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Marco Prinari - m.prinari@tim-europe.com**FREE DIGITAL SUBSCRIPTION**Anis Zenadji
a.zenadji@tim-europe.com**Dear Readers,**

In this special sensors and smart factory issue you will find out an article from Kistler on future mobility. At the China Automotive Engineering Research Institute (CAERI), NVH testing now plays a major role in fostering the evolution of cars throughout China and beyond. CAERI operates various advanced facilities where its engineers use measurement technologies from Kistler for NVH tests on vehicles and their components.

A series of articles will guide you through the smart factory. Our world is an increasingly interconnected place. The only way we can influence the complex systems surrounding us is to know what they are doing and how they are reacting to the stresses we put on them. To do this we need data: how to obtain the amount of data required and what to do with it when it has been captured?

Moreover, page 18, Mike Bradford, Strategic Business Development Director at DELMIA, gives us an in depth review of what MES is, why it's essential for manufacturers and the key differences between manufacturing operations management (MOM) and MES.

Last, don't miss the Omron article on the state of the current traceability challenges and solutions in automotive production and what is to consider.

We wish you a pleasant and interesting reading

Editor for IEN Europe

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BGEN Acquires Radway Control Systems

BGEN, a specialist, multi-discipline engineering solutions business, has acquired Radway Control Systems to strengthen its industrial automation offering. The purchase of the business, which includes the trading and certain assets of the company, will support BGEN's growth ambitions in sectors including renewables and steel, and increase its presence in the automation aftermarket/service arena. Radway Control Systems specialises in the design and implementation of automation, control and information systems for a wide range of industries including automotive, chemicals, metals, renewables and water. It has a high degree of expertise in computer, PLC and drive application software, with a 24/7 breakdown cover and after sales service offering. Radway Control System is an ABB Drives Value Provider and Siemens Solution Partner.



Yokogawa Selected as MAC for Construction of Europe's Largest Renewable Hydrogen Plant

The Holland Hydrogen I plant will produce renewable hydrogen by using electricity from an offshore wind farm and will be Europe's largest renewable hydrogen plant once operational in 2025. In its role as MAC, Yokogawa will optimize operations at the plant by closely integrating its systems and equipment.

The Holland Hydrogen I plant will have a 200 megawatts (MW) electrolyser that will produce up to 60,000 kilograms of green hydrogen per day. The green hydrogen produced at this plant will be transported via a pipeline to the Shell Energy and Chemicals Park Rotterdam, where it will replace some of the grey hydrogen used in the refinery, partially decarbonizing the facility's production of energy products like gasoline, diesel and jet fuel.



On-demand Custom Manufacturing with Tridi



Tridi manufactures Vimo apparatus, which connects the personal phone to the microscope via mobile and web app and allows to process microscope images instantly without the need for any expensive scanning devices. Vimo is being used by Tridi's customer Virasoft, which is known for AI-based digital pathology solutions. Before the manufacturing process, DfM work was carried out in terms of materials and tolerances. MJF and FDM technologies were utilized in conjunction with 25 kg of filament. 2000+ parts were manufactured and assembled in 30 days. A total of 120 assembled final products were delivered to Virasoft. With the five main manufacturing methods and the competent supplier network, Tridi provides a one stop shop digital manufacturing service in which the user can track all processes in Tridi.co from manufacturing to delivery.

Parker Hannifin and Fraunhofer Announce Partnership to Define the Next generation of Humidifiers for Fuel Cells

Parker Hannifin's Engine Mobile Filtration EMEA Division (EMFE) and the Fraunhofer Institute for Microengineering and Microsystems (IMM) today announced a partnership to further develop and test new proprietary hollow fibre membrane technology designed for fuel cell humidification applications. Parker has thorough experience developing membrane filtration solutions for a variety of applications, including fuel cells. The company first introduced membrane fibres for gas separation in the 1980s and is now leveraging this knowledge to develop the next generation of fuel cell humidifiers. "We are delighted to launch this partnership with the Fraunhofer IMM, a world leader in applied research," said Jonathan Griffith, General Manager of EMFE at Parker. "Fuel cell technology is key to helping reduce emissions worldwide. We are confident that with Fraunhofer's development assistance and the support of Parker's EMFE R&D site in Stuttgart, Germany, among others, we will continue to improve our hollow fibre membrane technology, extend the service life of fuel cell humidifiers, and increase efficiency for our customers."



Distec Presents Robust and Low-maintenance Box PC for Info Terminals, Medical Technology and Transportation

Distec GmbH introduces another innovative product: The "BoxPC Pro NPA-2009" offers a novel docking connector for direct connection of high-resolution V-by-One and/or eDP TFT displays. Areas of application for the NPA-2009 are all applications that require high-resolution displays with a high frame rate and high color depth, such as info terminals, medical technology, transportation and many more. The trend in the TFT display sector is towards ever higher resolutions and Full HD is increasingly being replaced by 4K or 8K. The LVDS interface is not well suited for the transmission of such large amounts of data, so that high-resolution TFT displays are usually equipped with V-by-One or eDP interfaces, which have a significantly higher bandwidth. With V-by-One, the signals are transmitted at high-speed via a low-cost, standardized cable, which also has better EMC values than an LVDS cable.



TTI Europe Supports Future Industrial Trends at Electronica 2022

TTI, Inc. – Europe will be exhibiting the latest technologies to support future industrial trends at Electronica in Munich, Germany, on stand C3.578, 15th – 18th November 2022. Visitors to the stand will be able to learn about the newest technologies such as passives, sensors, connectors and power solutions, from TTI Europe's valued manufacturing partners as well as understanding how they are advancing industry. Energy is a particularly important focus as industry looks to operate in a more sustainable and cost-effective way. Engineers are increasingly having to consider energy efficiency as a priority in the design of their systems as energy costs continue to rise, and state-of-the-art electronic technologies are proving vital here. Additionally, there is an increased focus on renewable energy sources such as wind and solar as companies and consumers look to reduce their reliance on fossil fuels.



CLPA to Highlight Role of TSN in Delivering Convergence

The CC-Link Partner Association (CLPA) will showcase its latest advances in open industrial Ethernet with Time-Sensitive Networking (TSN) at SPS 2022. From 8th-10th November, visi-

itors to Stand 106 in Hall 5 will see how this cutting-edge network technology forms the foundation of the Connected Industries of tomorrow. The leading trade fair for Smart Production Solutions, SPS, will reopen its doors for a three-day physical event focusing on key technologies and trends in the industrial automation industry. In line with this year's theme 'Bringing automation to life', the CLPA will emphasise the role of open industrial networks in making effective digital manufacturing a reality. The organisation will highlight how convergent network architectures are a must to support Industry 4.0 and realise truly futureproof operations. As a leader in the industrial communications industry, the CLPA has developed an open industrial Ethernet that was the first to offer gigabit bandwidth and TSN functions, CC-Link IE TSN, to address these requirements.



Altus Introduces the Industry to the Benefits of Laser Depaneling

Laser cutting is one of the most innovative and advanced methods for separating PCBs today and is changing the way electronics components are being manufactured. Although relatively new to the UK and Ireland, Altus Group, a leading distributor of capital equipment, has been introducing LPKF's systems to the electronics industry and is seeing growing interest in the process. With traditional depaneling methods, assembled PCBs are cut out of the panel using a mechanical separation process. The laser depaneling process from LPKF, however, uses a focused laser beam that ablates the material layer by layer. This offers several advantages over conventional mechanical cutting processes including stress-free processing, high quality edge quality and design and flexibility freedom. These are important factors in electronics manufacturing as assemblies become smaller and more complex to produce, and increasingly cost and labour intensive.



ABB's Robot Podcast is back for Season Three, Exploring the Role of Robotics in Driving Sustainability

With seasons one and two ranking in the top five per cent of all podcasts globally in terms of listenership, The Robot Podcast from ABB returns for Season Three. Continuing to explore the world of robotics and automation in-depth, the series focuses on their benefits to society, industry and the environment. The new season kicks off with Episode One on October 5th and looks at how robotics and automation is making production and processes more sustainable. From food production and takeaway packaging, to construction and retail – robots are already making a big difference and have the potential to do even more in the transformative decade to come. Each of the five episodes will focus on a particular theme, with a panel of experts and commentators discussing the role of robotics in making production and processes safer, more efficient and more sustainable. Fran Scott, a regular contributor to the BBC and Channel 4 in the UK, returns as host.



