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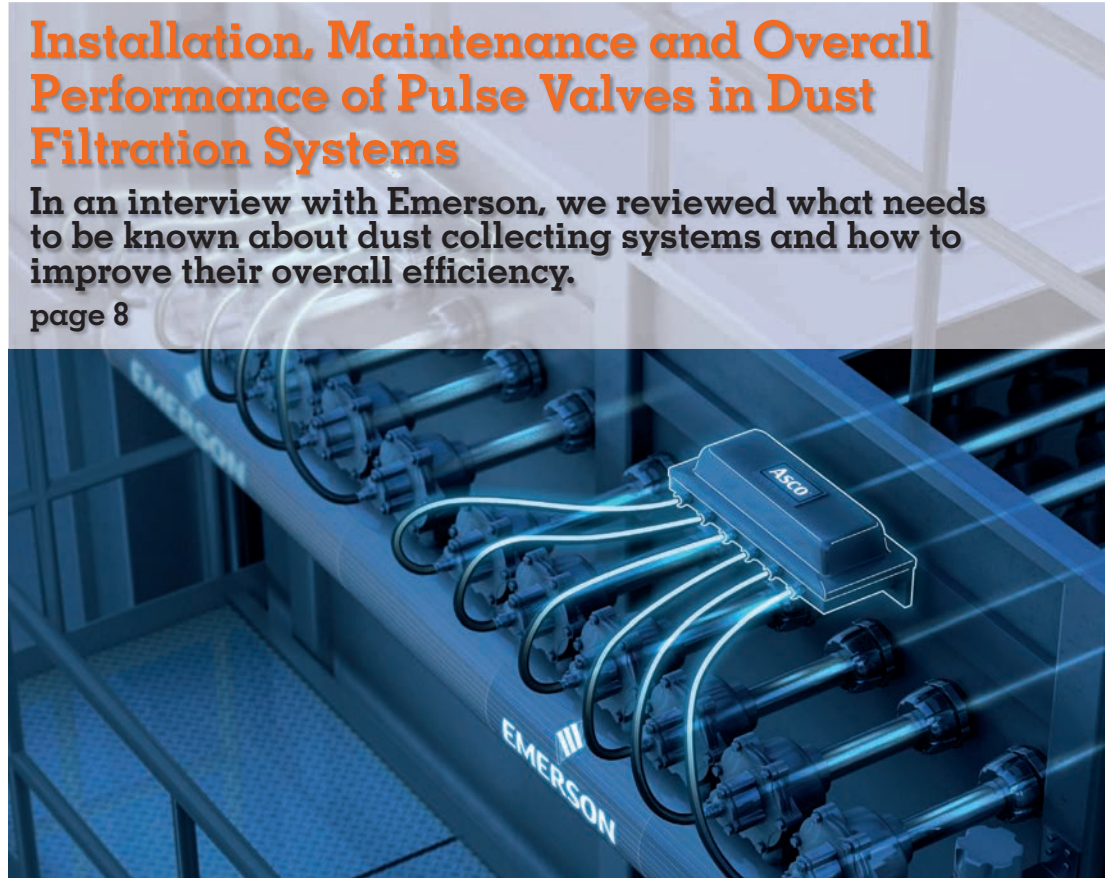
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[marketing@tim-europe.com](mailto:marketing@tim-europe.com)

**IEN** europe  
Industrial Engineering News

<b>Editorial Director:</b>	<b>Orhan Erenberk</b> o.erenberk@tim-europe.com
<b>Editor:</b>	<b>Anis Zenadji</b> a.zenadji@tim-europe.com
<b>Editorial Support</b> <b>Energy Efficiency:</b>	<b>Flavio Steinbach</b> f.steinbach@tim-europe.com
<b>Associate Publisher:</b>	<b>Marco Marangoni</b> m.marangoni@tim-europe.com
<b>Production &amp;</b> <b>Order Administration:</b>	<b>Francesca Lorini</b> f.lorini@tim-europe.com
<b>Website &amp;</b> <b>Newsletter:</b>	<b>Carlo Cucchi</b> c.cucchi@tim-europe.com
<b>Marketing Manager:</b>	<b>Marco Prinari</b> m.prinari@tim-europe.com
<b>President:</b>	<b>Orhan Erenberk</b> o.erenberk@tim-europe.com

**ADVERTISING SALES OFFICES****EUROPE**AUSTRIA/SWITZERLAND  
Monika Ailinger  
Tel: +41 41 850 44 24  
m.ailinger@marcomedia.chBENELUX,  
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Nadia Liefsoens  
Tel: +32-(0)11-224397  
Fax: +32-(0)11-224397  
n.liefsoens@tim-europe.comFRANCE  
Roxanne Akbulut  
Tel: +33 06 52 31 41 56  
rakbulut@tim-europe.comM'fumu Tiya Mindombe  
Tel: +32 465 443 530  
m.mindombe@tim-europe.comGERMANY  
Simone Ciolek  
Tel: +49-(0)9771-1779007  
s.ciolek@tim-europe.comITALY, SLOVENIA  
Andrea Rancati  
Tel: +39-02-7030 0088  
arancati@rancatinet.itTURKEY  
Onur Dil  
Tel: +90 212 366 02 76  
Fax: +90 212 366 58 02  
E-mail: o.dil@tim-europe.comUNITED KINGDOM/DENMARK/  
FINLAND  
Dave Harvett  
Tel: +44 (0)121 705 21 20  
daveharvett@btconnect.com**NORTH AMERICA**Hamilton-Murphy Global, LLC  
John Murphy  
Tel: +1 616 682 4790  
Fax: +1 616 682 4791  
john@hamiltonmurphy.com**JAPAN**Ichiro Suzuki  
Incom Co. Ltd.  
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Fax: +81-(0)3-3260-7833  
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Marco Prinari - m.prinari@tim-europe.comAnis Zenadji  
a.zenadji@tim-europe.com**Dear Readers,**

IEN Europe is back from summer holidays with many exciting contents to come! Do not miss the release of our next publishing schedule 2023 with brand new topics. Each further issue will also have a supplement dedicated to Artificial Intelligence or Energy Efficiency.

In this issue you will find out several articles on key topics such as material handling and remote control. A series of articles will guide you through objective data analysis to enable autonomous program adjustments, as well as how to enable manufacturers to monitor production without being rooted to the production floor.

A 6 pages energy efficiency section will show you some innovations from JUMO that enhance safety and help to optimize indoor climate. You will also find out how eco-conscious plastic products manufacturer may be well on the way to becoming carbon neutral.

Last, take a look at our 3 exclusive interviews with key figures in automation, aerospace and specialist optics, as well as our selection of product news.

We wish you a pleasant and interesting reading

Editor for IEN Europe

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## Technology Advances in AI, 5G & LoRaWAN Connectivity and Edge Computing at SIDO Lyon

**Advantech showcases its extensive product portfolio with a series of live demos on three key topics: AI, 5G & LoRaWAN Connectivity and Edge computing.**

### The AI Area

Among the solutions being demonstrated there is a MIC-730AI inferencing unit, based on the NVIDIA Jetson™ Xavier system-on-module (SoM), and BrainCreators' digital crowd inspector used for people counting and tracking. Besides, content about BrainCreators' digital inspector ARA (Automated Recognition and Anonymization) has been presented. ARA takes privacy issues out of the picture, and it allows organizations to use surveillance camera footage for any purpose while complying with privacy (GDPR) regulations.

Advantech shows how to leverage AI at the Edge using AIR-020X, an ultra-compact edge AI system powered by the Nvidia Jetson Xavier. This is integrated with Advantech's WISE-DeviceOn IoT device operation management software to support remote connectivity, device and data management along with Over The Air (OTA) update features to deploy production-ready AI inference models & remote desktops. Dashboards and situation rooms, on top of AI stats & inference results using Grafana, can easily be created as a result.

Other important highlights that must not be missed comprise the MIC-733-AO computing solution used for AI and video analytics, which incorporates dual 10GE ports and a Jetson AGX Orin™ module from NVIDIA.

Alongside is the MIC-715-NXA1 inference system with its 384 CUDA parallel computing cores, 12M connectivity and 21TOPS processing performance, the combination of Advantech's popular MIC-770 computing and MIC-75GF10 expansion modules with NVIDIA MXM GPU cards.

### The 5G & LoRaWAN Connectivity Area

A live demo demonstrates the ability of the WISE-2410 LoRaWAN wireless Condition and Vibration monitoring sensor, with built-in temperature sensing and multi-axis accelerometer, to continuously measure multiple operating parameters (including vibration, temperature and humidity).

Visitors to the Advantech stand learned about the performance benefits offered by the WISE-6610 LoRaWAN gateway.

Attendees have seen the company's ICR-4453 5G cellular router/gateway, with quad-core Arm Cortex-A72 processor running at 1200MHz, in action. They learned how this can be applied to a variety of 5G industrial networking use cases, providing ultra-fast, low latency data transfer while maintaining assured reliability.

Another product presented is AIW-355, a highly integrated 5G WWAN module that uses a M.2 form-factor interface and supports 5G NR SUB6/LTE FDD/LTE TDD/WCDMA systems. It can be applied to most mobile carriers' cellular networks.

### The Edge Computing Area

One of the many hardware solutions found in this field is the highly robust ECU-150 intelligent communication gateway for industrial networks (featuring a 600MHz-rated Arm Cortex A8 processing resource).

In addition, the streamlined IPC-220 V2 industrial computer system (based on LGA1151 processing technology from Intel®) and the TPC-110W computer panel (with 10.1" multi-touch display for intuitive human/machine interaction plus a high-performance NXP quad-core processor) has been exhibited too. SIDO attendees had likewise the chance to see the widely implemented UNO-127, UNO-137 and UNO-148 controllers for edge-based networking.

Last, another solution presented is the EI-52 is designed for edge-to-cloud interconnection and for AI and 5G solutions. It includes an integrated hardware and software package with EdgeX Foundry IoT plug-and-play open software infrastructure and Advantech's IoT WISE-DeviceOn edge intelligence software.



*The SIDO Lyon Fair,  
September 14-15*



## Growing E-Commerce Industry Leading the Automated Material Handling Systems Market

**The automated material handling systems market is predicted to increase at a CAGR of 9.4% from 2022 to 2027, rising from USD 28.8 billion in 2022 to USD 45.1 billion in 2027. The automated material industry is developing primarily due to increased demand for ASRS in the e-commerce industry.**

The material handling industry is expected to benefit from the growing trend toward smart factories. To evaluate operating efficiency and decrease waste, the entire manufacturing floor now requires monitoring at every step of the process. In such cases, smart factories with handling equipment provide continuous monitoring of all processes.

Wireless remote-control systems that help give better diagnostics and save commissioning time are also provided by the incorporation of such automated material systems placed in facilities. As a result, the rise of industry 4.0 and smart factory development is creating a potential market for automated material handling systems.

The failure or breakdown of AMH equipment can have a significant impact on a company's overall earnings. Thus, such automated material handling systems business' must invest extensively in preventive maintenance of their AMH equipment to avoid downtime and assure proper operation.

The automated material handling systems market growth is predicted to rise as the e-commerce industry continues to develop. Today's e-commerce industry is booming all over the world, creating a great need for process automation. The growth of the manufacturing industry is a big contributor to the material handling systems market expansion. Owners of facilities are concentrating on producing and delivering products to their clients at a faster, cheaper, and higher quality rate. Integrating handling equipment allows for more efficient production cycles, which minimises operational costs and waste.

### Key Takeaways

- Due to factors such as rising need for industrial processes and warehousing units, Asia Pacific dominates the worldwide automated material handling systems market.
- Due to increased penetration of online shopping trends, the presence of large online vendors, rising logistics infrastructure, and other factors, the e-commerce sub-segment is predicted to grow significantly throughout the projection period.
- The unit load sub-segment is predicted to grow at the fastest rate, propelling the automated material handling systems market forward in the near future.
- Through the rising consumption from the food and beverage, pharmaceutical, and e-commerce industries, the packaging sub-segment is predicted to rise gradually over the projected timeline.

### Competitive Landscape

Through the growing demand for increased efficiencies at distribution centres because of the expansion of e-commerce, prominent corporations are proactively working on supplying automated material handling systems for logistics solutions businesses.

