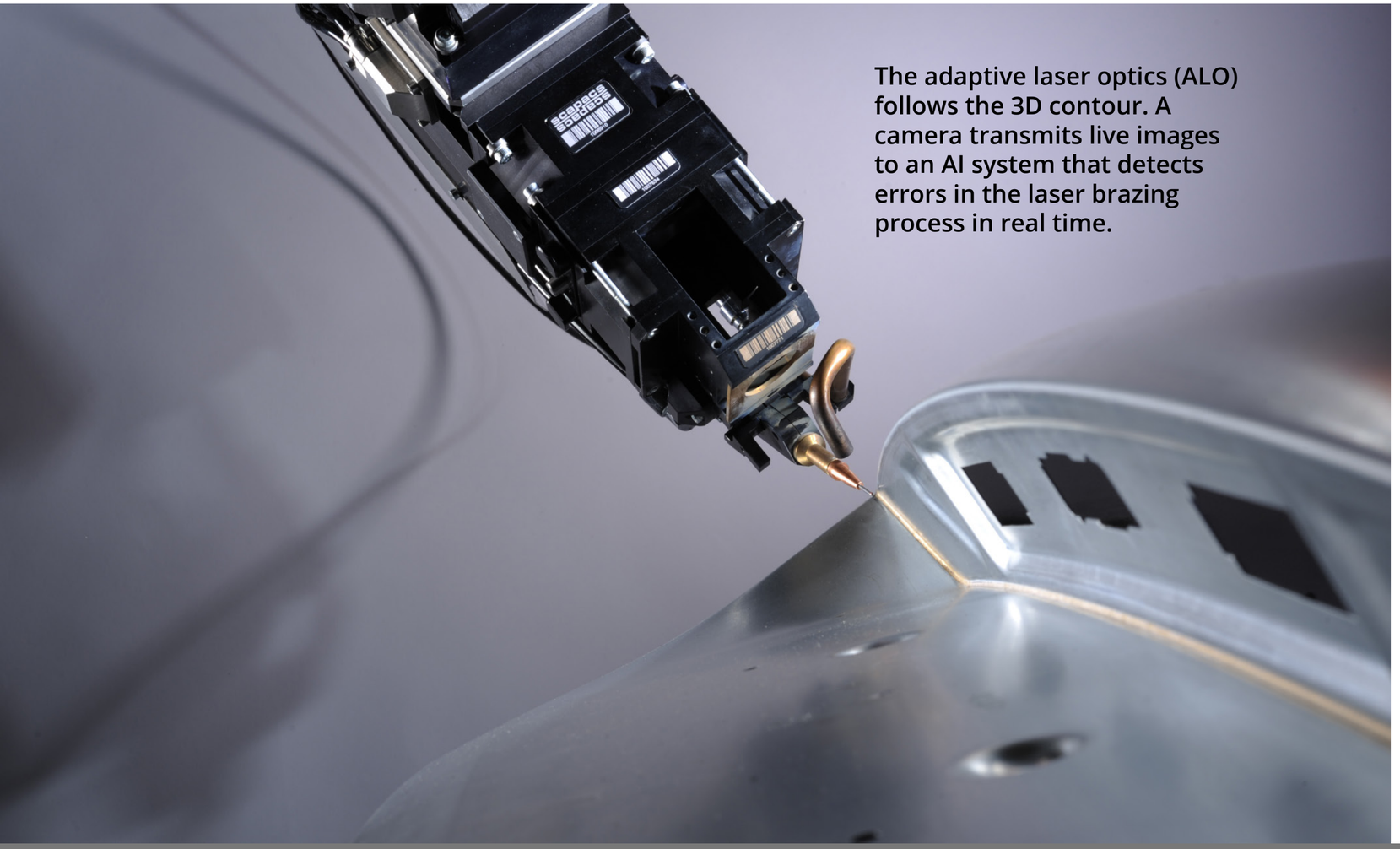
all images: Sunex

Automatic Defect Detection in Laser Welding and Brazing with AI

Process Monitoring in Automotive Production

Smart sensor technologies are key for Industry 4.0. But data alone is not enough. It must also be interpreted effectively. Artificial intelligence makes it possible to automatically detect defects in laser-joined seams with high detection rates. This marks another significant milestone in the digital transformation of automotive manufacturing.



The adaptive laser optics (ALO) follows the 3D contour. A camera transmits live images to an AI system that detects errors in the laser brazing process in real time.