European e-mobility Specialist QUANTRON Expands to North America

Quantron AG offers innovative mobility solutions for environmentally friendly goods and passenger transport. The Augsburg-based company not only supplies numerous European customers with battery- and hydrogen-electric commercial vehicles for the long-term reduction of CO2 emissions, but also offers a 360° product & solution ecosystem around zero-emission mobility with Quantron-as-a-service. QUANTRON will now implement this business model in the U.S., along with plans to develop new commercial vehicle designs with BEV and FCEV powertrains. Several inquiries from US fleet operators about these new technologies have supported the decision to expand into North America.



Entec rolls out Project Fulcrum for Diageo in Australia

UK based MRO procurement and supply chain specialist Entec International has secured a three-year contract with alcoholic beverages giant Diageo to roll out its 'Project Fulcrum' service in Australia, following a successful implementation programme across Africa. Project Fulcrum is Entec's 3PMRO business model, which optimises MRO procurement, streamlines the global supply chain and right sizes spares inventory to support both demand and planned maintenance. Project Fulcrum saves costs, reduces carbon footprint, drives out administrative complexity, and returns cash to client businesses. As part of Project Fulcrum in Australia, a dedicated Entec team will also be embedded on site at Diageo's Huntingwood factory to manage the MRO processes. Entec's Chris Cullen is responsible for the global roll-out of Project Fulcrum; he says that the company is targeting significant savings for Diageo during the life of the contract.





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Shaping the sound of future mobility

At the China Automotive Engineering Research Institute (CAERI), NVH testing now plays a major role in fostering the evolution of cars throughout China and beyond. CAERI operates various advanced facilities where its engineers use measurement technologies from Kistler for NVH tests on vehicles and their components.

Surveys of the growing Chinese automobile market show that both consumers and manufacturers are demanding quieter and more comfortable vehicles, a trend that is gaining more momentum now that electric and hybrid vehicle sales achieve breakthrough growth. By eliminating the noise from combustion engines, electric vehicles create a much quieter environment, however, this also makes noise and vibration from other sources more noticeable, even to the point of causing annoyance. China has made impressive progress with NVH (Noise, Vibration and Harshness) testing in recent years, and CAERI is one of the key drivers of this successful development.

Headquartered in Chongqing, the China Automotive Engineering Research Institute (CAERI) is a publicly listed R&D center that numbers among the technology leaders of China's automotive industry. Ever since it was founded in the 1960s, CAERI has focused on vehicle R&D,



The China Automotive Engineering Research Institute (CAERI), a leading R&D institute for NVH testing, is driving China's automotive technology ahead with the help of sensors, data acquisition and software from Kistler.

testing, and quality inspection: to date, the institute has developed more than 300 vehicle models, 30 engine types and 80 new materi-

als or processes, as well as drafting over 300 national industry standards. CAERI's State Key Laboratory of Vehicle NVH and Safety Center, established in 2010, is China's highest-level NVH research facility: activities here include testing, verification and development of solutions for vehicles, systems and components covering both software and hardware.

AT THE FOREFRONT OF NVH RESEARCH AND DEVELOPMENT IN CHINA

CAERI's NVH testing facilities support diverse test scenarios with precisely defined operating conditions:

- A semi-anechoic chamber with low-noise four-wheel drive drums suitable for vehicle NVH testing and simulation
- A fully anechoic chamber (sound absorption: >0.99, background noise: 13 dBA) for sound pressure and sound power testing of components, and calibration of acoustic materials and instruments
- A reverberation chamber with a long reverberation time for sound fields from 1,500 to 4,000 Hz – used to test vehicle sound deadening, and for noise testing and absorption coefficient testing of interior materials
- A five-shaft electric powertrain laboratory for new energy powertrains (such as motors, electric drive assemblies, transmissions, and electric drive axles)
- An electromagnetic road testing laboratory that simulates road temperature, illumination, humidity and durability scenarios

Cutting-edge measurement technology drives advanced NVH testing

"With the support of our State Key Laboratory and the Chongqing Research Center of Vehicle NVH Engineering and Technology, we've developed new technologies for NVH, fatigue and durability testing in China," says Dr. Li Peiran, Deputy Director of the CAERI Automotive Engineering Technology Center and Director of the CAERI NVH Technology Center. Dr. Li has led CAERI's NVH research for over 10 years: this senior engineer and his





CAERI's state-of-the-art laboratories for NVH testing are equipped with specialized measurement technology from Kistler.



Advanced accelerometers and DAQ systems from Kistler help CAERI perform holistic NVH tests, optimize vehicles and define new industry standards in China.

team rely on dynamic measurement technology from Kistler. "We collaborate closely with Kistler to help our customers identify and address technical problems, enabling them to optimize their products."

What makes NVH engineering so special? And what resources are necessary for success in this field? Among the key factors here are the new scenarios created by electric and hybrid vehicles, such as changes in design logic or the use of two different powertrain systems: these have presented NVH test engineers with some major challenges. Wu Yong, an NVH engineer at CAERI who specializes in performance optimization and noise cancelling, explains: "Vehicle NVH testing is much more complicated than most other processes. First: the constantly changing state of a vehicle during starting, driving and braking makes it an unstable and complex system. That's why huge amounts of data are required to identify the sources and triggers of certain symptoms. And second: source identification is not the end of the process. To determine the transmission medium or receiving ends, we have to understand the vehicle's inner working mechanism – and that calls for a great deal of testing, as well as multi-factor analyses."

Accurately measuring vehicle and powertrain NVH

With the help of accelerometers from Kistler, the NVH engineers at CAERI are able to attain a new level of NVH optimization. Typical scenarios include steering vibration testing, thermal management system vibration testing, and further analyses at vehicle and component levels. One of the principal products



An 8763B accelerometer from Kistler is mounted on a steering wheel for NVH testing at the China Automotive Engineering Research Institute (CAERI) in Chongqing.

used for NVH testing at CAERI is the 8763B triaxial IEPE accelerometer from Kistler. This ultra-compact, lightweight and robust cube accelerometer with an edge length of only 10.9 mm (0.43 in) includes three threaded holes for enhanced efficiency and flexibility during the mounting phase and when selecting the orientation.

For electric powertrain testing, the 8763B is available with multiple measuring ranges (from 50 g to 2,000 g); it features a wide usable frequency response (up to 15 kHz±10%) combined with high immunity to electromagnetic fields. Last but not least: small vibrations that are typical of electric motors can now be captured even more accurately, because further product refinements have been introduced to significantly reduce the noise threshold compared to the previous version of the product. As an added benefit for CAERI's NVH engineers, all Kistler sensors can be easily operated with different kinds of data ac-

quisition software, with almost no extra time needed to spend for preparation.

Reliable development partnership fosters innovation

CAERI's advanced NVH testing facilities – equipped with state-of-the-art measurement technology from Kistler – enable numerous customers to develop and improve their vehicles: examples include ChangAn Auto, BAIC Motor, Dongfeng Motor and BYD. The final words from Dr. Li: "Over the years, we have contributed several cutting-edge NVH technologies to the industry, and we've helped various automakers to develop high-quality vehicles." Many of the best-selling models in the Chinese market and beyond would have been impossible without CAERI's R&D work, and the Institute is sure to continue placing its trust in Kistler technology going forward.

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Ecological Transition: Why Priority Must be Given to European Reindustrialization

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.

On 18th May 2022, the European Commission presented its "RePowerEU" plan to the press. A 300 billion Euro plan to develop the European Union's energy autonomy by making it less dependent on Russian fossil fuel imports and by promoting the generation of renewable energy. Energy autonomy is evidently a major strategic and ecological issue. But it will only be entirely successful if Europe can reindustrialize at the same time.

A strategic and ecological necessity

While the RePowerEU plan is an immediate response to the crisis in Ukraine and the resulting upheaval in the energy market, it is also part of a longer-term effort driven by climate and the need for coordination between EU countries. How can the European Union achieve its greenhouse gas emission reduction objectives without directly controlling its own energy production and reducing its consumption of imported fossil fuels? As such, the strategic and ecological interests of Member States are largely aligned. A joint plan was therefore drawn up quickly to put in place ambitious measures: boost biomethane production capacity, diversify suppliers outside the EU, approve the first hydro-

gen production projects, joint purchase of gas and hydrogen by the EU's energy platform, etc.

Not forgetting industrial autonomy

This particularly ambitious plan is definitely good news both for Europeans affected by energy inflation and for the climate. But in order to fully succeed ecologically, energy autonomy is not enough: relative industrial independence is also vital. Indeed, one third of the European Union's carbon footprint is due to imports. How can the European economy be decarbonized while remaining dependent on exporting countries whose climate policy remains unclear?