Daifuku, KION, SSI Schaefer, Toyota Industries, and Honeywell International are among the key players.



### Recent Developments

- KION Group will open a new forklift truck manufacturing in China in December 2021 to provide supply chain solutions. For future manufacture of industrial trucks and supply chain solutions in Jinan, the plant has a total volume of roughly 140 million.
- Toyota Material Handling Japan introduced the SenS+ operation system in August 2021, which detects and identifies pedestrians and objects behind the forklift and instantly controls and stops the truck's backward motion.
- Daifuku and AFT industries collaborated in February 2021 to combine their material handling capabilities in the automotive business. Daifuku and AFT will benefit from each other as a strategy to open global markets and secure increased demand and investments in material handling systems from car manufacturers.



## An AI Software to Accelerates Development of World-Class Vehicles

**Monolith**, an AI software platform used by leading automotive, aerospace and industrial engineering teams from Siemens to Honeywell, announced that engineering teams at the BMW Group are using its software to accelerate the development of their world-class vehicles. By training Monolith self-learning models with the company's engineering test data, engineers can now use AI to solve previously impossible physics challenges and instantly predict the performance of highly complex systems like crash and aerodynamics tests. The BMW Group crash test engineering team began working with Monolith in 2019 via the BMW Startup Garage to explore the potential of using AI to predict the force on a passenger's tibia during a crash. Current crash development uses 1000s of simulations as well as physical tests to capture performance.



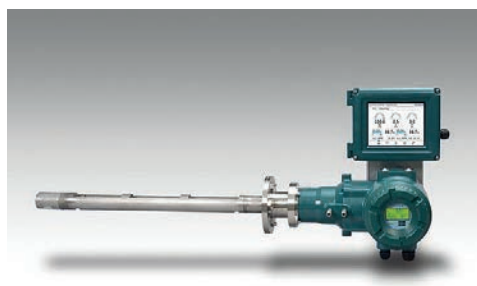
## Smalley Europe Celebrates 20 Years of Local Service

In 2002, **Smalley** opened their first global branch office in France to provide quick and personalized service to European customers. In 2013, they expanded service capabilities with order fulfilment from a local warehouse, which was expanded further in 2021 to now offer over 10,000 parts from inventory. From France, Smalley provides full customer support including order fulfilment / logistics, customer service, product engineering / design assistance and more. With over 100 years of manufacturing excellence, Smalley now looks to continue that journey in Europe, and globally for many years to come. "From a simple idea to provide local support to our European customers, we have, for 20 years, continuously worked to build an entire team dedicated to help our customers develop their ideas further and faster. We are proud of this successful implantation and will continue our investments to contribute to our European customers' success by offering precision engineering solutions, and exceptional service with a high level of urgency." said Fabrice Jeannin, SVP, Managing Director at Smalley Europe.



## Yokogawa Adds Explosion-Proof Version of its Probe Type Tunable Diode Laser Spectrometer to OpreX Analyzer Lineup

**Yokogawa Electric Corporation** announces that it has developed an explosion-proof version of the TDLS8200 probe type tunable diode laser spectrometer and will release it for sale on July 25 as part of its OpreX™ Analyzer family. The TDLS8200 features low installation cost, high measurement stability, and high reliability, and is able to simultaneously and directly measure concentrations of two gas types (oxygen plus either carbon monoxide or methane) at high speed. Currently on offer are types that are capable of measuring temperatures up to 600°C and 850°C, and the addition of an explosion-proof version makes it possible to facilitate efficient combustion control and safe operation across a broader range of applications.



## Micro-Epsilon Opens Competence Center for Micromechatronics

The new Competence Center for Micromechatronics has been built on an area of 36x30 m at the **Micro-Epsilon** headquarters in Ortenburg, Germany. The new building offers optimal conditions for the sophisticated production of miniature mechatronic systems used in the semiconductor and aerospace industries. This allows the growing demand for high-tech products from these key industries to be further served. Production comprises sensors and systems for the latest generation of semiconductor lithography machines as well as sensors for use in aircraft and in space. Micro-Epsilon sensors aim to contribute to the highest accuracy in the production of future chip generations. To manufacture such high-tech sensors, a clean room is required that offers optimum environmental conditions. In addition to the high requirements for cleanliness, humidity and temperature values must be maintained. Furthermore, sensor-actuator solutions for laser-based satellite communication are manufactured in the new production center.



# Installation, Maintenance and Overall Performance of Pulse Valves in Dust Filtration Systems

In this interview with **Samuele Oliva**, Product Marketing Manager, Dust Filtration Systems at Emerson, we reviewed what needs to be known about dust collecting systems and how to improve their overall efficiency.

**IEN Europe:** What should a plant operator look for when choosing a dust collecting system?

**Samuele Oliva:** First of all, high peak pressure. Peak pressure determines the speed and power of the compressed air burst a pulse valve emits when it cleans the filters in a dust collector. Pulse valves that quickly hit high peak pressure increase the efficiency of the dust collector's overall performance. The ASCO™ Series 355B Power Pulse Tank System offers the highest peak pressure and flow performance on the market.

Secondly, a fast valve response time. Pulse valves that open and close quickly not only improve filter cleaning, but they also use less compressed air.

Last, easy installation and maintenance. Plant operators should consider the investment in installation and labor costs when choosing a dust collector system. The more complex the valves in a dust collector system are, the more time and labor costs they will consume when it comes time to install or to disassemble for annual maintenance. One way to save even more time is through Emerson's patented Quick Mount Clamp connection, which makes installation and maintenance fast and easy. The Quick Mount Clamp is featured on the ASCO Series 353 Pulse Solenoid Valve.

**Valves disassembly and or installation can be time consuming.**

**Can you tell us more about the Quick Mount Clamp feature?**

Compared to other connection types, the Quick Mount Clamp reduces installation time by 60%. This is especially significant when you consider that installation takes time for original equipment manufacturers (OEMs) and end users alike. Conventional valves have threaded or dresser fitting connections. Quick-mount clamp connection valves connect to pipework more easily and quickly than threaded and dresser connections and require no special tools or additional sealing.

When specifying pulse valves, it's important to consider how complex the installation process will be. Do they require special tools? Do they have a lot of parts? The more complex valves are to install, the more time and labor costs they will consume.

**What is the role of a pulse valve in a dust collecting system?**

When a dust collector is in operation, it draws dusty particles onto its filters. As particles accumulate, they compress into cakes. These cakes



*The ASCO Series 353 Pulse Solenoid Valve is designed to deliver extremely fast pulsing in reverse-jet dust collector systems.*

can block filters, reducing the dust collector's efficiency. To remove dust particles from filters, pulse valves periodically blast compressed air, which sends a shockwave through the filters. When the shockwave hits the dusty cakes, they crumble off the filters. As a result, pulse valves are critical to the system. Without them, dust cakes would continue to accumulate and lower the efficiency of the dust collector. One example of these critical valves is the ASCO Series 353 Pulse Solenoid Valve. The product's high flow rates, higher peak pressure and fast response time deliver optimal filter cleaning performance while using less air.

**How do pulse valves improve dust collector performance?**

Reliable pulse valves help lower emissions, energy consumption and operating costs. Compressed air can be expensive for processing facili-







ties, and plants with multiple dust collector systems may use a lot of it. The length of time the valve is open determines how much compressed air is used. Choosing a pulse valve with quick response times leads to less compressed air consumption compared to pulse valves with slower response times. The pulse time can be reduced by having a more efficient way to use the air as well. In addition, dust collector systems rely on pulse valves to clear out filters. Without pulse valves, dust would continually clog filters, resulting in downtime and higher operating costs.

#### What efforts does Emerson support to reduce carbon footprints?

At Emerson, we have a three-part sustainability framework, Greening Of, Greening By and Greening With. It is part of Emerson's purpose to help support and enable our customers' decarbonization and environmental sustainability efforts, which we call Greening By. One way that we do this is through energy-efficient solutions, like the Series 355B Power Pulse Tank System and Series 353 Pulse Valves. The high peak pressure and fast valve response time these solutions feature can reduce compressed air consumption. This, in turn, reduces the energy used by the compressor to produce the air and carbon emissions. Compressed air savings can be substantial when multiplied across an entire plant.

In addition to compressed air savings, providing a high-pressure pulsing can reduce the number of pulsations needed to efficiently clean the filters and thus extend filter life, increasing the filtering efficiency and reducing the waste generated by the replacement of the filter themselves. This also reduces maintenance and purchasing costs.

#### Can you tell us about successful application stories the ASCO Series 353 Pulse Solenoid Valve have been part of?

We have installed the Series 353 pulse valve around the world, and the positive results are extensive. This includes OEMs manufacturing laser cutting and dust collector solutions as well as end users with applications such as carbon black manufacturing and steel mills, especially in the Asia Pacific region. We've also had great success with applications in the rubber manufacturing and chemical industries. Our extensive portfolio of dust collector equipment and global footprint



*The ASCO Series 355B Power Pulse Tank System provides long operating life and wide temperature performance, reducing costs and unplanned downtime in dust collector systems.*

allow our customers to supply components from a single supplier, including explosion-proof solenoid valves and pressure vessel. Our products are able to deliver consistent results in standard applications like cement to less common applications like biomass plant cleaning.

#### Do you foresee any technical developments in the dust filtration systems side? Are the number of applications using them increasing?

Digital transformation is changing every business, including dust collector applications. The increased insights in the technical parameters of dust collector equipment and improved automated controlling will eventually lead to lower emissions, a more efficient plant operation and reduced maintenance.

In response to the trend of reducing complexity in manufacturing and plant operation, influenced by the need for high production levels despite worker shortages, it will be ever more valuable to have simple and complete solutions that reduce working time and complexity.

Visit Emerson at the Powtech Show, Hall 3/Booth 482

Anis Zenadji

▶▶ 62356 at [www.ien.eu](http://www.ien.eu)



## Motek 2022 (October 4 to 7) will be the 40th Anniversary of the Trade Fair

Together with the 15th Bondexpo international trade fair for bonding technology, the 40th Motek international trade fair for automation in production and assembly is preparing for the fall event season in 2022.

The exhibition halls of the industry highlighting featuring Motek/Bondexpo are filling up. Exhibitors and expert visitors will meet in person for a face-to-face exchange of ideas in Stuttgart from the 4th through the 7th of October, 2022. The event's motto – "Automation Intelligence for Production and Assembly" – is well rounded, as is its anniversary: Motek is celebrating its 40th birthday! "The industry is eagerly anticipating its top event," confirms Motek/Bondexpo project manager Rainer Bachert. "Already during the summer, we've exceeded registration levels reached for the event in 2021," continues Bachert. "Many exhibitors firmed up their participation at this year's trade fair right after the event in October 2021, and the halls have been filling up in recent weeks," explains the project manager. "Traditionally, Motek/Bondexpo is a practice and user-oriented work event for expert visitors who are seeking concrete solutions for their pro-

duction environments," says Bettina Schall, managing director of trade fair promoters P. E. Schall GmbH & Co. KG. "The challenges currently faced by the industry sector are enormous, and the exhibitors at this year's Motek/Bondexpo will be tackling them from numerous angles and demonstrating new approaches."

### Sustainability via Further Development in Digitalisation and Automation

Essentially important issues such as reduced consumption of energy and resources, environmental and climate protection, reliable suppliers, dependable intermediate production and short distances are driving modernisation and further technical innovations. Industry players in assembly and production automation are working full steam ahead to equip their plants more economically, more effectively, more efficiently and more reliably in order to cut costs and remain com-

petitive. "That's why it's important to attend the trade fair in person, to engage in professional discussions on an equal footing, to explore practical solutions and to network," explains Rainer Bachert. "Matching target groups meet up with each other at Motek/Bondexpo."

In the fall of 2022, the industry meeting place in Stuttgart will bring together suppliers and users of industrial production and assembly automation, as well as bonding technology. Special significance will be attributed to the vastly important issue of sustainability this year, because modern, highly automated factories with intelligent components and control systems, as well as networked, self-learning processes, must increasingly adhere to the principle of sustainability – they have to be operated in an environmentally and socially responsible manner. As a result, digitalisation and automation of industrial manufacturing processes are becoming even



more important in order to further increase the efficiency, environmental friendliness and economy of production operations. In this respect, Motek/Bondexpo is an important platform for making it possible to implement new developments and approaches to solutions in a user-friendly way, and for meeting current and future challenges.