It all started with a request from the German plant of a U.S. car manufacturer preparing for a model update. In the previous mid-size car version, roof and side panels were joined using spot welding and concealed behind decorative strips. The new model would forgo these strips. But exposing the seams to the customer's eye leads to increased requirements on the weld quality. At the same time, the production team aimed to digitize more of its processes.

The search began for a different joining method. The project team identified laser brazing as the optimal solution and reached out to Scansonic. The ALO4 laser processing optics – featuring tactile seam tracking and additional filler wire – has proven itself globally in this application. The integration of a camera enables online monitoring. Artificial intelligence (AI) can be used to analyze the images provided by the camera to assess the seam quality – a capability the customer wanted to explore further.

AI-Enhanced Process Monitoring

The ALO4 represents the fourth generation of tactilely guided laser processing optics in automotive manufacturing. Since 2017, the ALO has been equipped with the SC Eye monitoring system, consisting of an integrated illumination-module, a camera, and a control module.

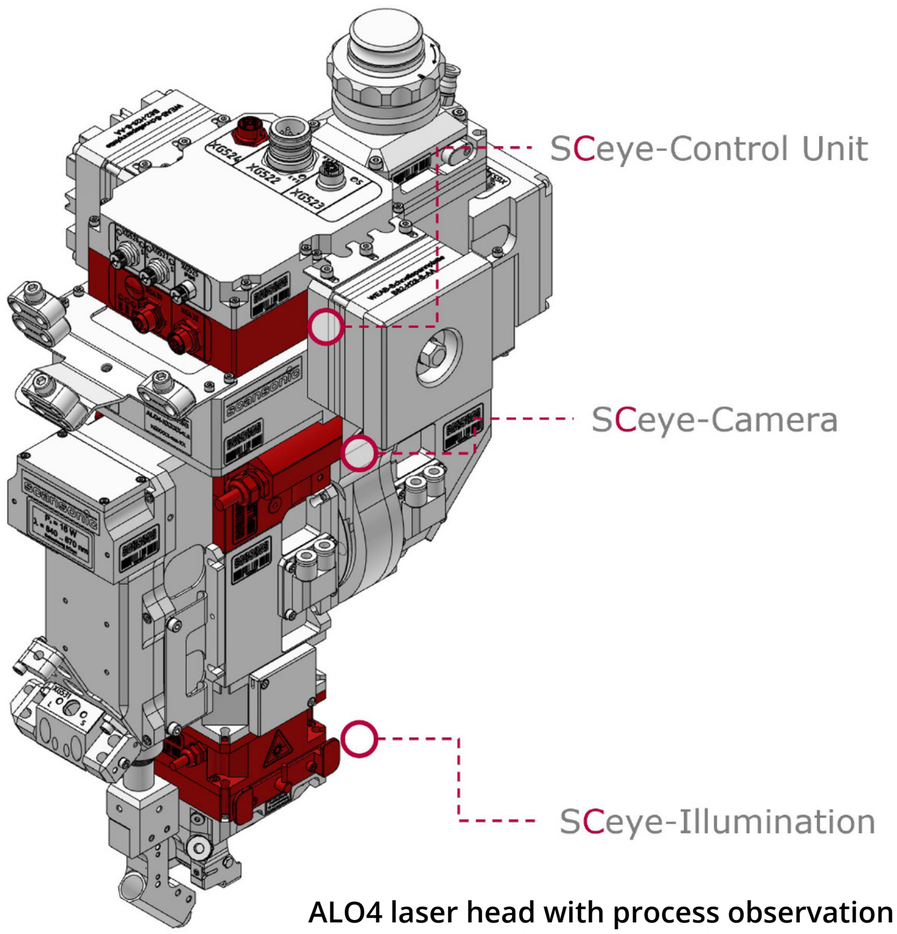
Automated image processing was a decisive factor in the customer's choice. But for three years now, the system does more than visualizing the process: The AI identifies defects such as spatter or pores in real-time. AI essentially takes over visual inspection, as operators are shown images of detected failures and can decide on rework, accordingly.

Customer Learning Curve

The integration of the laser brazing technology into the customer's production processes took several months in total. The ALO4 with the integrated SC Eye system generated large volumes of image data during the production process. These data have been essential to train an AI model and made efficient data management essential. To enable this, standards for data processing had to be established to ensure efficient handling both on the factory floor and at Scansonic.

In the meantime, the new technology has been fully integrated into the production system. Detected defects are automatically assigned to a specific vehicle and displayed to the operator. Based on the classification by the AI, the defective part is directed to a repair station.

Following the initial successful implementation phase, even the smallest defects were identified. Customer evaluations showed that the system reliably detected failures as small as 0.2 mm. This is particularly important, as pores of this size can no longer be sealed by paint or may reappear during subsequent processing steps.