A matter not just of resilience

Since the start of the COVID-19 pandemic, the issue of European reindustrialization has been raised by several political and economic institutions. It was considered a factor of resilience against health crises and their disastrous consequences on supply chains. In the age of Industry 4.0 however, relocating industry is also an ecological issue of the utmost importance. Europe has the opportunity to develop its own production plant that is efficient, flexible, resilient and, above all, energy efficient.



Olivier Helterlin, VP Sales - France Benelux and Switzerland & CEO PTC France

In this context, any effort towards greater European industrial autonomy does not just mean freedom from exporting countries, particularly in Asia, but also represents an important step towards ecological transition and the decarbonization of the economy. In some sectors affected by shortages, as seen for semiconductors, these efforts could bear fruit in the short term. In February 2022, the European Commission put forward a proposal to reduce the dependence of member states in this field: 90 to 100 billion euros would be invested by 2030. This initiative aligns economic, strategic and ecological interests, and should now be rolled out to other industrial sectors to ensure that the industry of the future serves ecological transition.

Olivier Helterlin, VP Sales - France Benelux and Switzerland & CEO PTC France

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FIBRE OPTIC PYROMETER

Able to measure targets as low as 100°C and up to 2,000°C



This new high-performance pyrometer from **Calex** enables temperature measurements in the most challenging applications. With a broad choice of temperature ranges, it is now possible to measure targets as

low as 100°C and up to 2,000°C, covering a huge range of applications. Three options for measurement wavelength ensure available options for the most demanding applications as for more limited budgets. With a response time of just 1 millisecond on the analogue output the FibreCube fast enough for almost any purpose. The sensor allows the smallest-ever areas to be measured. Standard optics provide spot sizes as small as 0.4 mm for close-up targets, and other options allow small targets to be measured at longer distances (for example 6 mm at 1 m distance). Ambient temperatures up to 150°C are no problem. The FibreCube's miniature sensing head withstands high-temperature applications with no cooling necessary. It contains no electronics, and may be positioned in strong electromagnetic fields. Installation made easy: the sensor body and head can be detached from the fibre optic cable and the output cable via connectors, to allow them to be fitted easily along cable runs and through conduits. The length of the fibre optic cable may be customised on ordering, with lengths of 1 m to 28 m available depending on the model. A built-in LED aiming light is included as standard on all models.

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4K+ SMART 3D LASER LINE PROFILERS

For measurement of microscopic features and large parts



LMI Technologies announced the official release of its new Gocator® 2600 Series of 4K+ resolution smart 3D laser line profile sensors. These factory pre-calibrated sensors come equipped with custom optics and a powerful 9-megapixel imager to deliver 4200 data

points per profile for high-resolution 3D scanning and inspection across wide fields of view--in applications such as battery inspection, food processing (e.g. baked goods production), building materials (e.g. furniture, doors and windows, planks, sheet metal), automotive (e.g. air spring and wheel inspection), rubber and tire production, and general factory automation. The Gocator 2600 features a 9-megapixel imager, 4200 data points per profile for high-resolution measurement, X resolutions up to 0.018 mm (at 71 mm) FOV) and fields of view up to 2 m (at 0.55 mm X-resolution). It has on-sensor measurement tools and I/O connectivity, with native multi-sensor alignment and networking support. "The Gocator 2600 series adds landmark 4K+ laser profiling to our field-tested, robust, and reliable 3D smart sensor product lineup. At 4200 data points per profile, customers can now solve for the most challenging microscopic features or choose to leverage the 2600's wider field of view models for 3D scanning and inspection across a multitude of large conveyor applications", said Mark Radford, CEO, LMI Technologies.

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TPI 300-M	300W	Encased	12, 15, 24, 36, 48, 53VDC	4.6"×2.44"×2.32"
TPP 300A-M	300W	Open frame	12, 15, 24, 36, 48, 53VDC	4"×2"×1.3"
TPP 300-M	300W	Encased	12, 15, 24, 36, 48, 53VDC	4.6"×2.44"×2.32"

Multiturn Position Sensor Provides True Power-On Capabilities with Zero Power

This article outlines the current methods used to enable true power-on (TPO) multiturn sensing capabilities and introduces a new simplified solution that will enable designers to replace bulky and expensive incumbent solutions.

Position sensors and encoders are ubiquitous in automotive and industrial applications where it is vital that the position of the system is known at all times. However, incumbent position sensors and encoders can only provide a single turn or 360° TPO position information. Systems that require TPO position information over multiple rotations or wider measurement range typically incorporate a backup power supply to track and memorize the multiple rotations of the single turn sensor after an unexpected loss of power, or to track multiple turn movement during key-off or power-down. Alternatively, a gear reduction mechanism can be added to the system to reduce the multiple rotations to a single turn, and in combination with a single turn sensor, to find TPO multiturn position information. These solutions are expensive and bulky, and, in the case of the battery backup system, a regular maintenance contract is required.

Rotary and linear encoders are key devices used in applications where the system designer needs to ensure that the position of a mechanical system is always known for closed-loop control, even after a loss of power either as part of the normal operating cycle or accidental. The challenge for system designers is to ensure that the TPO position is available even after a loss of power. If the system state is lost, then a lengthy and often complex procedure is required to reset the system into a known state.

Incumbent Solutions

Modern factories are becoming more dependent on robots and cobots to reduce cycle times, increase factory throughput, and improve efficiency. One of the major costs and inefficiencies associated with standard robots, cobots, and other automated assembly equipment is the resulting downtime required for rehomeing and initializing power-up following a sudden loss of power while operating. This resulting downtime and productivity loss are both costly and inefficient. Although this issue can be solved with backup batteries, memory, and single turn sensors, these solutions have their limitations. Battery packs have a limited life span, and maintenance/service contracts are required to manage the battery replacement. In certain environments, where there is a risk of explosion, the maximum energy that can be stored in the battery pack is limited. The reduction in energy storage leads to a shorter maintenance cycle where the batteries must be replaced more frequently.



An alternative to battery backup is the use of Wiegand wire energy harvesting modules. These modules make use of a specially treated wire where the magnetic coercivity of the outer shell is much higher than the coercivity of the inner core. The different coercivities create voltage spikes at the device output when a magnetic field is rotated. The spikes can be used to power external circuitry and record the number of turns in a ferroelectric random-access memory (FRAM). The magnetic multiturn memory that has been developed by Analog Devices requires no external power to record the number of rotations of an external magnetic field. This leads to a reduced system size and cost.

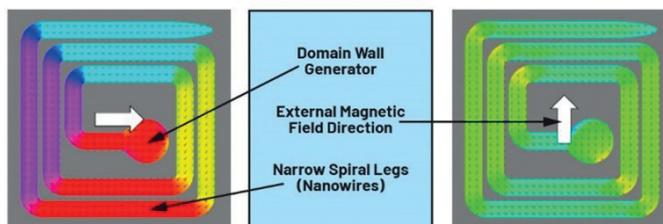


Figure 1. The multiturn principle of the operation.



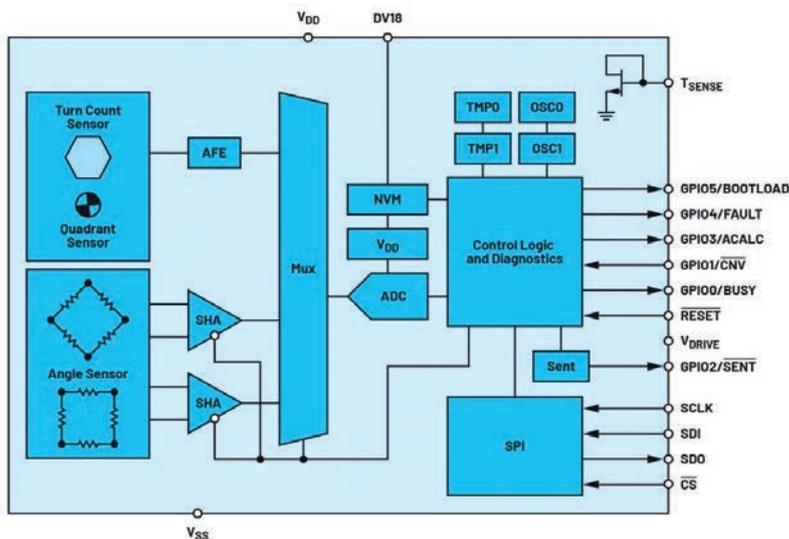


Figure 2. The ADMT4000 multiturn sensor block diagram.