### A Highly Interested Expert Audience Right from the Very First Day

However, we won't just be looking to the future from 4 to 7 October 2022 – we'll also be looking back, because Motek is celebrating its 40th birthday. The first trade fair for assembly technology was launched in 1982 in Sindelfingen, initially on a relatively small scale. As of 1990, the event with highly dynamic growth was held in Sinsheim and since 2007, Stuttgart has been its highly adequate venue. "Motek

can look back on an extremely impressive 40-year history on its way to becoming one of the most important industrial trade fairs in southern Germany," notes Michael Blaß, managing director of the energy-chain systems division at igus GmbH in Cologne. "And it has never forgotten its original spirit, even to this day: bringing people together in dialogue and as a forum for innovation – directly oriented to the needs of the visitors who have approached us here at the event with very tangible challenges in recent decades. This has resulted in numerous long-standing customer relationships and exciting projects. We're grateful to P. E. Schall for this, and we're looking forward to a successful Motek together in 2022."

### Essential, Live Trade Fair with Dates Etched in Stone

Motek/Bondexpo focuses on the practical,

future-oriented organisation of industrial manufacturing processes. This is why the trade fair is and will remain an ideal business platform for the capital goods industry. The exhibition will be supplemented by additional world-class presentations – for example the Arena of Integration (AoI) which will make digitalised, networked production processes tangible and intelligible once again in 2022, the Startup Area where young companies will present their innovations, and the expert forum for "Safety + Automation" which will be organised in cooperation with Pilsz GmbH & Co. KG. Numerous exhibitors, expert visitors and other interested parties have already saved the trade fair dates – the industry will meet in Stuttgart from the 4th through the 7th of October, 2022!

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## OPTIMIZING YOUR LIQUID BATCHING SYSTEM

Titan reports on 5 flow meter considerations



**Titan Enterprises.** Titan has published a white paper on the use of ultrasonic flowmeters in high-speed batching. Here the focus is on the general batching system. Five key considerations

are discussed when choosing a flow meter that will ensure your batching process runs smoothly. Probably the most recognized batch filling system is that of beverages, either directly into a glass or into bottles. But batching systems are also integral to the pharmaceutical and medical, and chemical and oil industries. Additive injection or chemical dosing are typical applications where flow meters are used to precisely control the amount of liquid dispensed, which is critical in such processes. Multiple uncertainties can change the amount of liquid being dispensed, causing a negative effect on the repeatability of the system. Controlling as many process variables as possible will help to ensure the accuracy and repeatability of flow measurement. Flowmeters, such as Titans' mini turbines, can boast repeatability of 0.1% or better when operating under the same conditions. Choosing the correct flow meter for a batch system can be complex thus Titan Enterprises can help you find the best flow meter solution for your process and plant.

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# Automatic Teach Point Optimization

When objective data analysis enables autonomous program adjustments

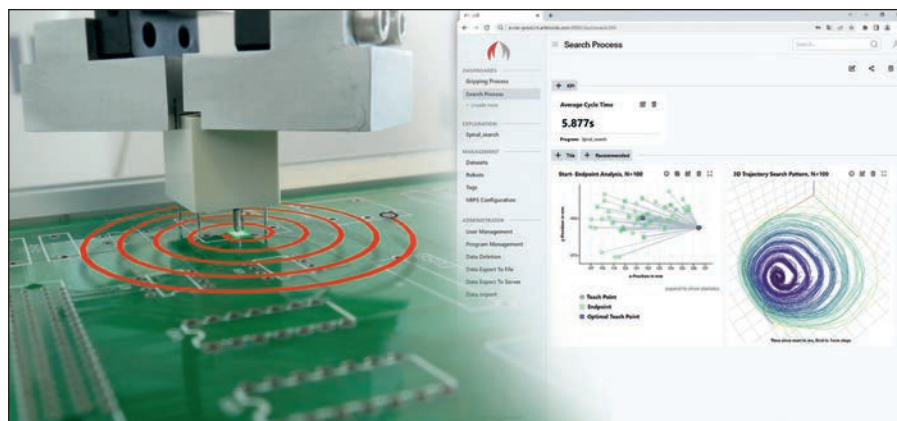
ArtiMinds Robotics. Modern industrial robots produce an enormous amount of data during ongoing production. By using intelligent software, this data is automatically collectable and can be used to calculate program optimizations. Thus, the robot is able to independently adjust to changing workpiece properties. ArtiMinds Robotics has developed a novel approach where a PLC serves as gatekeeper between robot controller and analysis software. The supervision of the PLC permits a safe autonomous change of the robot's teach points.

Quick changes of suppliers, a high number of variants in high-mix/low-volume production, production on short notice and ever-shorter product life cycles pose great challenges for classical automation. The typical automation is mechanically tuned to perform a very specific task that runs without major changes over a long period of time. Frequently changing processes can thus often not be mapped to automation. Hence, in many cases it remains the domain of manual work to this day.

Sensor-adaptive industrial robots and cobots in combination with intelligent software can fill this gap and bring those previously manual work steps into automation. This includes the robot being able to perceive changes in its immediate environment via force-torque sensors or cameras. In addition, this perception must be collected over many production cycles. Based on this knowledge of the current process, intelligent software can calculate program optimizations that adapt the robot task to current workpiece or system properties.

## Data-driven adjustment of robot poses

Teach points or individual robot poses form spatial key elements for robot programs with sen-



The analysis tool ArtiMinds LAR can be used to determine the best possible joining point for different workpiece carriers with tolerances, thereby improving the cycle time

sor-based operations. This can be, for example, the starting point for a force-sensitive joining operation or the direction of a contact motion. In the past, such key poses must be manually fine-tuned in exhaustive teaching processes. In the case of small-scale variances or stochastic scatter over a large number of workpieces, manual adaptation is often not even possible at all. The same applies to short-term post-optimization during operation.

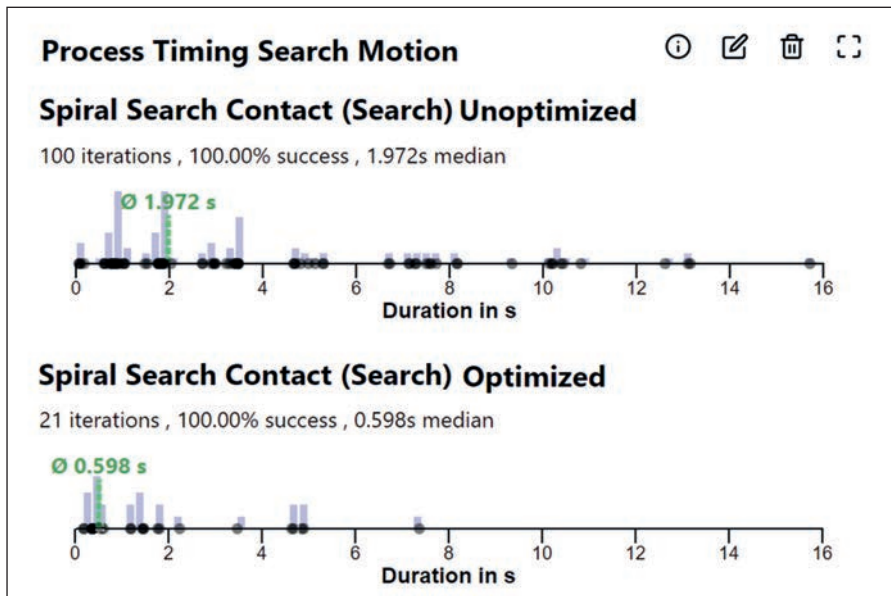
Data-driven automatic adjustment can manage these challenges. During operation, motion data is collected from the robot at a high sampling rate. Due to sensor adaptive motions, this data can provide insights into actual geometric arrangements during operation, simply by analyzing motion adjustments based on sensor measurements. Typical sensor sampling rates are around 250 data points per second with spatial resolutions down to 50µm and forces down to less than 0.1N. Using semantic structuring of a robot program, the data can be assigned to

clearly defined motion elements once collected which is crucial for focused optimization. Based on the collected runtime data from a set of work cycles - from a few to a few thousand - a recalculation of teach points can be performed using statistical fitting methods.

## Objective data analysis and process monitoring

ArtiMinds Robotics with its software tool Learning & Analytics for Robots (LAR) has developed a solution to specifically adjust relevant points of a robot program with regard to runtime and robustness and to continuously monitor processes. For this purpose, an analysis of the process data generated during operation of the robot is created on a time-decoupled edge PC. This data can be automatically collected and annotated without additional programming effort by using the low-code programming software ArtiMinds RPS. Therefore, for example, the best possible starting point of a sensor-based search for a join-





The segment timing diagram shows the cycle time before and after the adjustment. An improvement of 70 percent was achieved

ics, explains. "Our approach is the interaction of the process-critical robot controller, our software ArtiMinds LAR and the in time securely coupled PLC."

#### Self-improving system

Using the described approach of robot, PLC, and data-driven adjustment, there are not only general improvements feasible. The system is able to learn optimizations per specific component or workpiece carrier and to use these appropriately at runtime and for the present situation. A reliable, self-optimizing system consisting of established industrial components can thus be realized from a single source.

"Sensor-adaptive robot programs reliably compensate for even major process deviations. With our system, however, the cycle time buffers required for this can be drastically reduced, as the process is automatically adjusted based on the optimization results. This increases the robustness of the robot system and the quality of the process," says Schmidt-Rohr, explaining the advantages of ArtiMinds Robotics' approach. "In addition, employees are of course strongly supported by the software and thus gain new capacities to take care of other tasks."

As a result, the future execution of sensor-adaptive robot programs will be faster, better and more robust.

The automatic teach point adjustment can be used during system development, commissioning, post-optimization in continuous operation as well as during changeovers. It is suitable both for different types of processes and for every conceivable type of robot.

#### Outlook

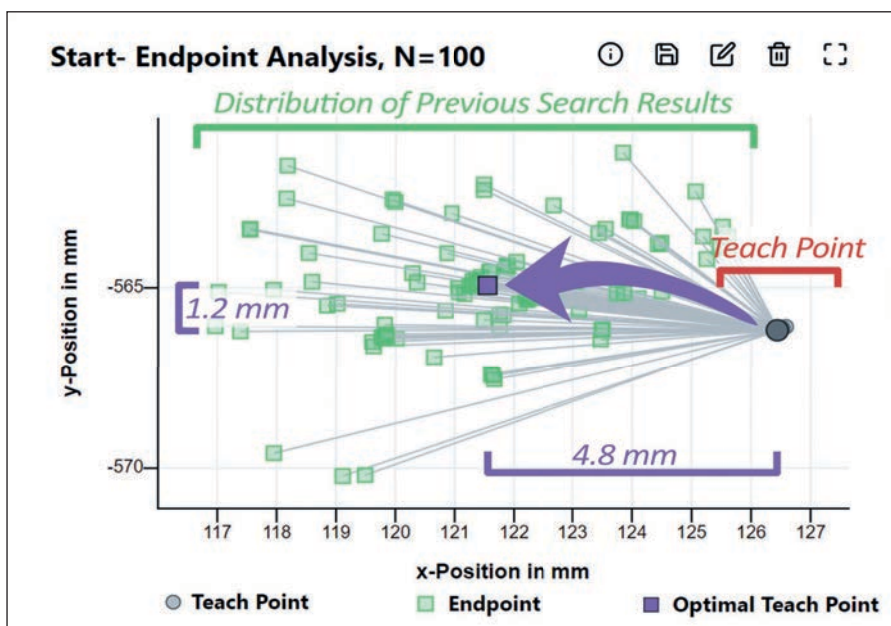
In automatic teach point optimization, the main intelligence runs on the time-decoupled edge PC with the ArtiMinds LAR analysis tool. But here the development is not finished yet. Plans are already underway to use deep learning or deep neural networks to optimize complex relationships of parameters in the robot program that go beyond teach points. "This will enable processes to adjust to even more complicated changes or occurring wear and tear on workpieces independently and automatically," says Schmidt-Rohr, giving an initial outlook.

ing process can be determined very efficiently and transparently. The results can then be transferred offline to the adjusted RPS program.