ALO4 laser head with process observation system SC Eye from Scansonic MI

Processes are Fully Traceable, even across Factories

In the production line, a robot places the roof onto the body, and two more robots guide ALO4 optics along the seam to join roof and side panels. All defect-related videos are stored with metadata such as vehicle ID, materials, and tool settings. This makes processes fully traceable and optimizable, even across factories or plants. AI-based quality monitoring is becoming a key component on the road to fully digital workflows.

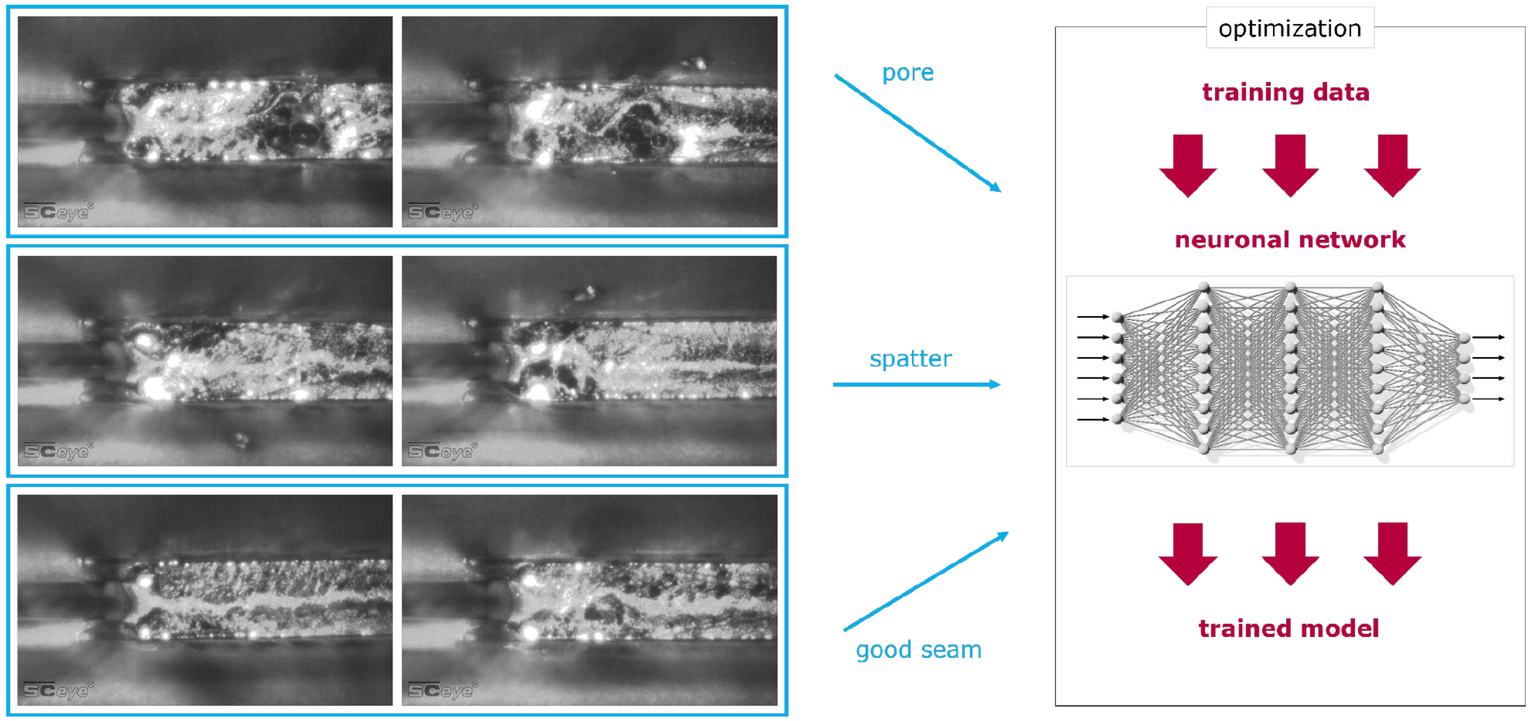
Further advantages are expected in the future – for example, setup times are anticipated to become shorter. Because of AI, fewer tests are needed when adapting processes.

What the AI Actually Does

Essentially, the AI mimics human learning. A convolutional neural network (CNN) is trained on images of good and defective seams – in this case, two defect types: "pores" and "spatter". The CNN detects these in real time and can be trained for other defect types as well. Scansonic is actively collaborating with universities and industrial partners to further enhance the detection rate of the AI model.