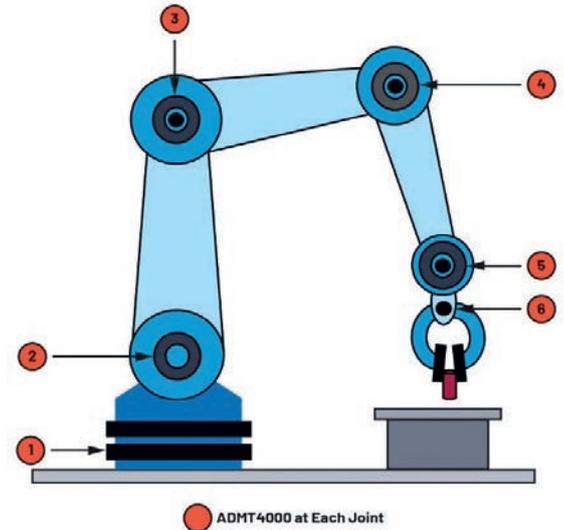


Figure 4. The ADMT4000 in a robot/cobot application.

Multiturn Sensor Technology

At the core of the magnetic multiturn sensor is a spiral of giant magnetoresistance (GMR) material made up of multiple nanowires of GMR elements. The operating principle of the sensor is based on shape anisotropy and the generation of domain walls in a domain wall generator in the presence of an external magnetic field. As the external magnetic field rotates, the domain walls propagate through the narrow spiral tracks (nanowires) attached to the domain wall generator, as shown in *Figure 1*.

As the domain walls move through the spiral leg structures, the state of each spiral leg element changes. Since the elements are fabricated from GMR material, the state of each one can be determined by measuring their resistance. The sensor relies only on the external magnetic field, and no additional backup power or energy harvesting technique is needed for the turn counting operation. When power is reapplied to the sensor, a reading of the turn count state is available with no further user actions or system resetting required.

A Combined Technology Solution that Simplifies System Design

The top-level block diagram of the ADMT4000, shown in *Figure 2*, combines the earlier described GMR multiturn sensor with a highly accurate AMR angle sensor and integrated signal conditioning IC to provide a solution that is capable of recording 46 turns or 16,560° of movement with a typical accuracy of $\pm 0.25^\circ$. The integrated signal conditioning IC enables further system enhancements to support harmonic calibration, which can remove errors due to magnetic and mechanical tolerances from the application. The ADMT4000 provides absolute 46 turn (0° to 16,560°) digital output via an SPI or SENT interface. The ADMT4000 is positioned opposite a dipole magnet

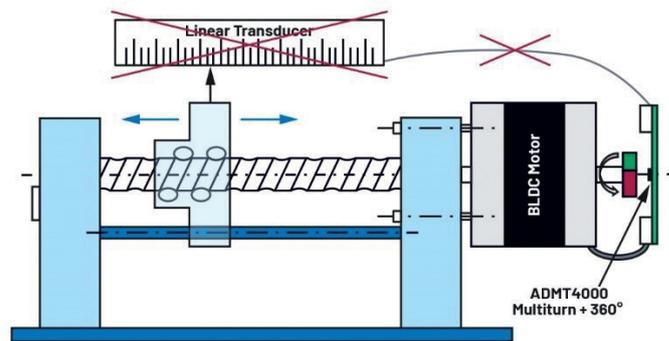


Figure 5. The ADMT4000 in a rotary to linear actuator application.

mounted to the rotating shaft.

ADI is preparing a magnetic reference design that will enable users with little or no magnetic design capability to easily adopt the ADMT4000 in their application. In addition to the core magnet design, this reference design will also provide immunity and robustness to stray magnetic fields, which will allow customers to implement the sensor in harsh environments. Stray fields can be generated from many sources where currents are carried in a wire, in particular, when used in close proximity to electric motors or actuators.

ADMT4000 capabilities are valuable in many industrial applications including robot and cobot arm joint position tracking in the event of a power outage or during power-down (*see Figure 3*). Other industrial applications include the absolute and TPO tracking of x-y tables in industrial automation, machine tools or medical equipment applica-



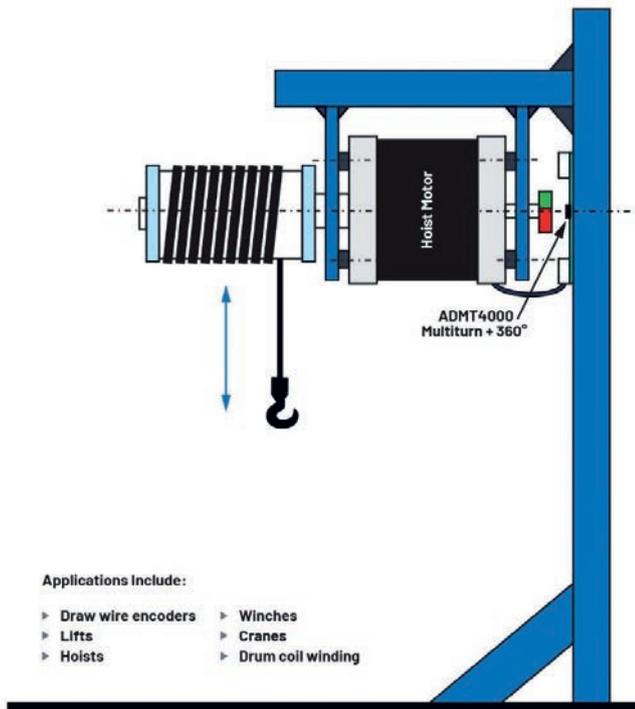
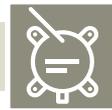


Figure 6. Wire draw encoder applications.

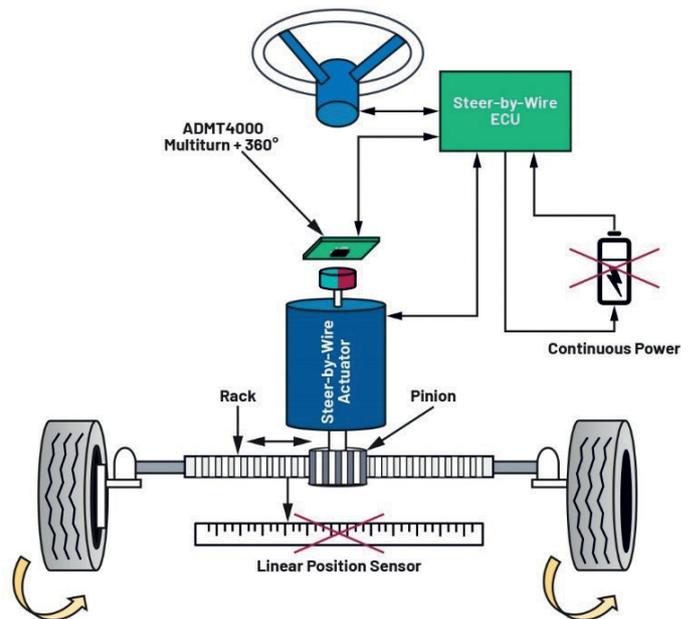


Figure 7. A steer-by-wire application.

tions (shown in Figure 4). Other rotary to linear applications include, but are not limited to the turn counting of coils, drums, spools, reels, hoists, winches, and lifts (Figure 5) when powered or movement tracking when powered down or during power outages. Additionally, TPO position sensing provided by the ADMT4000 is of significant value for automotive applications including, but not limited to, transmission actuators (Figure 4), electrical power steering (EPS) including steer-by-wire (Figure 6), parking lock actuators, other general-purpose actuators, and seat belt retractors (Figure 7). The size, cost, and operating temperature range of the ADMT4000 enable its use in a wide range of applications including safety critical applications in the automotive and industrial space. Automotive safety critical applications are compliant to the ISO 26262 standard and a particular automotive safety integrity level (ASIL). The ADMT4000 will be supplied as either ASIL-QM or ASIL-B(D) to suit applications that do and don't need the advanced ASIL or SIL functionality.

Conclusion

The ADMT4000 and the first integrated TPO multiturn position sensor are set to significantly reduce system design complexity and effort, ultimately resulting in smaller, lighter, and lower cost solutions. The ease of use of the ADMT4000 will enable designers with and without magnetic design capability to add new and improved functionality to current applications and open the door to many new applications.



Figure 8. A seat belt retractor application.

To find out more about the ADMT4000 and the magnetic reference design, please contact your local ADI sales team who will be happy to discuss your requirements and applications or visit analog.com/magnetics.

Stephen Bradshaw, Product Applications Engineer,
Christian Nau, Product Marketing Manager, and
Enda Nicholl, Strategic Marketing Manager, Analog Devices



From Massive IoT to the Smart Environment – LoRa®-enabled IoT network connects it all

Our world is an increasingly interconnected place. The only way we can influence the complex systems surrounding us is to know what they are doing and how they are reacting to the stresses we put on them.