In order to integrate the adjustment fully automatically without stopping production, ArtiMinds has recently established the use of a PLC for this method. This PLC acts as a gatekeeper between the LAR database backend and the robot controller, since both have different requirements regarding their communication protocols. Furthermore, the PLC takes over the role of an additional safety instance that ensures that automatic adjustments can only take place to a safe degree and that guarantees an interruption-free robot operation even if the database is not available. The PLC temporarily stores optimization results and checks them for unauthorized

limit violations using independently stored safeguarding rules. The motion program in turn actively requests teach points adjusted by the PLC. In this way, temporal synchronization anomalies can be ruled out as well as unauthorized outliers, which can occur in untested special cases in more complicated optimization procedures. Last but not least, an HMI on the PLC allows manual intervention in the optimization parameters or (de)activation of the adjustment after successful user authentication.

"The robot program can regularly request the new, optimized poses from the PLC and apply them. The fact that the robot program queries the poses ensures that the process is correctly synchronized in time via the network," Dr. Sven Schmidt-Rohr, CEO of ArtiMinds Robot-



A data-driven shift of the teach point reduces the search paths of the robot program

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## Reducing Downtime and Improving Machine Health with Predictive Maintenance

Unplanned downtime represents one of the major challenges facing factory and building operators worldwide: more than 80 percent of companies experienced at least one instance of unplanned downtime during the past three years.

A single factory can lose \$2.3M annually due to unplanned stoppages. In some industries – such as automotive – those costs are even higher, with losses of tens of thousands of dollars per minute of unplanned downtime.

In the current environment, those issues are also being magnified by the hiring and labor shortages many companies are facing today. Data from the Chamber of Commerce found that 35 percent of all openings in durable goods manufacturing were unfilled at the end of 2021. In addition to their issues filling open headcount positions, many of those same companies will soon be facing waves of retirements from their more experienced workers. Almost 25 percent of the U.S. manufacturing workforce is over the age of 55, and by 2030, there could be up to 2.1 million unfilled jobs in the sector due to a growing skills gap.

On several fronts, plant managers are being asked to do more with less.

### Legacy Maintenance Approaches Create Stubborn, Inefficient Processes

With some exceptions, current and legacy machine health maintenance strategies continue to be driven by manual walkarounds and standard preventative maintenance schedules. Walkarounds will continue to be a mainstay in most facilities, and it remains valuable for maintenance personnel to directly review machine assets on a regular basis.

However, relying on them as the sole method of fault detection is both an inefficient use of resources and a source of unnecessary risk. As experienced workers retire in the coming years, their less experienced replacements will need additional support to deliver the same level of asset performance.



Standard time-based preventative maintenance strategies also have their limitations. If those processes are followed appropriately – and resourced appropriately – they ensure lubrication, etc. measures are completed in a regular manner.

However, it is also a costly and time-intensive process, taking up the resources of the maintenance team – often when no issues are present – while also introducing additional opportunities where human error may result in negative consequences for the asset itself.

Over the long-term, many plant operators will be under continued pressure to move away from traditional PM schedules and either extend maintenance timelines – when not limited by warranty terms – or find alternative approaches.

### Connected Devices and IoT Gaining Momentum

Predictive maintenance and the Industrial Internet of Things (or IIoT) are concepts which have been building in the industry for years, but have finally reached a point of maturity where solutions are becoming more and more accessible. Looking at the industry holistically, the predic-

tive maintenance market stood at \$5.6B at the end of 2020, representing a 17% jump year-over-year.

While impressive, it represents just the starting point. Survey data found that less than 40 percent of companies have invested in predictive maintenance, but within the next 3 years more than 75 percent expect to have projects in motion.

Even at companies where smart sensors and other IIoT strategies are in place, the cost structures associated with those platforms mean that only 15 percent of assets are currently monitored by connected devices. In an integrated building or factory setting, a production line is only as resilient as its least reliable asset.

As solutions become more affordable and return-on-investment evaluations shift, growth in IIoT is expected to scale rapidly. From 2021 to 2026, the industry will nearly double its acceleration, with a forecast compound annual growth rate of 31 percent through 2026.

As the share of assets being monitored by smart sensors in real time set to grow, plant managers can use that data to rethink how those assets are maintained on an ongoing basis.



### Connected Assets Drive Condition-Based and Predictive Maintenance Approaches

The growth of IIoT-based solutions is unleashing for a paradigm shift in machine health monitoring – allowing companies to gently shift away from manual walkarounds and legacy PM schedules and toward condition-based or predictive asset monitoring approaches.

Condition-based systems are built around a sensor – such as a vibration, pressure, or temperature sensor – connected to a monitoring platform via either a wired or wireless connection.

Based on the machinery and processes in place, an alarm or alert value is set which would represent an error state or potential machine health issue. If the alarm is triggered, technicians are alerted, and the team works to identify the issue, and replace the machine or part.

One straightforward example may be the concept of using temperature sensors to monitor high-resistance joints in a motor, where loose or corroded electrical connections can generate current arcing, a rise in temperature and a potential fire. When the temperature reading reaches a critical value – signifying an issue where motors may be nearing a failure point –

### Sensata DIY App for Easy Sensor Setup

the maintenance team is alerted and can schedule corrective action appropriately.

Predictive maintenance takes the principals of condition-based maintenance and pushes them further – using machine learning/artificial intelligence to identify issues earlier, proposing what maintenance steps may be helpful in rectifying them, and create a better overall picture of machine health.

Rather than waiting for issues to reach a critical alert value, the system looks for anomalies in various sensing modalities and uses those values in combination with machine learning/AI algorithms to predict upcoming machine failure and identify the root causes of potential issues. This kind of automated fault characterization can also reduce the need for companies to have a vibration analysis expert on-hand.

This dynamic is often represented using the P-F (Potential Failure – Functional Failure) curve, where the system can interpret different sensor readings and make judgements about the remaining useful life of the asset.

This type of evaluation can allow operators to determine the amount of time they have to make repairs and identify the optimal time to take corrective action – creating a minimum amount of disruption to overall operations.

Vibration monitoring specifically can create a strong return-on-investment for a wide variety of assets, as its principles can be widely applied to a motors, pumps, and other rotary equipment assets. Over 50% of motor failures are due to premature bearing failures. In addition, many of the rotating machine faults that can be di-

agnosed with vibration condition monitoring – such as unbalance, misalignment, and mechanical looseness – directly impact the motor's bearings. Vibration analysis also ties in directly to the ISO 20816 standard (which replaced the previously existing 10816 standard), which establishes how companies should evaluate machine vibration magnitude and shifts to help ensure reliable operation of the equipment.

In most cases, vibration begins far earlier on the P-F curve than audible noise or temperature variations that can be detected during a standard operator walkaround.

By using vibration analysis in combination with other sensor types, operators can identify potential machine health issues earlier in the process and approach corrective action on those assets with a long-term view. Repairs do not need to take place immediately, but can be scheduled for the optimal time within the expected useful life of the asset.

This type of predictive insight also creates additional benefits from a supply chain and balance sheet perspective, as plant managers can optimize their near- and medium-term parts requirements and may be able keep fewer parts on-hand on a regular basis.

### Digital Transformation for Smart Factories and Buildings

As these connected solutions continue to transform maintenance approaches, plant managers and other corporate leaders will need to remain flexible as the idea of smart buildings and factories continues to mature.

Solutions likely to deliver the best near-term gains will likely be iterative solutions which can be retrofit onto existing motors and other assets, with true “connected” options from many OEMs still in various aspects of the product development phase.

But as each asset comes online, the maintenance processes around it will shift from reactive break-fix solutions toward predictive, smart approaches that prioritize the right actions at the right time. That will allow maintenance personnel to put down their clipboards and focus on performing the tasks that improve machine health, reduce downtime, and drive down costs across the organization.



Sensata 6VW Series Sensor

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Paul Heine, MBA, PMP, SP, IIOT  
Product Manager, Sensata Technologies

# Space Ready High Performance Optics for Satellite-based Applications

Designing and producing optics for use in space is a highly specialised area where expertise and experience are critical. IEN Europe discussed the overall challenges with Mark Pontin, Managing Director at Resolve Optics.

**IEN Europe:** As a well-known and experienced high performance optics supplier for different markets, can you tell us about your expertise and experience in space applications?

**Mark Pontin:** Resolve Optics has been supplying optical systems for space applications for over 15 years. During this period, we have acquired a considerable amount of knowledge with regards to the do's and don'ts of designing for the harsh environment of space. For a lens or optical system to be considered space ready it must meet some extremely strict requirements. These requirements typically flow down from international space organisations, such as NASA or ESA, with the aim of ensuring that any optical components that are to be launched must withstand the rigors of launch and the harsh environment of space. The last thing you would want is for a component to fail and jeopardize or hamper the mission. The cost of launching payloads into space is considerable, incorporating only 'space ready' lenses or optical systems into your satellite or space observation system is therefore critical for realising longer term, high-performance operation. Other challenges of designing for spaceborne projects includes only using optics that can cope with a wide temperature range, being resistant to solar irradiation that causes standard optics to darken and lose throughput and been able to operate in a vacuum.

**Can you tell us about some recent space projects you have been part of?**

Due to the competitive nature of the space industry, most projects we have undertaken for satellite and space vehicle developers as well as space agencies are bound by non-disclosure agreements that preclude us from discussing their particulars. However, one customer we can talk about is Sen Corporation Ltd.

Sen is a UK based video streaming data business that is launching a satellite constellation capable of streaming real-time videos of Earth and space to smart phones. Sen launched its first set of Ultra-High Definition (UHD) video cameras into space in 2019 and successfully demonstrated the excellent performance of its video streaming platform. Sen approached Resolve Optics to assist with the initial optical design project because of our expertise in custom designing low mass, high performance lenses using radiation resistant glass that could meet the harsh demands of the space environment. Sen have returned for subsequent optical design projects because they appreciated how Resolve Optics took their requirements in terms of optical performance, mass and mounting points and designed very high-quality lenses that



*Mark Pontin, Managing Director of Resolve Optics Ltd.*

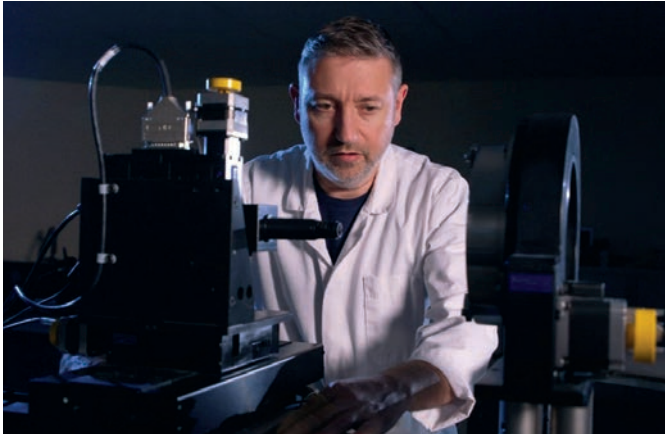
addressed both the mechanical and environmental challenges of their spaceborne application.

**What needs to be considered when developing optics solutions to be used in space? What characteristics of your optics make them suitable?**

One of the biggest challenges of using optics in space is exposure to radiation. When standard optical glass is exposed to radiation it will change colour, either brown or grey. If the glass accumulates a large enough dose of radiation the colour change will become severe enough to reduce transmission to a level where the optical instruments will fail to operate or operate with unacceptable performance. Drawing upon approaching 30 years' experience, Resolve Optics has built an international reputation for specialist lens design and manufacture of smaller production quantities of radiation resistant lenses and optical products on time to strict quality and target price guidelines. All optical elements within Resolve Optics radiation resistant (non-browning) lens designs are made using cerium oxide doped glass or synthetic silica enabling them to withstand radiation doses of up to one hundred million rad and higher temperatures without







discoloration or degradation of performance. All Resolve Optics radiation resistant lenses provide high image resolution and minimum geometric distortion from 400 to 750nm. Apart from the vital resistance to radiation our aim is to supply space ready lenses. By space ready I mean they are ready to launch without any further modification.