Machine Learning and New Processes

For the initial training of the system, the customer provided approximately 5,500 images of good brazed seams and around 2,000 images showing pores. Scansonic was able to demonstrate in its laser laboratory that only a small number of additional images were required to transfer the good detection results to similar processes.



Training data for the neural network includes pores (top left row), spatter (mid left row), and good seams (lower left row).

With just a few hundred images, detection rates of over 95 percent were achieved for brazing processes that differed only slightly from the automotive manufacturer's series production; primarily in terms of the materials used and the process parameters applied. Even when transferring the AI-based detection approach to entirely different laser processes, such as aluminum laser welding, retraining with only a few images still delivered excellent results for the new process.

Towards Zero Training?

Today, the system is installed at more than five different customers. Currently, each application is still trained individually. In the future, the AI could become significantly more powerful if training data from various applications were combined. This would allow the AI to be trained on a wide range of use cases, resulting in a highly advanced model that delivers optimal performance across all applications.

With this future approach, any customer willing to contribute their training data would benefit from the best-trained AI available. In the long term, this could lead to the creation of a database that eliminates the need for individual training altogether.

Looking ahead, data from other detectors (e.g., spectral analysis of process emissions) or from process parameters could also be incorporated. This would pave the way towards another strategic goal: complete process optimization through AI. A separate AI could suggest optimized process settings to the operator or even configure the entire process automatically. Although this visionary goal is still on the distant development horizon, Scansonic's development team is already laying the foundation today. ■

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Smart Temperature Measurement

Non-contact Infrared Pyrometers for Automation and Process Technology

Measuring temperatures is one of the oldest measuring disciplines of all. Today, temperatures are measured without contact using fast, high-precision infrared pyrometers. They are essential for monitoring industrial processes and ensuring high product quality.

Durable, robust and maintenance-friendly temperature sensors are required for industrial measurement tasks. High accuracy of the measuring devices is also crucial to ensure that measurement errors do not lead to system downtime or unforeseen actions.

For non-contact temperature measurement, Micro-Epsilon uses the infrared radiation of a body for its sensors. It is made up of the emission of the object, the transmission and the reflection. To determine the actual object temperature, only the emission is considered. By entering an emissivity, the material properties described above are mapped and the correct temperature value is calculated based on the measured infrared energy without contact, very quickly and without influencing the measured object.

Portfolio of Non-contact Temperature Sensors

The new series of Thermometer UC, SE and FI temperature sensors detect high temperatures from -50 to +1.100 °C without contact. The stainless steel housing ensures that the sensors measure precisely even in harsh environmental conditions, while maintaining high signal quality and stability. A compact housing with a high protection class, industrial interfaces and simple installation with standard M12 cables make the sensors ideal for use in automation and process technology. The most important distinguishing feature of the UC, SE and FI series is their sensor design.

Remote Controller for High Ambient Temperatures

The UC (universal controller) variant separates the sensor and controller from each other–connected by a cable of 1 to 15 m in length–for high ambient temperatures without endangering the controller unit.

Micro-Epsilon serves the temperature sensor market with the three new thermometer UC, SE and FI series.