To do this we need data: how to obtain the amount of data required and what to do with it when it has been captured?

The global economy, worldwide transport and energy links, the natural world, weather, and climate are all linked across a web of complex systems. Consumer choices of which products to use cause companies to make buying and transport decisions that affect the planet and its climate. This in turn affects the planet's capacity to provide the resources that ensure we can all live a good, safe life.

The only way we can influence these complex systems, to keep them in balance and preserve their characteristics, is to know what they are doing and how they are reacting to the stresses we put on them. To do this we need data - and lots of it, but the question is how to obtain the amount of data required and what to do with it when it has been captured?

The answer lies with the advent of the Internet of Things (IoT) over the last few years, and in

particular massive IoT, where thousands or even millions of sensors capture and transmit small amounts of data. This means we now have the chance to capture more data than ever before, helping us discover what natural systems are doing and how human actions are affecting them.

The biggest challenge remains how we collect masses of IoT sensor data, not just from static elements but from systems where conditions might be constantly changing, and where the data of interest is generated in widely distributed areas, perhaps many kilometres from human populations.

These sensors need to be connected quickly and cheaply, over long ranges, using a method that is easy to install, requires little to no maintenance and is easily able to link to the Cloud to allow data analytics and which can use onboard

power to avoid the expense of wired connections to the power grid.

The answer to these challenges is LoRa®, the Long Range Low Power technology that is making it cheaper and more convenient than ever before to connect up the whole planet. LoRa® underpins a large number of IoT networks across the globe, used by 163 network operators with nearly three million gateways.

With a range of up to 15km, a battery life measured in years, penetration both indoors and deep underground, LoRa® is a cost-effective method of covering large areas in both cities and rural or wilderness areas.

The possibilities the use of LoRa® provides are magnified by the use of satellite links – using a satellite in geosynchronous orbit, data can be exchanged across continental distances, giving us many more options to receive data from dis-



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parate regions and assess how environmental and human factors affect each other.

Cities get smarter to remain sustainable

Making urban life sustainable for the growing populations of cities is a major imperative, one made easier by the timely collection and analysis of IoT data. Today's 'Smart Cities' are already using widespread data-driven technologies to help monitor and manage everything they need to function, from traffic and power requirements to utilities and waste.

Sensors placed to detect where traffic is busiest at certain times of day helps the smart city programme traffic lights, for example, and take oth-

er measures to discourage vehicles idling with their engines running and causing air pollution. The portability of sensors using LoRa® means they can be moved to account for changes in traffic patterns. Beyond this, using satellite links holds out the prospect of turning a collection of smart cities into a smart country, which monitors not just urban issues, but the natural and man-made environment in the countryside beyond.

Data down to the last drop

One of the major challenges faced by water utilities is the need to manage water supplies effectively and efficiently, to prevent loss and the extra expense, dosing chemicals and en-

ergy needed to replace this lost water. Sensors on components such as valves, flow meters or water analysis sensors, linked by satellite, make it easier to access data originating from remote areas, underground sites or in places that pose a risk to installers.

A major use of LoRa® is as a connectivity method for smart meters in homes, ensuring utilities can meet demand at various times of the day while keeping water pressures at levels that will prevent damage to pipes. Damaged pipes are a major source of leaks and connected devices are helping in the fight against this non-revenue water. Many companies are now using LoRa® to detect water leaks with acoustic sensors, while also using LoRa® based sensors to help monitor water quality parameters including conductivity, chlorine content and dissolved oxygen. Power distribution is another essential aspect of modern life and electricity must be distributed safely and efficiently. The key challenge is that installing smart meters in homes requires a reliable, secure backhaul that is not reliant on existing infrastructure.

A green and pleasant land

We may not think of farming as particularly 'high-tech', but here too, LoRa®-enabled IoT devices are bringing great benefits. The health of soil, crops and livestock is of immense importance to farmers and IoT technologies can help them keep track of these vital parameters over thousands of square hectares. Linking them over a satellite extends the range hugely and means

SMART CITIES

When we think of Smart Cities we may picture huge urban conglomerations, yet the concept can be adopted by even the smallest communities. As a town of only 9,700 residents, SaintGrégoire in France has installed its own IoT network based on LoRa®. The network will help the community reduce the energy consumption of buildings by 20 percent, cut its CO2 emissions and allow residents to make more convenient use of the city's services. Gateways across the city receive and route data from 150 parking-spot sensors and 68 energy-use sensors.





that sensors always remain in line of sight. For example, a cow's vital signs and location can be monitored, with alerts sent when any abnormalities are detected, or if animals stray into locations they should not be in. Soil conditions like nutrient levels and moisture are also being increasingly monitored. By using connected sensors, farmers could increase yields, improve the efficiency of water and fertilizer, and make their farming practices more sustainable. One vendor offering solutions to the agricultural industry is Communicate2Integrate, a German company which has chosen LoRa® connectivity for its Florja solution. This is a Cloud-based plant management platform that allows users to monitor the status of their plants from anywhere. With satellite links, huge plantations could be monitored easily using such a platform.

Keeping a weather eye on nature
Monitoring the environment also extends to the wilder side of nature. Eventually, large parts of the Earth's coasts, mountains, forests, and tectonic plates will be monitored for changes that could indicate a trend or a possible cataclysmic event. IoT devices are set to monitor and predict everything, from the quality of air and soil to develop better farming practices, to the likelihood of devastating floods and forest fires. For example, using smart environment technologies, it will be possible to track the kind of seismic activity that precedes an earthquake, building up a cache of data to identify patterns that can help predict future events. With more data, more patterns emerge, allowing scientists and planners to see where disas-

ters are likely to occur and the probable effects, giving time to put measures in place or even avoid the incident entirely. The world is a diverse and changing place - keeping it habitable and ensuring people are safe requires a huge amount of knowledge, based on data that is captured from a wide range of sources in many different environments. The flexibility and ease of use of LoRa®, combined with the ultra-long range 'anywhere access' of satellite systems, means we have a better chance than ever of capturing more of that data and ensuring we use it to build a greener, safer world.

*Telemaco Melia, VP and General Manager
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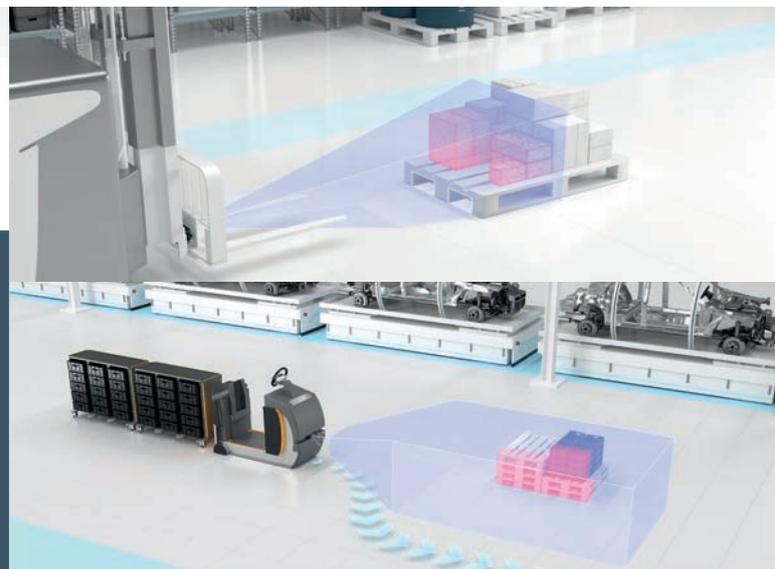
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What is MES & Why Should Manufacturers Invest in it?

Mike Bradford, Strategic Business Development Director at DELMIA, gives us an in depth review of what MES is, why it's essential for manufacturers and the key differences between manufacturing operations management (MOM) and MES.

3DS DELMIA (part of the Dassault Systèmes Group). A manufacturing execution system, often referred to as MES, has quickly become a staple within many businesses around the globe. Offering manufacturers a dynamic software solution that is capable of monitoring, tracking, controlling and documenting manufactured products throughout production; MES provides key decision-makers with all of the information they require to implement efficiency driven changes to their operations.

Whilst MES has established itself with some of the major manufacturers, there's still a large number of businesses that could stand to benefit from the solution but simply don't have enough understanding about the tangible benefits it can bring to their operation.

What is the difference between MOM & MES?