**When it comes to testing, how do you simulate the conditions the 'space optics' will be subjected to?**

All our space ready lenses go through rigorous environmental testing and qualification to ensure they earn their space ready title. For example, all optical assemblies undergo vibration and shock testing to ensure they will withstand the forces they will encounter on launch into Space. To achieve the limit of performance, we can also perform vacuum bakeout on lenses and optical systems to ensure that they are completely free of microscopic foreign object debris. Optically lenses are not affected by the vacuum of space, but they can be affected by temperature shifts, as such we conduct resolution testing at the top and bottom limit of the operating temperature range to ensure desired performance goals will be met.

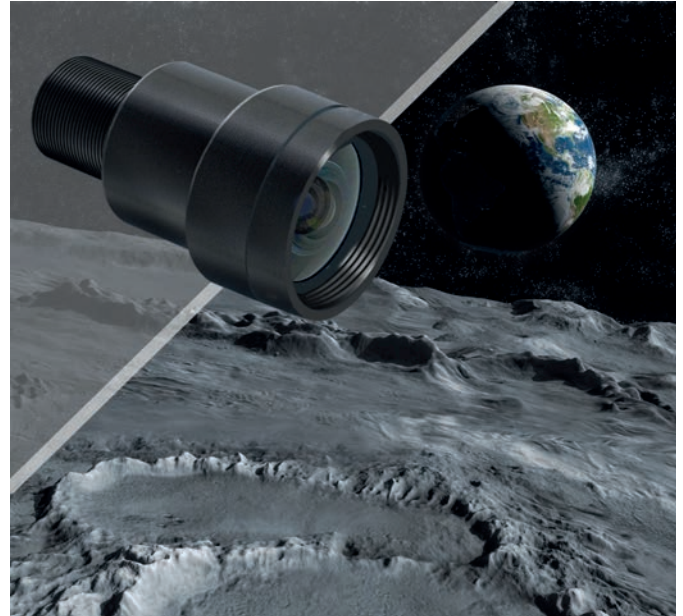
**Lens servicing or replacement is highly undesirable in spaceborne applications. How do you overcome this challenge?**

Our space ready lenses do not have any moving parts, so the challenge is to build a lens that can survive the rigors of space launch or landing on an extra-terrestrial surface. To ensure our lenses are as rugged as possible all optical clamp rings are staked to prevent them becoming loose after tightening. Each space ready lens we supply undergoes a vibration acceptance test to ensure nothing is loose.

Designing and producing optics for use in space is a highly specialised area where expertise and experience are critical. The last thing you would want is for a component to fail and jeopardize or hamper a mission. The cost of launching payloads into space is considerable, incorporating only 'space ready' lenses or optical systems into your satellite or space observation system is therefore critical for realising longer term, high-performance operation.

**What technical trends are you seeing for optics to be used in space? Are the number of applications increasing?**

Many of the major advances in the space industry are being driven by technological innovations in satellites. The most significant satellite trend we have noted is the move towards development and deployment of micro and nano satellites. Because of the lower manufacturing cost of these smallsats – this trend is paving the way for the mass production of satellites. From an optical perspective we have seen a



significant rise in demand for small S-mount lenses to be used on these micro and nano satellites.

Mark Pontin is Managing Director of Resolve Optics Ltd. He may be contacted on [mark.pontin@resolveoptics.com](mailto:mark.pontin@resolveoptics.com)


Anis Zenadji

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# Level Switches

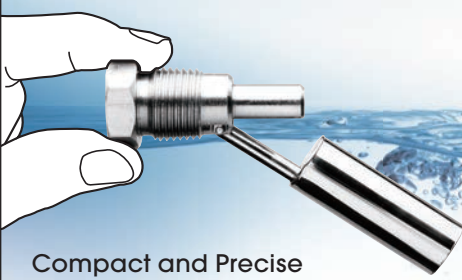
**High Quality**  
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- Specific Gravity : 0.7
- Operating Temperature : -40°C ~ +120°C
- External Mount Type



Riko's Level Switches are compact and simple in design. They have proven their high reliabilities in the wide range of applications. Many more types are available. OEM designs are widely welcome. Please check with our website below.

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# Flower Power: Solar Powered Roboshot Sets Bloom-in-box On Road to Net Zero

Following its investment in an energy-saving FANUC ROBOSHOT injection moulding machine, eco-conscious plastic products manufacturer Bloom-in-Box is well on the way to becoming carbon neutral.

Thanks to superior servo technology and intelligent power regeneration capabilities, the energy-efficient ROBOSHOT S150iA installed at Bloom-in-Box's Burscough facility uses just 3kW per hour, permitting it to be powered exclusively by renewable solar energy.

"Our goal at Bloom-in-Box is to become carbon neutral over the next 12-18 months. We have been working with all-electric machines for the last 20 years to reduce power consumption and emissions. Solar installations and our new FANUC ROBOSHOT were the next steps to achieving this. Thanks to these latest investments, our current carbon emissions as a business are estimated to be less than 10 tonnes of CO2 per year, with our ultimate goal to achieve net zero," says Tom Reardon, production co-ordinator and robotics engineer at Bloom-in-Box.

## Born again plastics

Bloom-in-Box is a third-generation, family-run plastic injection moulding business grounded in an ethos of responsible consumption and production. A commitment to creating products with more than one life drives the company's design and manufacturing activities and in 2018 earned Bloom-in-Box a place in the final of Best Recycled Plastic Product of the Year for its Bloomie floristry box. The Bloomie is made from 99% recycled material and is 100% recyclable. Any boxes that mould incorrectly are chopped up, passed through a grinder and made into security spikes. Other products made by the business include laundry pegs, scoops and measures.

Bloom-in-Box has been involved in injection moulding for more than 20 years and has always been an advocate of electric moulding



Tom Reardon at Bloom-in-Box believes FANUC machines are at the top of the league table for energy efficiency in injection moulding



The energy-efficient ROBOSHOT S150iA installed at Bloom-in-Box's Burscough facility uses just 3kW per hour, permitting it to be powered exclusively by renewable solar energy

machines on the basis that they use up to 80% less energy than their hydraulic counterparts. When significant growth meant the company had reached maximum production capacity last year, it took the decision to invest in a new electric machine that would enable it to increase capacity by 25-40%.

"We had reached a plateau. Our older machines were slower, causing production bottlenecks, and lacked the precise temperature control needed for working with biodegradable plastics," recalls David Reardon, director of Bloom-in-Box.





*Energy goals. Bloom-in-Box aims to be carbon neutral within the next 18 months. Solar installations and the new FANUC ROBOSHOT were the next steps to help achieve this.*

### Carbon neutral ambitions

At the same time, the company had embarked on a roadmap to become carbon neutral, starting with an assessment of its carbon footprint. This revealed that electricity was its biggest source of carbon emissions, accounting for 95% of its total emissions. To address this situation, in November 2021, Bloom-in-Box installed a 40kWp solar system that feeds directly into the factory. During daylight hours this generates on average 10kW per hour, with the potential to produce even more electrical energy during the summer months. Therefore, when it came to deciding which injection moulding machine to invest in, energy efficiency was a top consideration, alongside production speed, quality, CNC reliability and

repeatability. Bloom-in-Box wanted this machine purchase to support its carbon emission reduction ambitions and to be powered exclusively by the new solar panels.

This search led Bloom-in-Box to FANUC's ROBOSHOT range – the most energy-efficient injection moulding machines available today. "FANUC machines are at the top of the league table for energy efficiency in injection moulding," says Tom Reardon.

It is well known that all-electric injection moulding machines use up to 80% less electricity than a hydraulic machine of a comparable size. FANUC's ROBOSHOT goes even further than this, consuming 10-15% less energy than other all-electric machines.

### Energy efficient design

The ROBOSHOT's best-in-category energy efficiency can largely be attributed to a combination of FANUC's proprietary servo technology and smart energy recovery.

"All our competitors buy their servo drives from a third-party manufacturer, whereas we build our own, meaning they are as energy efficient as is physically possible. This also enables us to specify servo drives that are the perfect match for each machine's target performance, ensure they deliver exactly the amount of power to the motor that it needs," explains David Raine, ROBOSHOT sales manager UK and Ireland.

In addition, the ROBOSHOT's advanced power regeneration feature enables intelligent energy recovery: when an axis decelerates, energy returns to the power source, adding to the



*Bloom-in-Box is a family-run plastic injection moulding business grounded in an ethos of responsible consumption and production.*

overall savings.

"When the equipment starts to decelerate and the motor is no longer required to drive a process, it automatically switches to being a generator, feeding the electricity that is generated back through the system to another location on the machine where it is needed," says Raine.

The 150T clamp force ROBOSHOT S150iA in operation at Bloom-in-Box runs at 2.9-3kW per hour for a six-second cycle (the longer the cycle the less energy consumed), reducing energy consumption by 20% versus previous generation electric machines in the plastic processor's fleet.

"This represents a huge saving both in terms of CO2 emissions and energy bills," says David Reardon.

As well as being well on track to becoming carbon neutral, Bloom-in-Box is well-placed to expand its garden, scoops and measures ranges and to develop new medical and PPE products.

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*The Bloomie living vases, injection moulded using recycled material by Bloom-in-Box*



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# Safety Performance, Climate Monitoring, and Pressure Transmitter

JUMO introduced 3 innovative solutions for safety and climate optimization

## JUMO NESOS: SIL 2 complete solutions with JUMO Safety Performance

Using the name JSP (JUMO Safety Performance), JUMO has already been bundling the company's expertise in the SIL (Safety Integrity Level) and PL (Performance Level) fields for years. Now the JSP portfolio is being expanded to include another important measurand – it enables the reliable detection and measurement of process-critical point levels and filling levels for liquids. JUMO offers solutions for the measuring point up to SIL 2 according to IEC 61508.

This is a system solution based on the products of the JUMO NESOS series that is available in various expansion stages to suit the customer's requirements. Flexible options are available including the SIL-qualified sensor with all required safety-related characteristic values, SIL-

certified sensors, and the certified measuring point. Qualification and certification were carried out by an independent test facility so that a solid basis has been laid for safety-critical applications.

The JSP complete solution in the "filling level" field can also reliably detect line faults, such as short circuits and cable breaks, ranging from the sensor to the actuator. Solutions can also be implemented in combination with applications in explosion-protected areas (intrinsically safe [Ex i] and flameproof enclosure [Ex d]) as well as in shipbuilding. As a result, possible applications include the field of liquid gas and hydrogen, steam boilers, bioreactors, or solvent purification plants.

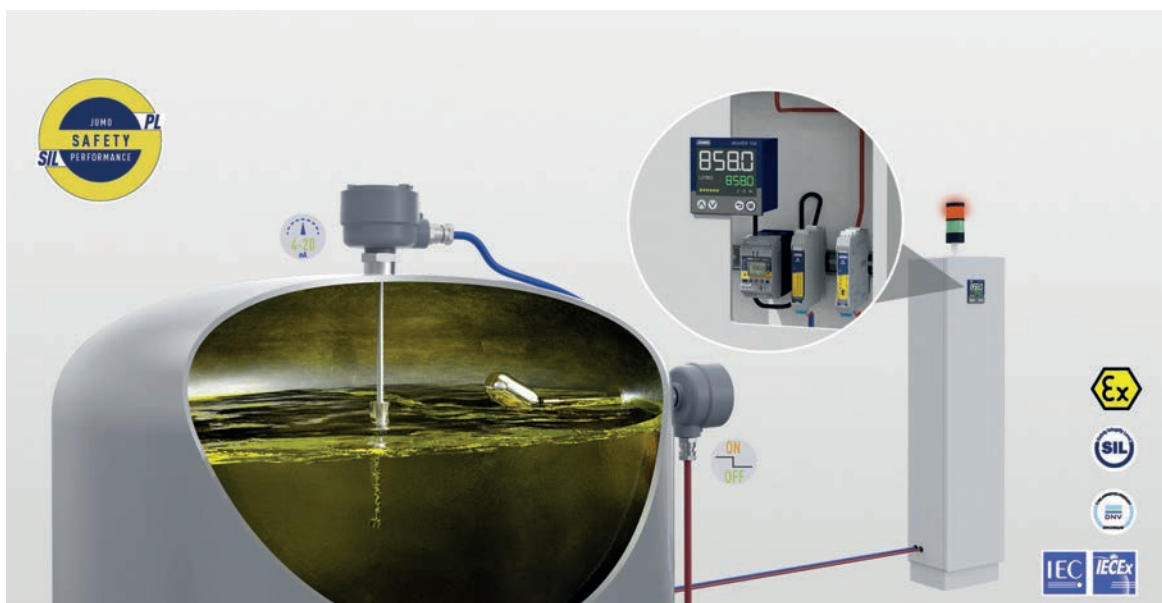
The product range under the JUMO Safety Performance brand now includes complete solutions for temperature, pressure, and filling

level. In addition to product and solution developments, JUMO Safety Performance focuses on a high level of consulting expertise. JUMO's SIL skills network is available to offer transnational help with its comprehensive expertise. The combination of high-quality products and comprehensive expertise makes JUMO Safety Performance a clever, complete solution for different industries and applications.