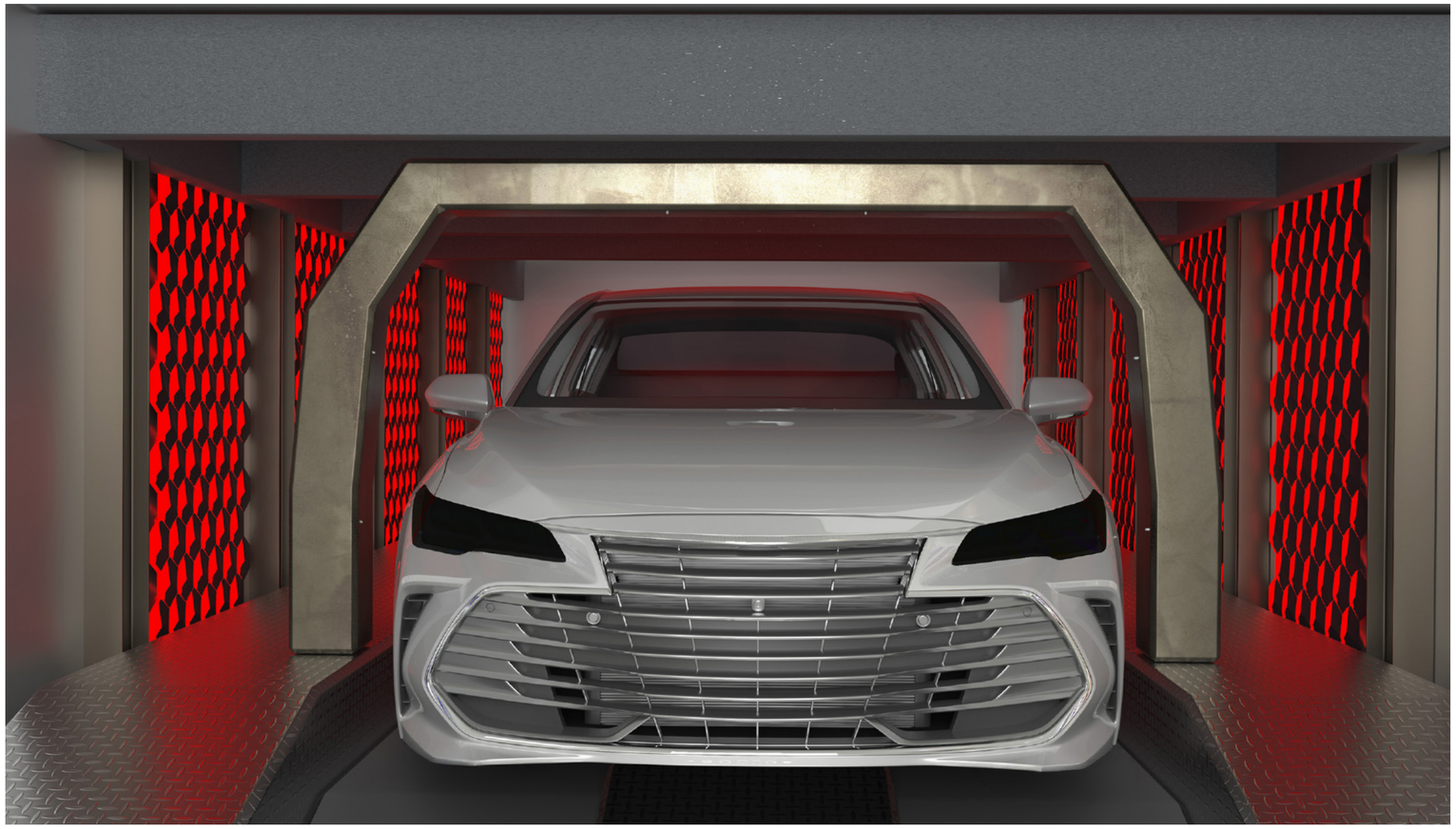
This means that the sensor can also be used at higher temperatures of up to 180 °C. The temperature measuring range covers -50 to +1.000 °C, with an accuracy of ± 1 °C and a resolution of 50 mK. Due to the remote controller unit, the UC version is particularly suitable if the sensor is to be configured without the use of a PC. In addition, the measured values can be processed digitally, for example via industrial interfaces such as RS485. Due to its inline and process capability, the thermometer UC is ideal for OEM or series use, for example in the field of process monitoring, automation or plant and machine integration.

Pre-assembled and Ready-to-use

The thermometer SE (separate electronic) series is pre-assembled consisting of sensor, controller and cable, with a direct connection via open cable ends. The compact sensor and controller design in the finished measuring channel measures non-contact temperatures from -40 to +1.100 °C at a maximum ambient temperature of 120 °C for the sensor. The inline and process-capable pyrometer is preset to current or voltage output (plug and play) and is supplied ready-to-use. IP65 protection class and miniature design ensure industrial suitability.

Fully Integrated Compact Pyrometer

The Thermometer FI (fully integrated) is even more compact than the SE version. As a fully integrated compact pyrometer, it is suitable for non-contact infrared temperature measurement of objects from -40 to +1.100 °C at an ambient temperature of up to +80 °C. Because the sensor and controller are combined in a robust stainless steel housing with an integrated M12 thread, the sensor is ideal for installation in confined spaces with minimal space requirements. Outstanding temperature compensation and high EMC immunity make the sensor ideal for series use in industry. Two-color status LEDs (red, green) integrated in the cable outlet are used to check the function and also as an alignment aid for commissioning.



In drying systems for painting lines in automotive production, continuous temperature monitoring is essential to ensure uniform curing of the paint layers and to avoid paint defects. Micro-Epsilon thermometer UC measure constantly and contact-free very high surface temperatures of the paint.

Simple Configuration and Networking

With the Sensortool software, which Micro-Epsilon makes available to its customers free of charge, users can easily configure and parameterize the new thermometers as well as the entire Micro-Epsilon product range. During commissioning, the loop impedance of the cabling can be checked easily via a simulation mode and fine-tuning can be performed in the field via offset or gain. A freely scalable analog output, automatic emissivity calculation and intelligent averaging are further features that enable flexible use. Users also benefit from a collector alarm (SE and FI versions) and two alarm outputs on the UC model.