First, it's important to differentiate between MES and MOM, as a lot of people within the industry use the terms interchangeably despite them not being the same thing. In fact, MES is actually a component of a wider MOM system, and they work hand in hand to give manufacturers capabilities that cross their entire operation

MES is primarily focused on production, so it will integrate into your equipment and give you visibility into machine status, highlight the operator work instructions whilst also tracking time for production. It also provides businesses with a full report on production and can identify any errors with the machine and workflow, essentially giving your business all of the information that is required to make quicker fixes to issues that arise.

In terms of a wider MOM solution, this will

look at the work instructions, link to machinery and the top equipment on the shop floor production. But the main differentiator comes where a MOM solution will also provide capabilities and visibility in other key functionality like quality, maintenance and materials / warehouse. You can integrate quality control, material synchronization and maintenance planning & execution into your overall manufacturing process, so that your line side quality, material supply and maintenance activities are part of your production process within your MOM solution. It doesn't require separate systems, separate reporting, or separate tracking.

Why Invest in MES?

Whilst there is plenty of awareness about the benefits of MOM for manufacturers, the

same can't be said of MES as there are still many within the sector who aren't totally sure what it brings to the table. When it comes to investing in MES, the most important thing to note is just how much value it can bring to your business, especially when helping reduce lead times.

It also plays a role in reducing the overall inventory required, as businesses won't need any 'just-in-case' inventory as a MES will ensure accurate inventory records are maintained. This will ensure manufacturers are able to stock as much as they require, with no surplus. DELMIA implemented a MES solution for Cummins, a farm equipment manufacturer and were able to reduce their inventories by \$36 million by simply having an effective MES inventory solution in place to reduce waste. Alongside this, throughput





was increased by 25% due to real-time reporting and the greater visibility afforded to the company by the Apriso production MES that was provided. In a separate case study, DELMIA's MES managed to save an aerospace company \$4 million each year by reducing overall scrap waste.

Many manufacturers will see quality and throughput improvements simultaneously when MES is in place, which can remove huge bottlenecks in the production process. Most businesses will add quality gates during the manufacturing process to ensure the quality of each product is as high as possible, this inevitably slows overall throughput.

With MES integrated as part of the process, the quality control aspects of production can be streamlined and, in some cases, removed, further enhancing the overall efficiency and profitability of the business.

It's also worth noting that you can improve reporting because quite often in environments which are still utilising manual inputs they end up adding the production and scrap counts at a later date. In the manufacturing industry, it is widely accepted – and proven in detailed studies – that when inputting data on production statistics, there is anywhere between 85% - 90% data accuracy. The 10% - 15% variable on this can throw

overall production, inventory and scrap figures out by a long way, which inevitably leads to more costs in the long run. Incorporating MES into production is a sure way to improve overall reporting and remove outdated and time-consuming manual data input, which is sure to save any manufacturing business money over time.

In summary, there's real value at every step of that process by rolling out an all-encompassing MOM solution. When pairing your MES solution with true MOM, you're likely to see even more benefits and a vast reduction in inventory, waste, and overall inefficiencies. So, when it comes to the question "why invest?", the simple answer is because there's real value in incorporating MES whether that be into an existing MOM solution or as a standalone product.

There is a value found typically in improvement, improved productivity, improved quality, including getting right first time through robust MES solutions, and all manufacturing firms should seriously consider the improved efficiencies and cost savings they can bring. Over time manufacturers can stand to save incredibly large sums through simply removing inefficiencies and ensuring that no surplus products are made. MES simply doesn't get as much attention as the far more established MOM solutions do, but in time professionals within the sector certainly will see the tangible benefits that MES brings.

Mike Bradford, Strategic Business Development Director at DELMIA (part of the Dassault Systèmes group)

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Traceability in Automotive: What Decision-makers and Experts Should Look Out for Now

State of the current traceability challenges and solutions in automotive production and what to consider

From e-mobility to autonomous driving, from skills shortages to digitalisation: The automotive industry is undergoing a profound change, marked, for example, by a shift to globalized platforms and standardized vehicle architectures. On the one hand, production is becoming increasingly efficient, but on the other, even a single faulty part can have more far-reaching effects than ever before. Faced with costly recalls, automotive manufacturers are confronted with increasingly complex requirements and stricter specifications. Is the effort of traceability worth it if it means labelling up to 20,000 parts per vehicle? Yes, it is, but powerful reading and verification technologies along with powerful software is needed to make sense of all the data.

There are several reasons why manufacturers need to keep accurate records of the parts and components that make up a new car. From a quality perspective, for example, barcode tracking helps to ensure that the right parts are put together. Even more important, however, is the ability to trace each car part back to its original supplier. In

the event of a recall or the discovery of a faulty part, manufacturers have to be able to quickly and comprehensively find out where each part came from. This is complemented by information such as batch number, date of manufacture and other important information to identify which vehicles are affected by a defective part. Recommendations and standards from AIAG, VDA, ANSI and ISO specify the details. As the automotive industry globalises, worldwide production of light vehicles is expected to reach around 96 million units by 2023. This means that even a single faulty part can have an enormous impact, and therefore must be prevented at all costs.

So why is traceability important?

Documenting the origin and history of parts is vital to ensure fast and cost-efficient recalls. If the origin of a part isn't completely documented, many more vehicles have to be recalled than necessary, increasing costs significantly. Additionally, traceability minimises counterfeiting because genuine parts can be traced back to





their origin. Another advantage of direct part identification, labels or RFID tags is that they streamline the manufacturing process itself, because real-time traceability systems transmit process information along all tiers of the manufacturing process enabling supply chain optimisation and reduced lead times. They monitor and compare production lines, providing the data needed to find out which production steps are taking longer than expected and the reasons why. Some large corporations already use global platforms for vehicle development based on a standardised architecture in a flexible manufacturing context so that millions of vehicles can use the same basic parts. By doing so, manufacturers spread the cost of manufacturing equipment and product development over a broader production base. The downside: a single faulty – or counterfeit – component can have a huge impact. Reliable traceability systems are therefore more important than ever before. The large supplier system created by the globally standardised architecture requires real-time visibility so that problems can be fixed quickly before they affect millions of new cars entering the market.

Compact barcode readers needed

Barcodes help guarantee that every part carries a unique identifier with it wherever it goes. This is usually a direct part marking (DPM), etched or printed directly on the part itself. Amongst the key pieces of data encoded for traceability purposes in the automotive industry are information such as part, serial, lot or model number. Other information that could be encoded in barcodes are source manufacturer, place of origin, production time and date, expiration date, manufacturing or assembly facility, components used in assembly and / or software version.

Whenever a code is read on the factory floor, the traceability system transmits that data to a manufacturing execution system (MES) or enterprise resource planning (ERP) software, helping to correctly bundle parts and control other elements of the production line in a data-driven manner. Traceability is used to label powertrain components with specific dimensions to ensure a perfect fit. Automation of

processes significantly reduces the likelihood of errors in this context. However, this is not always straightforward, as barcode or RFID readers need to be integrated into space-constrained assembly line machinery. It therefore makes sense to use particularly compact and

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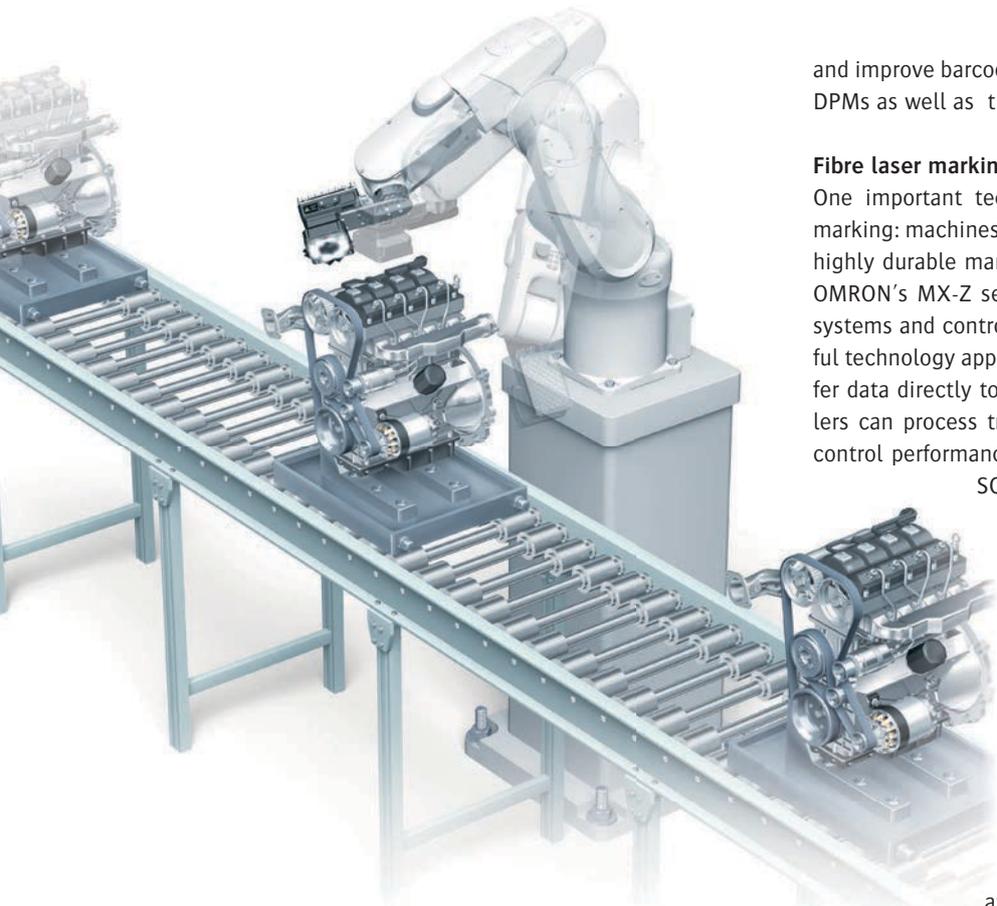