If the repeat test has to be performed after a defined time interval, JUMO offers customers the option of in-house tests including documentation and product labeling.

## JUMO hydroTRANS: Flexible humidity and temperature transmitter with optional CO2 module

Devices of the JUMO hydroTRANS series are reliable humidity and temperature transmitters



*The process engineering application from JUMO offers an end-to-end automation solution from the sensor to the cloud.*





*JUMO hydroTRANS provides users with a modern device series for determining the optimal indoor climate.*

with an optional CO<sub>2</sub> module, which operate according to the capacitive measurement method. The device series is available with various interfaces. It is characterized by easy installation, robustness, and reliable sensor technology.

Precise humidity and temperature monitoring is the basic requirement for accurate control of indoor and process air. As a result, users from the HVAC field (heating, ventilation, and air-conditioning) can reduce costs and minimize maintenance effort.

The JUMO hydroTRANS is the ideal partner for climate monitoring in offices and living quarters, railway applications, warehouses, or production halls. It is available in 4 variants: wall-mounted, duct, rod, or indoor. All of these versions can be mounted and installed very easily. The various models with protection classes between IP20 and IP65 make the device suitable for a wide range of building automation applications.

The measuring range includes 0 to 100 % rH, while the accuracy is 2 % rH. JUMO hydroTRANS has a modern color display and can be used in temperature ranges between -40 to +80 °C. A variant with an optional CO<sub>2</sub> module, which has a measuring range of up to 10 000 ppm, is available for precise determination of the indoor air quality. Very low response times can be achieved by placing the module in the probe head. A voltage and current output as well as Modbus are available as interfaces.

#### **JUMO SIRAS P21 AR / DP pressure transmitter: safety measuring chains up to SIL 3**

The JUMO SIRAS P21 AR / DP programmable pressure transmitter is approved for use in



*The JUMO SIRAS P21 AR / DP can be used in combination with other JUMO devices as an immediately operational safety chain for SIL 2 or SIL 3.*

safety-related plants with Safety Integrity Level (SIL) according to DIN EN 61508 and Performance Level (PL) according to DIN EN 13849. As a result, it is perfectly suited for safety measuring chains in the process industry.

JUMO SIRAS P21 AR / DP can be used in a variety of applications so that it reliably and precisely measures the relative, absolute, or differential pressure of liquids, steam, and gases. It is an extension of the JSP portfolio (JUMO Safety Performance) which can be used in combination with the JUMO safetyM STB/STW safety temperature limiter/safety temperature monitor and the JUMO transmitter power supply unit as an immediately operational safety chain for SIL 2 or SIL 3. This safety measuring system is certified according to the Pressure Equipment Directive (PED 2014/68/EU).

JUMO provides the required certificates and all safety-related system properties in a clearly arranged manner, so that the safety assessment effort for the user is significantly reduced.

The factory-set measuring ranges for the JUMO SIRAS P21 AR / DP are up to 100 bar relative pressure and up to 100 bar absolute pressure. JUMO SIRAS P21 AR / DP is particularly impressive due to its high degree of precision. Long-term stability is less than 0.1% per year, while the linearity is 0.05 %. All materials in contact with the media are made of stainless steel (316L). As a result, CIP cleaning is possible without any problems. Measurement outputs have available: 4 to 20 mA, two-wire, and HART® with 4 configurable measured values.

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## Water Efficiency Could Help Europe Drive Decarbonization and Boost Industrial Competitiveness

As water scarcity becomes a bigger issue, industry must become more resilient by reducing pressure on available freshwater resources. Strong policy frameworks are required to support more efficient water usage, says Emilio Tenuta from Ecolab

### The climate urgency requires swift action at global, regional and local levels

While the risks of a climate crisis loom ever-nearer, global leaders gathered a few weeks ago for the World Economic Forum in Davos, Switzerland, to argue once again for the need for swift climate action.

Even before this, in January 2021, the new German Chancellor Olaf Scholz called for a determined approach, saying: “We will no longer wait for the slowest and least ambitious. We’ll turn climate from a cost factor to competitive advantage”. It is encouraging to see leaders finally rising to the climate challenge.

The message is clear: We need more than ever to move faster and act collectively to address the climate emergency. To accelerate decarbonisation in industry and successfully achieve the goals set under the 2015 Paris Climate

Agreement, we will have to work together. Governments, businesses, investors and civil society will need to partner to turn this commitment into concrete actions. Water efficiency is part of the solution to decarbonisation.

### Critical Element

Being a fundamental resource for nearly every step of manufacturing and production processes, water is a critical element of the solution. Water and energy are closely intertwined as water is the primary energy transfer medium for many industries—using water for pumping, heating, cooling and cleaning requires energy. This water-energy nexus is ubiquitous in our modern industrial society and their relationship in terms of energy efficiency can be represented quite simply: saving water means



**EUROPEAN ALLIANCE TO  
SAVE ENERGY**

*Creating an Energy-Efficient Europe*

saving energy, which leads to greenhouse gas emission reduction while reducing costs for industry. In other words, water efficiency can help mitigate climate change while boosting industrial competitiveness.

In Europe, industry represents nearly 50% of total water use. Optimising industrial water use will not only decarbonise the economy in a cost-effective manner, but it will also help reduce pressure on water resources and exposure to risks of shortages.

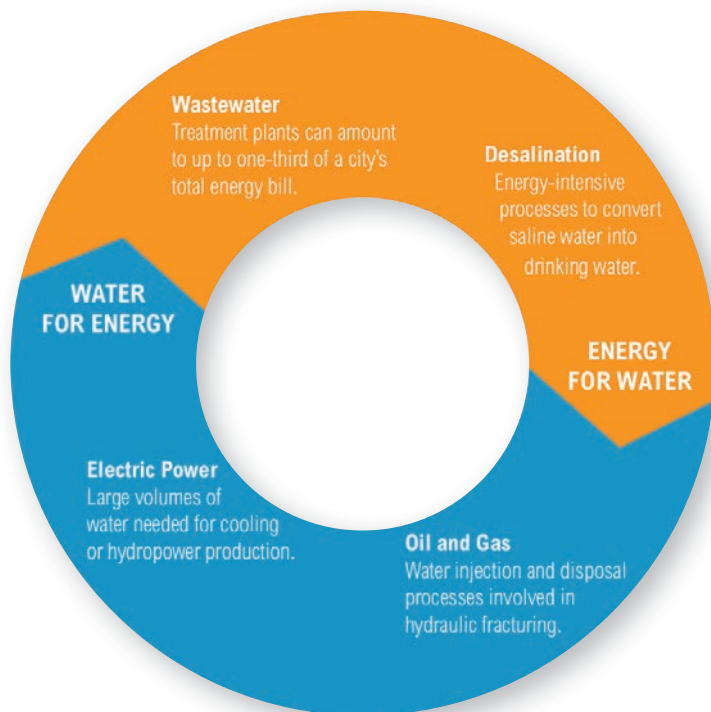
According to the World Resources Institute, there will be a global deficit of 56% between water supply and demand by 2030. In addition, the International Energy Agency forecasts a 35% increase in world energy demand by 2035 which corresponds to a growth of 85% in water demand.

Exacerbated by climate change and energy demand, water stress has become a serious business issue and generates competition between various economic sectors.

### Policy Incentives

A strong policy framework is needed to incentivise water efficiency. Circular water management can help alleviate this problem through water efficiency and water reuse techniques.





Unfortunately, only 2.4% of Europe's treated urban wastewater effluents are being reused. For this reason, water reuse in industrial processes should be strongly incentivised whenever appropriate to minimise water abstraction and wastewater discharge. This would bring environmental benefits and have a positive climate impact.

The water-energy nexus should be better reflected in legislation, and lawmakers should fully consider the benefits stemming from water efficiency as a key driver to delivering energy savings. For instance, the industry should be encouraged to assess water efficiency opportunities as part of their energy audits as it would incentivise measures towards water optimisation and energy savings.

EU lawmakers should seize the Green Deal policy package as an opportunity to exploit the benefits from the water-energy nexus in order to contribute to the climate neutrality objective while addressing water preservation and reinforcing industrial competitiveness. Technological solutions already exist, but they need regulatory incentives to be deployed at a large scale and to make long-lasting impacts.

#### Performance Indicators

Becoming greener also means being more

competitive. Large industrial companies are increasingly realising that improved water cycle performance can drive both cost efficiencies and corporate sustainability commitments.

Driving continuous improvement on water and energy-mass balance has become a critical performance indicator for industry as global competition increases pressures on productivity and costs while at the same time industry is called to support increasingly ambitious environmental regulation.

As an example, Arcelor Mittal, the world's largest steel mill company partnered with Ecolab to save 8.3 billion litres of water, reduce its energy use by 6.2 million kWh and avoid 1,226 metric tonnes of CO2 equivalent, while saving €1.2 million and creating a more sustainable operation in just over one year through more efficient water usage at a manufacturing site in Romania.

Water efficiency is a direct and cost-effective strategy that enables decarbonisation and supports industrial competitiveness. It is now time for lawmakers and industry leaders to speed up their actions and seize these existing opportunities.

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# Journey Through the HyperX Analysis and Design Optimization Software

Following the presentation of the HyperX software at JEC World 2022, IEN Europe interviewed Craig Collier, CEO and President at Collier Aerospace, on this new analysis and design optimization tool mostly engineered for Aerospace applications.

**IEN Europe:** Could you briefly introduce yourself as well as Collier Aerospace to our readers?

**Craig Collier:** I am an engineer that also has a computer science degree and I have worked in the industry before starting the company. My last work assignment was at NASA Langley Research Center as a research engineer. And that's how the software got started. You may note that our name had been called Collier Research, we did change it, recently. We started off focused on doing research in the aerospace Space Launch industry, and the company has been in business 27 years now. We still work closely with NASA but we've expanded to the general aerospace industry. We work in the field from commercial transport planes which carry hundreds of people to business jets. We are also getting involved in the new UAM markets, which are the aerial mobility/personal taxis. They are usually propelled by electric motors. Their vertical takeoff is called VTOL so that they take off almost like a helicopter, then they tilt the motors and then fly like a plane.

We do business in other areas as well, such as composite competitive sports, for instance Formula One or a composite mountain bike. You may have seen for example the sailboat that is trying to break the world record in speed. A lot of the guys in our company are very much hobbyist and they love to use our software that's been developed for industry and aerospace, but to use that in these other ways.