As temperature values need to be monitored in real time in modern industrial plants and users need to implement the measured values in digital control systems at the same time, the Thermometer UC series can be integrated into Ethercat, EthernetIP and Profinet environments via the IF2035 interface module. This covers the requirements of modern fieldbus systems, such as high transmission rates in real time, high flexibility and various network topographies. This benefits modern automation systems with high speed requirements, PLC controls as well as HMI and scada systems.

Drying Processes in Paint Booths

Due to their temperature compensation, good EMC immunity and high IP65 protection class, the sensors are ideally suited for industrial use and also for difficult-to-access places–for example in drying systems for paint lines in automotive production. Continuous temperature monitoring is essential here to ensure uniform curing of the paint layers and avoid paint defects. High-quality paint also reduces cost-intensive reworking and rejects. Micro-Epsilons UC thermometers measure the surface temperatures of the paint quickly, and reliably, and transmit the measurement results to higher-level control systems. They also measure the temperature evenly over the entire surface of the bodywork, without leaving out individual components.

In this way, the sensors ensure a high output of the drying system while maintaining the high quality of the paint layer–OEMs benefit from less rework and rejects.

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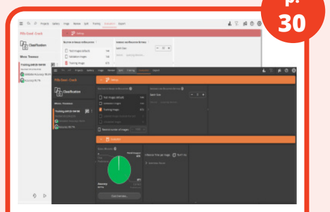

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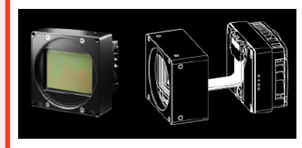


High-resolution 127 MPix cameras

Ximea

Image: Autovimation

Hygienic Protective Housing for Right-angle Cameras

Autovimation has developed a new protective housing for right-angle cameras and vision sensors that is specially designed for applications with high hygiene requirements. The Chameleon M stands out thanks to its hygienic design and complies with protection class IP69k. The housing walls are inclined at 5° to facilitate the drainage of cleaning water. A special hose system enables hygienic and protected routing of multiple cables to the control cabinet. Hygienic spacers are available for wall mounting. The housing is available in heights of 80 mm and 110 mm, allowing cameras with integrated optics and lighting to be placed directly behind the viewing window. The extra-flat, double-sealed window cover provides additional space for C-mount lenses. Autovimation has also integrated efficient heat dissipation, so that additional air conditioning is usually not required.

Image: Excelitas

Offers for Advanced Imaging

Excelitas offers components and systems for a wide range of photonic applications, including technologies for lidar, laser processing, analytical processes, and high-speed and multispectral imaging. A particular highlight is an optical coherence tomography (OCT) system with a tunable 1060 nm laser from the Axsun Azmyth series. Equipped with precision optics, a robotic arm and image analysis software, this system examines the surfaces and layers of various materials such as plastics, ceramics and silicon. The laser offers a high tuning bandwidth and sweep speed.

Image: Hamamatsu

Camera for Research and OEMs

Hamamatsu Photonics introduces the ORCA-Halo C17440-20U as the latest member of the well-known Orca family of scientific CMOS cameras. This camera is specifically designed for academic researchers and original equipment manufacturers (OEMs) and combines technology with image quality. Key features include a back-illuminated sensor with a peak quantum efficiency of 86 per cent, which ensures low noise and improved signal-to-noise ratios, a high resolution of 9 MP and a wide field of view, low readout noise, flexible settings for optimising performance with specific samples, and advanced cooling options. The patented technology of Light Sheet Readout Mode synchronises the readout time with the excitation light and improves results in light sheet microscopy.

Image: Hikmicro

New Algorithms for Thermal Imaging

Thermal imaging solutions provider Hikmicro has developed new AI-driven technologies, Superscene and Superscene+, that optimise inspections in residential construction, electrical engineering and industry. These algorithms enable even inexperienced users to achieve a high degree of accuracy. Superscene is designed to detect air leaks, heat loss and moisture damage, and simplifies inspection processes with a deep learning algorithm. Superscene+ offers automated risk detection when inspecting switchboards and circuit boards, improving workflows and safety. Both algorithms provide colour-coded alerts and instant diagnostics that increase precision and consistency in inspection tasks. Hikmicros innovations make thermal imaging technology more accessible by transforming advanced diagnostics into actionable insights and increasing efficiency.