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space-saving barcode readers that are specifically designed for applications where readers have to be built into complex equipment. Furthermore, powerful readers should be able to read a wide range of codes without complex software installation and even if the code is distorted, fading or damaged.

To ensure that every part carries the required data, some barcodes need to be particularly small. As with damaged codes, tiny codes require high-performance barcode readers that can read data with the required speed and accuracy. As more and more markings are applied earlier in the manufacturing process, they are increasingly likely to be damaged in the harsh conditions of the factory. Exposure to heat, splashes or caustic industrial chemicals can damage barcodes – even if they have been applied using a permanent method such as laser marking. For this reason, it is important that barcodes have the highest level of readability from the start. To ensure that barcodes are of good quality and remain readable throughout the life of the part, manufacturers can set up a barcode verification system to evaluate them against international standards such as ISO/IEC 29158. Diagnostic tools in the verification software should also provide troubleshooting information to adjust the marking devices

and improve barcode quality. These barcode verifiers can be used for DPMs as well as traditional labels.

Fibre laser marking and embedded SQL clients

One important technology for reliable traceability is fibre laser marking: machines that can apply exceptionally high-resolution and highly durable marks to a wide range of materials. In this context, OMRON's MX-Z series is particularly easy to integrate with other systems and controls, making marking more flexible. Another helpful technology approach is embedded SQL- or MQTT clients to transfer data directly to an SQL database or another system, so controllers can process traceability data without compromising machine control performance. Compared to the traditional method of using

SCADA for data collection, logging via SQL has a much smaller impact on machine cycle time and can increase productivity by up to ten percent.

Conclusion: Traceability integral part of modern production

Traceability systems provide a way to put process changes in context and analyze the effects they have on the quality of the resulting product. They help identify risks, reduce their impact, and generally maintain a state of constant vigilance. The more automated a traceability system is with real-time decision tracking, the better it is at analyzing the production process and rooting out problem steps. Although traceability may seem complex, its underlying structure is relatively simple. By affixing unique barcodes to works-in-progress and scanning these codes throughout the assembly process, manufacturers can gather and store significant amounts of data on the whereabouts and history of each item at each point in time.

Automotive manufacturers are currently facing a variety of pressing and complex challenges that require comprehensive and reliable documentation and traceability. Processing all the data generated by barcode scanning on a manufacturing line can dramatically lengthen production cycles unless manufacturers implement specific technologies that mitigate this problem. To be future-proof and competitive, companies therefore need powerful automation and robotics solutions paired with smart and integrated traceability solutions such as laser markers, barcode readers, barcode verifiers and controllers that can capture and analyse data without interfering with production.

Nico Hooiveld, Business Development Manager at OMRON Europe

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When World-leading Pharmaceutical Developer turns to TorqSense

TorqSense transducers are used to ensure caps are being properly fitted to pharmaceutical bottles in a high-speed packaging line run by the Almac Group at its global headquarters in Craigavon, Northern Ireland, UK.

The Almac Group is a pharmaceutical and biotech development and manufacturing organisation. The company now has operations around the world and has just announced a major investment plan for new facilities at Dundalk, Ireland. Strict international rules apply to the manufacture and packaging of pharmaceutical products and require that the correct environment is maintained within the bottle following capping. To this end, Regulation USP 671 provides a guide to the torque range to be used for screw type containers with varying closure diameters. By ensuring that bottle caps are successfully applied to the bottles within the required torque tolerances, the integrity of the product can be maintained.

Sensor Technology Ltd, which makes TorqSense, has worked with many OEMs to develop high precision, high speed capping machines for use in pharmaceutical plants and a range of other applications. One of these, Cap Coder, an Oxfordshire neighbour of Sensor Technology, incorporates TorqSense units in its CC1440 and CC1440T Bench top Cap Coder machines, both of which are used by the Almac Group.

TorqSense is wireless in that it does not need to physically contact the bottle caps or shaft of the torque head it is monitoring. Instead, sensing is achieved through a radio frequency link.

“All you have to do is set up a TorqSense transducer in the capping machine and turn it on.” explains Mark Ingham of Sensor Technology. The Almac Group use a number of Cap Coder machines, both standard designs and purpose built at its global headquarters, some of which have been in service for five years. When in use, if a torque value outside the acceptable range is encountered, an alarm will trigger the capping machine to identify unacceptable product for immediate rejection.



Mark Ingham of Sensor Technology commented, “Fast and accurate torque measurement is becoming more and more important as all sectors of manufacturing automate their physical processes and also need to improve the recording of their production performance data. TorqSense is now used in many industries from automotive to materials handling, test and measurement, FMCG (fast moving consumer goods) production, power generation etc.”

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Overcoming the Challenges of PCBA Inspection

Ofer Nir, VP of Products & Marketing from Inspekto, explains how autonomous quality inspection can help in the electronics industry.

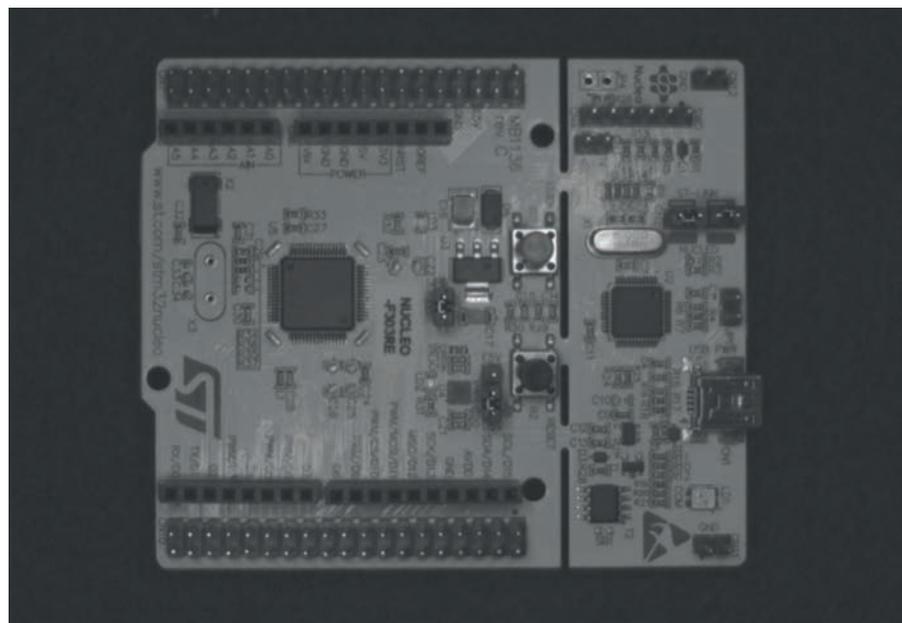
The ever-increasing development pace and diversity of electronic appliances means increasing production challenges in the area of printed circuit boards assembly (PCBA), a complex process that involves numerous component suppliers, sophisticated assembly machines and manual labour. In addition, the miniaturisation and growing complexity of printed circuit boards (PCBs) and the derived assembly work add to the complexity of this phase. This makes quality assurance (QA) of the PCBA an invaluable step of the manufacturing process, yet a very challenging one.