**At JEC World 2022 will be presented the global debut of Collier Aerospace new analysis and design optimization software. Can you introduce us to the HyperX software?**

The HyperX software was originally developed for the purpose of helping customers find the lightest weight solution. In addition to that, we have added four other major benefits to the customers to help them reduce schedule. The second is schedule which is very important for companies to be able to complete the design cycle, from conceptual to preliminary to final design. The third one that we really have focused on as well is the producibility of the composites. So not only in the world of analysis and design or simulation, but also in asking yourself, how is that part could actually be made? Is it feasible? Is it practical? What can you do to make it easier to be made out of composites? And to do so without compromising lightweight? The fourth one is related to the certification aspects again, so how do you know that that part you design is strong enough to carry the load without failure? It is usually not just one load but there

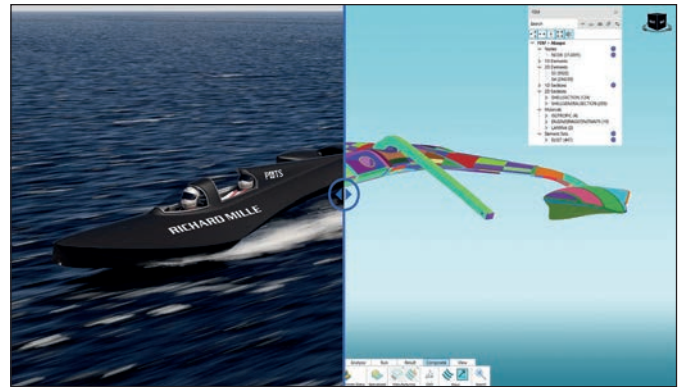
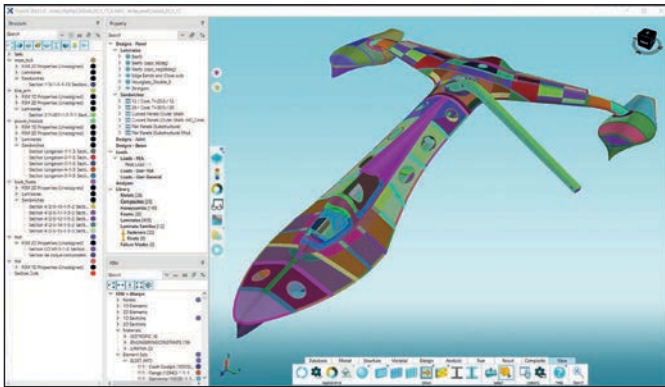


*Craig Collier, CEO & President, Collier Aerospace.*

are multiple loading environments or loading conditions that need to be considered. There are a lot of ways the part can fail, thus there are a lot of different failure analyses that need to be performed and reported out to the certification authorities to prove structural integrity. That is the benefit of the software to users. A part of what we do in this context is help the engineer whether he's a design or an analytical engineer, to be able to determine what material system is most appropriate, most performant for that structure. And what kind of architecture should it be, and what kind of a design specifically such as thicknesses and its dimensions? We can help our customer do these trades between metal composites or, for instance, if it is about composite between next generation thermostats, versus the thermoplastics versus resin infusion. These kinds of capabilities are not just useful for aerospace, they are useful for any industry. Usually when you're introducing a new product, you may look at what people have done in the past that to see if there's a better way of doing it. And that's what our software has purposes in.







**What does HyperX bring in comparison with the HyperSizer software previously provided?**

The HyperX software has some of the same benefits offered by HyperSizer, one in particular with the weight reduction, e.g. lightweighting as they use in the automotive industry. HyperX has other benefits in regard with standard workflows, we have a workflow for analysis only and we have a workflow for design. We actually have a workflow focused on taking a finite element model and using that as a basis of your model that you work on to do the analysis and design. The other aspects are the ability of it to be more intuitive, more modern thus people are a lot more efficient with the software and they can get their work done faster thanks to the new underlying software technology we have incorporated in it. We have a drag and drop process where you can take any material system or design and just drop it on to the part and you immediately know how well they perform. We would know if it is failing.

What are the main application fields? Which industries can be interested? Particularly in Europe, in the Formula One racing industry, obviously they want the lightest composite structures, where it means everything to them. Same for the competitive mountain bikes, or racing. Another application is related to wind turbine blades. In that case, the focus is about looking at the performance of a wind blade that would be not made with

the typical fiberglass but made instead with plant based or natural flax material in addition to carbon fiber.

**What needs to be considered when developing a software solution to be used in aircraft, space and automotive applications?**

Fundamentally it is kind of a balancing act, right? You want to be able to have a general solution that applies to a lot of industries. But at the same time, if you have your software used by aerospace engineers, the software's needs to be really capable of performing in a manner in which that aerospace engineer needs to get his work done, or her work done because a lot of times, the general software capability is modified or customized a lot, to make our software usable. What is out of the box is to have the software ready on day one to solve your problem. This is certainly true as well for Space Launch industry.

In aerospace, there are very specific material allowable well standardized over decades and we have those in our software that a general software package would not have.

**That makes your software a little bit more unique, correct?**

Yes, I would think it is very unique in that way. The persons using the software since day one feel very comfortable with the way we have organized





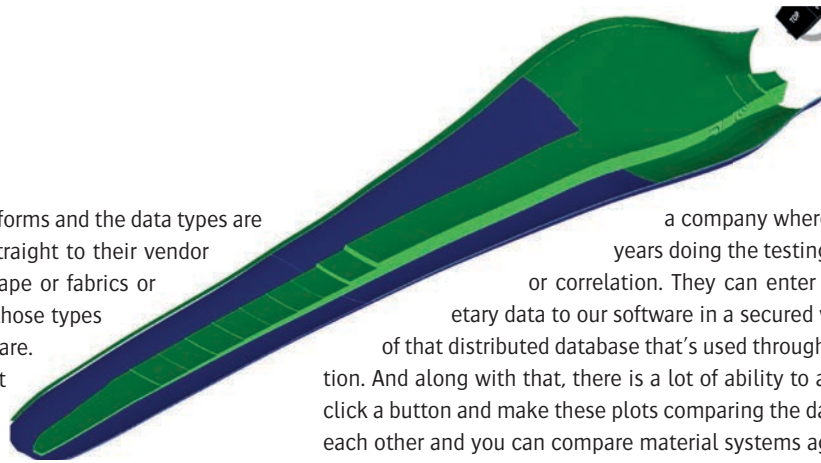
the interface, through the way the data forms and the data types are already defined. They can usually go straight to their vendor catalogs, whether it is the individual tape or fabrics or maybe the fasteners that are used, all those types of data are natively known in our software.

The software system has a very robust database, which is part of the reason why it crosses all these different industry needs of these different design engineers.

Underlying relational database is a very big part of that enabling capability and that we can handle so much data of so many different types. And the engineer does not have to reenter that data. It is maintained now over the years and in the case of an enterprise, use cases and organization, a business can enter that data one time and securely maintain it, so one source of truth for that data, and all the template databases come off of that, thus the engineers are using that same data. So, the ability to go from a model to a composite is just a matter of dragging something that you are interested in and just dropping it, for instance, on the wing skin and you immediately know how the materials will perform.

**Is it Because a company can enter their specific data for their particular needs, that they're organically growing those datasets as well?**

Yes. One aspect is that they are some of the data available in their catalogs, but other aspects of this data could be highly proprietary to



a company where they have spent years doing the testing, data calibration or correlation. They can enter their own proprietary data to our software in a secured way and still, part of that distributed database that's used throughout the organization. And along with that, there is a lot of ability to automatically just click a button and make these plots comparing the data values against each other and you can compare material systems against each other. Swap materials in and out began at any time during the process.

**Can you tell us about successful use cases of your solution?**

One of the stories is the racing boat. They are setting out to break the world record, which is about 92 miles per hour. Our software was used everywhere on that structure which uses fiber reinforced composites. And we also had mentioned earlier that some of our engineers like the idea of being able to get involved in fun projects like this. Our engineers actually performed the analysis and design of that composite structure as well. And we worked with the other members of that organization. We pass data back and forth, and they learned on our software.

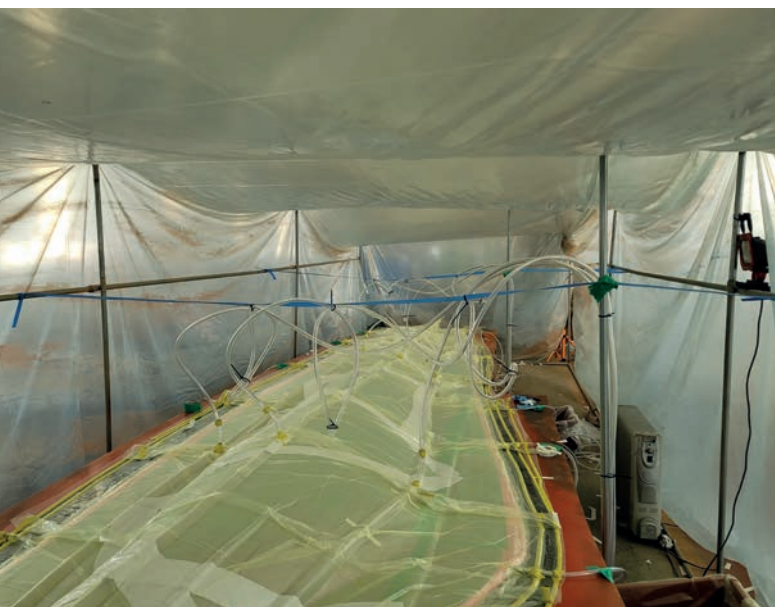
At JEC World, we actually had a model of that structure with us. A 3d printed model and the FEM in our HyperX software interface.

The other story is about the plant-based wind turbine blade. Our software was used exclusively in the optimization aspect. We have a team member performing the analysis and design in that particular use case which was very stiffness driven, and the issue was not just the lower stress allowable of the plant-based composite, but also its softness. The concern is of how much the long slender turbine blade deflects. If they deflect too much they could actually hit the tower, under heavy wind for example, so a lot of the optimization of that composite had to do with making it stiff enough so it wouldn't deflect too much. Our software has that capability as well as making sure it is strong enough.

What is planned next in the technological aspect? Anything more to say? One comment is related to CAD systems since we are very good at coupling or integrating with a customer's finite element model. We are also working now in automating the connectivity of our software with CAD data. Then we would have the full sort of a triangle, where you have the CAD drawing with the data for the manufacturing machines. The finite element model for performing the simulation of the part and then of course, our software, a third part of that triangle, which is passing data back and forth between both of those environments. So yes, improving our ability to work with CAD is one of the bigger new technologies that we're working on.

Anis Zenadji

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# Remote Control: Enabling Manufacturers to Monitor Production Without Being Rooted to the Production Floor.

This tribune from **Grégory Chauvet, General Manager, JPB Système**, has a vocation to help manufacturers to face the fundamental changes to the way businesses operate through remote control.

Despite the turmoil that industry has had to endure over the last two years, we do now generally appear to be turning a corner on COVID-19. As swift and effective as vaccination programs have been in confronting the virus itself, the COVID-19 experience has brought with it some fundamental changes to the way businesses operate.

For one, it inflicted a revised model of working on us. Indeed, from the very outset, companies, including my own, were forced to have teams operate remotely as lockdowns were thrust upon the world. For some businesses this perhaps presented the perfect opportunity to 'trial' new ways of working that they may have been considering. In any case, it has brought forth an office/home hybrid model that is now commonplace across many organisations, regardless of the industry in which they operate.

The truth is that such new approaches to working were already becoming the norm; COVID merely forced the model on the world and accentuated its uptake. We were already living in a world where more and more business operations were being conducted on the move, away from the office or production facility, way before COVID hit us.

That world, as it was prior to early 2019, and as it is now, is one in which there is an ever-increasing expectation of instant access to information – be it from a work perspective, or indeed in our personal lives. The plethora of news and information apps loaded on our smartphones give us instant access to the world, and furthermore, we have grown to expect that information within seconds and in just a few clicks.

So, given this change to working models,



*Grégory Chauvet, General Manager,  
JPB Système*

and the reliance on information at our fingertips, there is a growing need for business owners and manufacturing directors to be able to stay abreast of production operations without being rooted to the production floor.

## **The Shazam for Industry**

This is an added challenge for those solution providers who are first simply seeking to facilitate production and improve efficiencies. The need to achieve this and also provide increased flexibility for manufacturers, was a key criterion in the development of our own KeyProd production monitoring platform.

Designed specifically for industrial environments, this cloud-based solution provides a consolidated real-time vision of production to analyse quality and performance indicators such as overall equipment effectiveness (OEE).