Image: IDS

AI Camera Portfolio Expanded with IP69K Protection

IDS has expanded its range of AI cameras with the IDS NXT Oslo. This camera combines artificial intelligence with image quality, video streaming and recording functions in a compact housing that is protected against dust and high-pressure water in accordance with the IP69K standard. The Ambarella chip built into the camera enables compressed video streams in full 5 MP sensor resolution at over 25 frames per second, which can be transmitted directly to end devices. The integrated image signal processor (ISP) offers automatic features for brightness, lens distortion and colour correction, which, together with the light-sensitive onsemi AR0521 sensor, ensures excellent image quality. The IDS NXT oslo is ideal for applications that require live images with AI-based overlays and offers reliable operation in demanding environments. It is part of the IDS NXT AI complete system and is available now.

Image: JAI

Extended Industrial Camera portfolio

JAI offers a wide range of industrial camera technologies, including prism-based multi-sensor area and line scan cameras, as well as compact, high-resolution single-sensor models. Highlights include the new 2K, 4K and 16K line scan cameras, which support high-speed interfaces such as 5GigE Vision and CoaXPress. Available in various colour and monochrome configurations, these cameras are ideal for precise high-speed applications. JAI is also introducing advanced colour and multispectral imaging solutions from the Sweep+ and Apex series, which offer exceptional colour image quality thanks to multi-sensor prism technology. The Sweep+ series also includes a prism-based camera with an InGaAs sensor for R-G-B and SWIR images. The range is complemented by compact area scan cameras from the Go-X and Spark series with high resolutions and frame rates, offering versatile application possibilities.

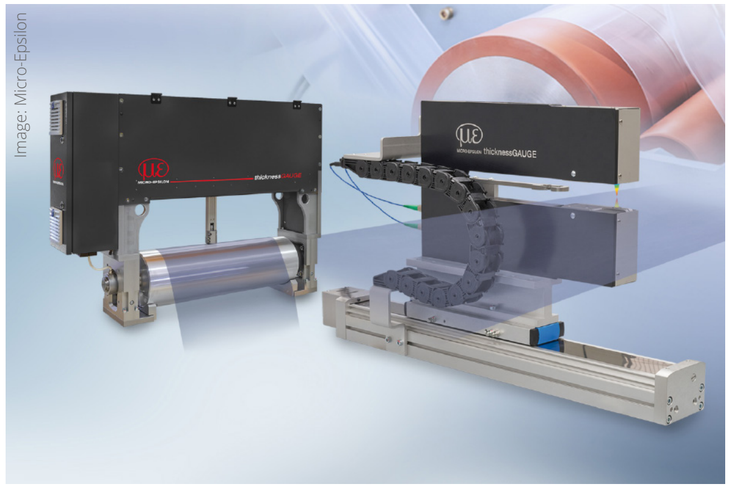


Image: Micro-Epsilon

Inline Thickness Measurement for Strip and Sheet Materials

The new thickness gauge systems from Micro-Epsilon offer precise inline thickness and 3D measurement for strip and sheet materials, ideal for applications in battery production and metal manufacturing. With a wide range of sensor models, measuring ranges and measuring widths, these systems are flexibly adaptable. They measure materials up to a thickness of 50 mm and are available as C-frame or stable O-frame systems that can be easily integrated into production lines. The sensors are based on various measuring principles, including laser profile sensors, laser point sensors, confocal, capacitive and eddy current sensors. The systems enable fixed-track, multi-track and traversing thickness measurements. Adjustments can be made quickly and cost-effectively, and the systems offer excellent value for money. Thanks to balanced, calibrated and temperature-compensated components, they deliver extremely accurate measurement results. Comprehensive software, a mechanical traverse axis and automatic calibration are included.

Image: Mitutoyo

Automated Precision Measurement

Smartmeasure-AL is the name of a new automated measurement system from Mitutoyo. It enables continuous operation without operator intervention, which increases productivity and reduces downtime. Measurement results are transmitted directly to CNC machines, enabling real-time adjustments and optimised workflows. The system ensures consistent measurements and reduces errors through repeated, consistent processes. The user-friendly software allows for easy operation and repeat measurements without complete series repetition, saving material waste and time. Flexible configuration and automatic part programme selection using RFID technology make SmartMeasure-AL versatile. It offers an efficient way to improve accuracy and maximise machine uptime to meet the demands of modern manufacturing.