Importantly, in just one click on their smartphone, manufacturers have complete visibility and control of their factory floor performance – whether they're in the factory, on the road or at home. In doing so, they can assess the different causes of machine downtime, take steps to correct and anticipate the various problem areas and reduce future stoppages.

As the general manager of an Industry 4.0 enabled manufacturing company, I know the importance of maintaining efficient and profitable production. Like many, I also value the increased versatility that technology can deliver when it comes to how we live and work. If a result of the COVID experience is an increase in the expectation and desire to have more flexibility within our lives, while still being able to work effectively, then it is incumbent upon solution providers like ours to continue to pioneer technologies that enable us all to strike that perfect balance.

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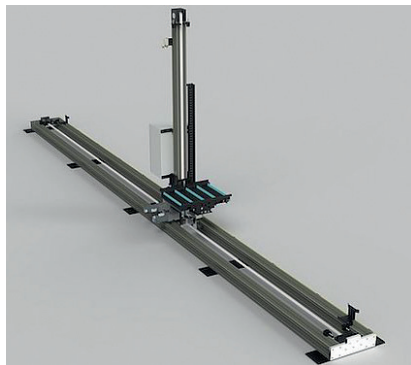
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## INTELLIGENT 3D SORTER SHUTTLE

Heightens robotic standards in warehouse logistics



**Addverb Technologies**, a global robotics company providing complete end-to-end warehouse automation solutions, announces the release of a new sorter robot called SortIE – a fast-moving scalable solution for rapid and efficient order fulfilment. As

a fully automated robotic put-to-wall sorting system, SortIE is capable of performing SKU-wise intelligent sortation at very high speeds and at different height levels. Additionally, it enables easy and rapid picking. It can be easily integrated with existing conveying systems such as conveyors, robots, and manual transport with no impact on ongoing operations. SortIE has a speed of 3m per second to ensure quick turnaround cycles. Combined with a Zippy sorting solution, it can also increase the number of destinations on a smaller footprint. This system is ideal for industries like e-commerce, third-party logistics, fast-moving consumer goods, and retail for quick order sequencing and sortation, allowing for faster dispatch of large order quantities.

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## 230VAC SERVO SYSTEM

High tolerance, stable operation



Showcased during Hannover Messe 2022, **Delta Electronics** new compact and high-efficiency servo system ASDA-B3 Series provides a user-friendly operation environment with precise motion control functions. The 230VAC ECM-B3 motor comprises a newly- added safe torque off (STO) function, high

responsiveness up to 3.1kHz and high positioning precision with over 16.7 million pulses per revolution to optimize production efficiency and output value in a wide range of applications, such as machine tools, electronics, semiconductors, industrial robots, printing, packaging, textiles, warehousing, and medical. Concurrently we have also launched the new generation motor of ECM-B3 Series, offering improved power density, stability, and stiffness while reducing 40% space requirements. Nevertheless, torque has increased at 350% and the maximum speed is now of 6000 rpm. With the new ASDASoft GUI, the time of commissioning and troubleshooting is shorter. Among the performance highlights of the new 230VAC ECM-B3 motor is an auto tuning feature that ensures optimized operation without the need for manual adjustments. Responsiveness has been bumped up to 3.1 kHz from the 1 kHz of the preceding model. Delta has programmed new motor control algorithms and increased the computing power of the drive to achieve this superior result.

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## PARALLEL REACTION STIRRING SYSTEM

Can drive three stirrer shafts with one overhead stirrer



Incorporating an energy efficient drive mechanism - the compact DrySyn Vortex overhead stirrer system from **Asynt** delivers effective overhead stirring to three round bottom flasks (100 mL to 500 mL) in parallel with stirring from 50 to 500 rpm. Suitable for reaction temperatures up to 200°C, the DrySyn Vortex is the perfect process development tool to efficiently, and safely, drive three stirrer shafts with one overhead stirrer. The compact footprint of the DrySyn Vortex is

designed to operate on a single standard hotplate. The powerful DrySyn Vortex features a reduction drive proven to work even with higher viscosity substances, where magnetic stirring is not strong enough or where materials could be damaged by the grinding effect of a magnetic stirring bar. Users may also use a smaller overhead stirrer. An optional adaptation to the DrySyn Vortex has been developed specifically to cater for the requirements of scientists who need to test in parallel in beakers. The DrySyn Vortex blend, able to hold three 600 mL beakers, will be of interest to blending and formulation scientists in the oil, cosmetics, cleansing and hygiene industries.

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## INTELLIGENT 3D SORTER SHUTTLE

Heightens robotic standards in warehouse logistics



INOTA AMR from **INOROBOTICS** standardizes the material movements. INOTA performs the duty of transporting material-load between stations 24/7, does not need any auxiliary personnel during its duty. In this way,

the in-plant carrying capacity is determined precisely and production planning is made in accordance with this capacity. No cable, tape or magnetic line infrastructure is needed during the commissioning process. INOTA calculates the free space around the obstacle when an unexpected obstacle, such as a pallet, box, or equipment, is in front of it. If there is enough space, it moves around to the destination, if there is not enough space, it reaches the destination by drawing a new route. INOTA determines the best route to reach the destination. Thanks to its safe driving technology, it minimizes product losses due to transportation and provides a safe intralogistics opportunity. The laser scanners on INOTA detect the obstacles, slow down at the most accurate acceleration, and help prevent carrier-related work accidents.

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## CUSTOM FIXED FOCUS LENS

Designed to retrofit existing camera



The customer required a 16mm radiation resistant lens which is not part of **Resolve Optics** standard range of fixed focus non browning lenses which consists of 6mm, 9mm, and 25mm focal length models. An added requirement was that the nuclear systems integrator needed the 16mm lens design to fit within a smaller footprint so they could

use the new lens, without any modifications, in an existing radiation tolerant camera housing. Mark Pontin, Managing Director of Resolve Optics commented "Drawing upon our extensive experience of developing non browning lenses for monitoring every part of the nuclear fuel cycle, we rose to the challenge and created the desired compact 16mm focal length lens design. Our customer is delighted as the new optimised lens fits seamlessly into their existing camera housing without need any modification". Designed to provide uncompromised performance on the customers 2/3-inch format radiation tolerant camera the new 16mm focal length fixed focus lens delivers high image resolution (f2) and minimal geometric distortion from 400 - 750 nm. Manufactured to the highest quality standards from cerium doped glass, the new custom specified lens can withstand radiation exposure of up to 100 kGy (100,000,000 rads) and temperatures up to 55 degrees centigrade without discoloration.

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## POSITION INDICATOR FOR SIZE CHANGEOVER

Position display with innovative IO-Link interface



The bus-compatible position indicators for monitored size changeover specialist **SIKO** is presenting the AP05 as the most compact version in this segment, now with an

integrated IO-Link interface. As the core element of monitored size changeover, networked position indicators have become an indispensable part of mechanical engineering. Their ability to display the setpoint and actual value on the adjusting spindle to the machine operator increases comfort for the setter. This significantly simplifies the process of refitting a production machine for a new product. Moreover, feedback on the positioning status to the machine controller extends reliability for format changes and optimizes set-up times. Incorrect settings are prevented, thus rejects and damage to tools are avoided. To summarize, the AP05 position indicator boosts efficiency and reduces setup times. Through smart communication with the higher-level machine control system, the AP05 position indicator ensures that product changes and size changeovers are implemented safely and ergonomically. Setpoints, actual position values and the positioning status are exchanged, which converts the manual spindle adjustment into a monitored process. In addition to the serial interfaces, the AP05 now deploys an innovative IO-Link interface. This allows fast and cost-effective integration via a point-to-point connection using uncomplicated I/O connection technology.

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## NEW LINE OF SWITCHES

Come with expanded design options



**Schurter.** The new MSM RD variants are distinguished by its high-quality choice of materials. The switch housing is made of black anodized aluminum. With the combination of the special black translucent plastic for its ring lighting, the switch gives an elegant, modern appearance. The

progressive modern look of dead-front displays provides expanded design options with the known intuitive features of tactile feel and optical feedback. While the DF black Light Guide material is translucent, it is very robust. The switch appears inconspicuously black when the lighting is inactive. It thus fits unobtrusively and discreetly into dark operating surfaces. If the illumination is active, the ring shines in the set color without any color shift despite the dark Light Guide material. Thus, special design effects or specific attention to detail can be created. The MSM RD variants are characterized by their high quality. As standard, the ring illuminated switches are available in different sizes as well as in different illumination colors. Depending on the variant, the switch can operate up to 10A.

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## TUBE SELECTOR & PICKER

Designed to select and pick wide, heavy, or tall tubes



The Mohawk 48 uses forty-eight solenoid pins to enable a specific frozen or thawed sample tube to be raised and selected when a 48-position tube rack is presented according to a pick list from Excel or a LIMS system. Alternatively specific individual tubes can be manually selected and picked via the user

interface. Individual sample tubes can be picked from a single rack, or users can create a picklist to select tubes across multiple racks. Pick lists can be created by connecting the Mohawk to a **Ziath** whole-rack reader, such as the Mirage. The advantage in this case is that destination racks of picked tubes can also be verified for accuracy on the same reader. Proven in installations worldwide - Mohawk tube selection and picking technology avoids the need for slow and costly robotic systems - importing a pick list, selecting, and picking larger whole tissue sample tubes in just seconds. Connecting the Mohawk 48 directly to a 2D-barcode scanner for tube confirmation provides extra sample tracking and security. Operating in this configuration it is also possible to generate picklists directly from the tube barcodes. For further traceability, a 1D-scanner for reading the rack barcode is included as standard.

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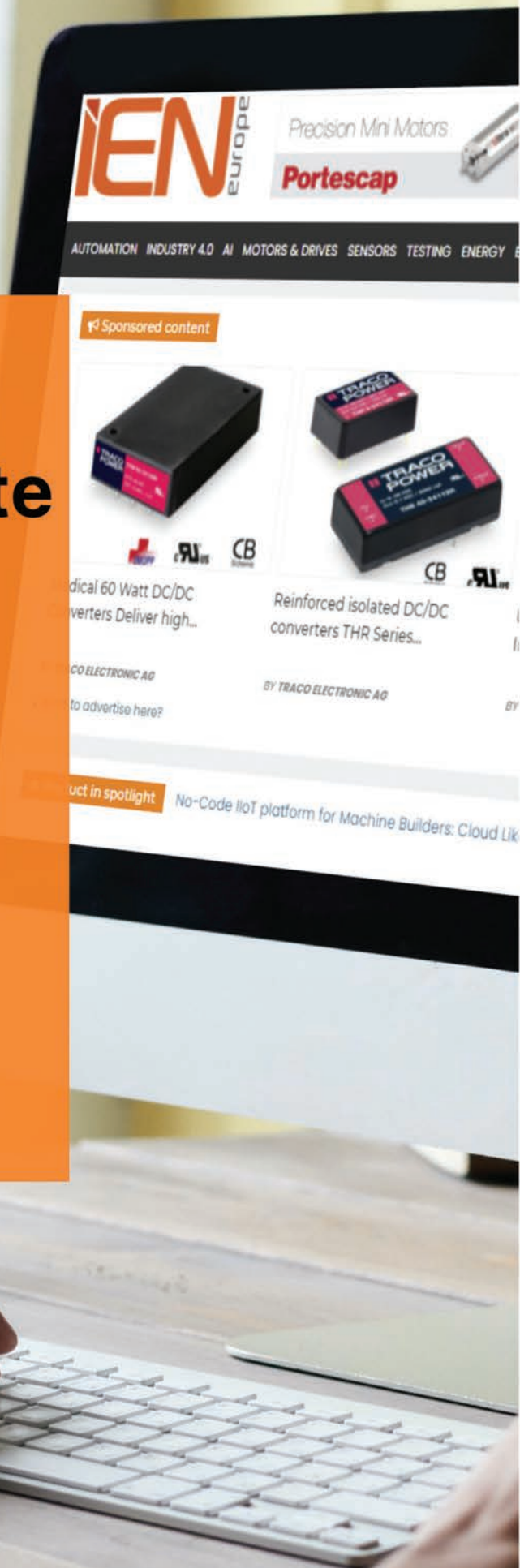
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