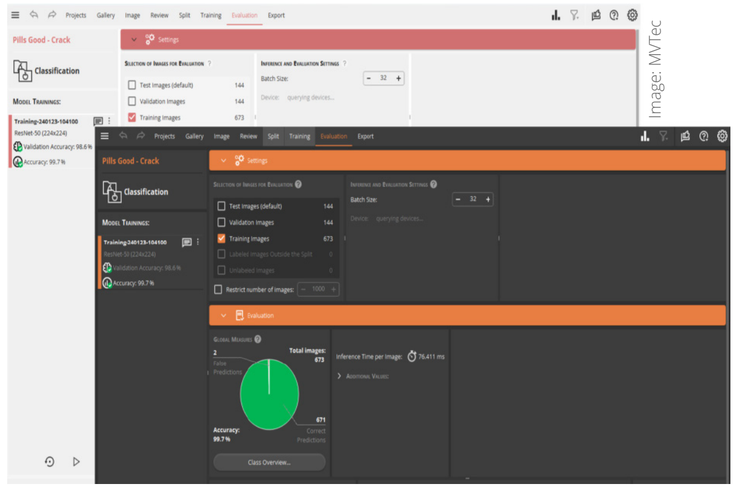


Image: MVTec

Deep Learning Tool for Machine Vision

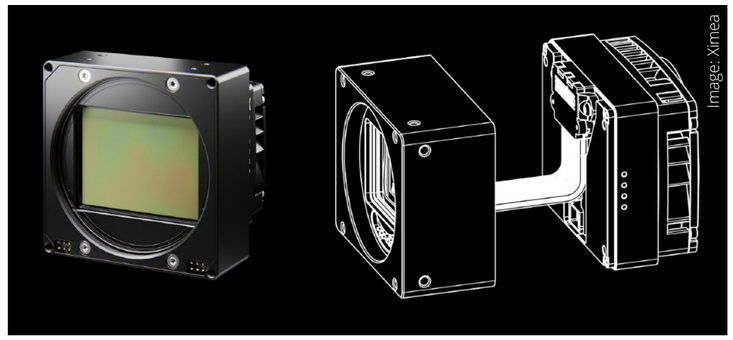
MVTec is expanding its deep learning tool. In addition to the free basic version, two commercial versions will be available from 30 April 2025: Professional and OEM. These new editions offer advanced features and enable machine builders and solution providers to resell the tool as part of their products. The tool facilitates the labelling of image data, a crucial step for the quality and robustness of deep learning applications. The Professional Edition offers a permanent licence and easy integration, while the OEM Edition allows for deeper customisation such as white labelling. Both editions promise a cost-effective way to add extensive deep learning capabilities to products and remain compatible with future MVTec products. Continuous updates ensure that users always remain at the cutting edge of AI technology.

Bricks System with Longer Cable Options

Vision Components has expanded its VC MIPI Bricks system with new cable options featuring Micro-Coax and GMSL2, which allow for cable lengths of up to 10 metres between the camera module and processor board. The new Micro-Coax cables are equipped with I-PEX connectors and support lengths of up to 100 cm without additional hardware. For applications requiring longer connections, GMSL2 options are available, allowing high-speed data transfer via serial signals. These solutions are particularly suitable for smart devices, humanoid robots and other applications that require flexible and remote sensor heads. The VC MIPI Bricks system also offers a wide range of accessories and enables easy integration and customisation of embedded vision systems. Vision Components also offers customised solutions and development support from the experts at Notavis, a VC Group company.

Sensor Technology with Blue Laser Light

The P1PY21x series from Wenglor combines time-of-flight technology with blue laser light. These sensors provide precise measurement results even under extreme conditions and are ideal for complex applications in automation technology. Blue laser light with a wavelength of 445 nm enables stable detection of dark, shiny, organic or transparent materials and is safe in accordance with laser class 2. The sensors can cope with uneven surfaces and offer functions such as dynamic jump detection and contactless speed measurement. With a working range of five metres and the ability to detect transparent objects, they deliver accurate results. A high-contrast OLED display and integrated Bluetooth functionality ensure high ease of use and simple parameterisation.



127 MPix Cameras

Ximea is expanding its XIX-XL family with high-resolution cameras featuring the Sony IMX661 global shutter sensor. These colour and monochrome cameras offer image quality and performance that meet the high demands of industrial applications. The MX1276 models feature an impressive resolution of 127.6 MPix with 13,400 x 9,528 pixels, ideal for precise inspections and analyses or aerial mapping. Thanks to global shutter technology, fast movements are captured without distortion. With over 20 frames per second , the cameras support fast image capture. Despite the medium-sized sensor, the design remains compact. The PCIe Gen 3 interface ensures fast data transfer. The removable camera unit enables flexible multi-camera systems, while additional cooling options ensure low vibration. Planned lens mounts offer remote control of aperture, focus and image stabilisation.

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