To quote Leonardo da Vinci, "Details make perfection, and perfection is not a detail." This is certainly true when it comes to the

manufacturing and quality inspection of PCBAs, where a slight deviation in assembly can produce a significant performance problem in the final product, and microscopic particles require a suitable verification mechanism.

Growing demand for consumer electronics, as well as smart connected devices in industry 4.0, are leading to considerable growth in the global PCB market, which is expected to reach USD 86.17 billion by 2026. The market has also become more demanding, requiring boards that are made with higher accuracy and precision during the manufacturing process.

The quality and reliability of PCBAs directly impacts the efficiency and cost of produc-



PCB as seen by the INSPEKTO S70. The image is completely free from reflection



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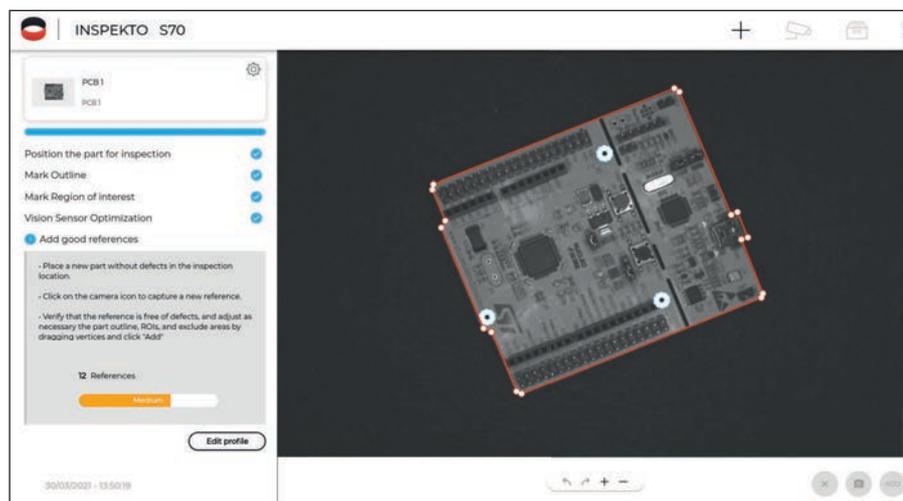
tion, as well as the functionality and reliability of end devices. In the highly competitive consumer electronics sector, in which production margins are key for survival, any decrease or increase in the production efficiency and cost has significant implications to the manufacturers. Reliability and performance are especially important in safety-critical sectors such as aerospace, automotive, defence and med-tech. For example, PCBs are a key component in the production of cochlear implants, pacemakers and medical imaging equipment, where precision could be a matter of life or death.

Over the past decades, PCB manufacturers have also striven to produce smaller, increasingly complex boards. The higher-density placement of smaller components makes the design, manufacturing and assembly processes even more challenging. For these reasons, quality assurance (QA) is essential to ensuring that the transition from PCB design to manufacturing is mistake-free.

The need for inspection reliability and agility

Because of the high complexity of modern PCBAs, which incorporate a huge number





PCB during the set up process. The system has seen 12 sample items and its knowledge of the item is medium

of hardly visible elements, manual inspection is not a reliable nor scalable QA method. Defects on tiny sub-components are difficult to see to begin with, and can become almost impossible to spot after an eight-hour shift. Moreover, even if inspectors manage to keep their focus unaltered throughout an entire shift, the amount of time needed to thoroughly examine a PCBA makes this method unviable.

For these reasons, automated visual quality inspection has long been sought-after to inspect PCBAs. Machine vision solutions have mitigated the core challenges of human inspectors — they are accurate, they do not tire, and they analyse huge amounts of small details. Machine vision seems ideal to detect common defects such as soldering errors, the absence or misplacement of key components and more.

However, traditional machine vision solutions struggle to keep up with PCB manufacturers' need for flexible, yet accurate, QA. These conventional solutions, when used, generally involve the commissioning, design and integration of a customised project that relies on the constant services of a systems

integrator or machine vision expert. The whole process can be extremely expensive and time-consuming, and the final solution will be fit to inspect only a specific type of PCBA. At best, these solutions can be a good fit for highly engineered, rigid assembly lines with extremely large production batches.

Moreover, another common attribute of PCBA lines is the constant change of the assembled module. In the current global supply-chain reality, components suppliers constantly change, and with them the appearance of the PCBA.

Given the dynamicity of the PCBA market - and its need for customisation, small-batch manufacturing and how frequently PCBA change - it's easy to see why the fixity of traditional machine vision discourages many manufacturers from transitioning to automated QA.

Autonomy is the answer

Autonomous Machine Vision (AMV) has been created to overcome the shortcomings of traditional machine vision systems in terms of cost, complexity and flexibility. Unlike tailored projects, AMV systems are off-the-shelf

products that come ready to inspect a wide variety of use cases. They can be deployed by the end-user without any expertise in machine vision or deep learning, and without the assistance of a systems integrator or machine vision expert. They only require a quick and easy set-up procedure and are ideal to inspect complex items such as PCBAs.

Users must simply present a PCBA to the system, trace the outline of the areas to inspect with a regular mouse, and then show the system a few sample items. In a short time, the system will be able to learn the gold standard for the PCBA.

Thanks to its proprietary artificial intelligence (AI) technology, AMV-AI™, the system will then be able to inspect items based on the tolerances and characteristics it self-learnt during the set-up procedure, to determine whether there are defects or assembly errors. There is no need for complex training, large amounts of data collection, or never-ending defects definition, annotation and labelling — these steps will be autonomously handled by the system's AI.

This definitely simplifies QA for PCBA manufacturers, who can be safe in the knowledge that defects are spotted reliably in even the most complex assembly lines. Moreover, the amount of scrapped parts is drastically reduced, as the system learns and optimises the checks, allowing immediate response in the production line. Another benefit is that the QA of small batches will no longer be a problem, since AMV doesn't require manufacturers to compromise between quality and customisation.

To compete on a global scale, PCBA manufacturers need to aim for nothing less than perfection. Autonomous QA can give manufacturers the competitive edge they need and ensure that PCBAs leave their facilities mistake-free — after all, as Leonardo da Vinci said, "Details make perfection."

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ELGi's AB Series Powers Production of Premium Italian Pizza, Cake, and Bread Flour at Polselli, in Italy

Certified Class '0', 100% oil-free compressed air supports the production and packaging of over 350 tonnes per day of 40 different types of flour meeting the company's needs for quality and reliability.

ELGi Compressors Europe, a subsidiary of ELGi Equipments Limited, one of the world's leading air compressor manufacturers, announced today that Polselli, one of the leading Italian flour millers, selected three state-of-the-art, water-injected AB Series screw air compressors of 45kW to support its entire pneumatic production and bagging requirements.

The AB45s provide unmatched air quality in line with the ISO8573-1 Class '0' oil-free air and ISO8573-Class 7 compliance norms, ensuring zero traces of microbial contaminants, high reliability, consistent air quality, and a low lifecycle cost.

HIGHER RELIABILITY and peace of mind with a comprehensive maintenance contract provided by ELGi's Channel Partner SOL.IM.I. including 24-hour response time guaranteed. Founded in Arce, in the province of Frosinone, south of Rome, in the first half of the twentieth century, from a small artisan beginning, Polselli today is a leading player in the quality milling sector in Italy and a leader in the production of flour for bread, cakes, and pizza. Guided for nearly a century by the entrepreneurial experience of a

family that has now reached its third generation, Polselli aims to meet consumers' needs with unique, natural, and innovative products exported all over Europe, North America and some countries in Asia. Installed in January 2022, the choice of three ELGi AB Series oil-free compressors (two AB45 fixed speed and one AB45V variable speed) is aligned with the company's goals to innovate and improve the environmental impact of its operations constantly.

Domenico Polselli, Owner of the third-generation family-owned flour millers, Polselli said, "The Polselli family's passion for wheat is based on quality, transparency, and reliability. These same principles guided our choice when upgrading our existing oil-lubricated compressors. We needed the highest quality of air, ensuring zero risk of oil contamination to meet our strict quality standards and an honest and trustworthy partner who assured ease of maintenance and the reliability of our compressed air systems. The latter is a critical factor when producing and bagging 40 different types of flour mixes, using around 22 varieties of grain and producing up to 350 tonnes per day. In the six months since installation, the units have per-



formed flawlessly, thanks to ELGi's quality and the service and support provided by SOL.IM.I., ELGi's Channel Partner."

Graziano Dal Tio, Regional Manager, ELGi Southern Europe, said, "ELGi's AB Series is a welcome disruption in oil-free compressed air technology, opening new possibilities for sensitive industrial applications where reliability, high air purity, and energy efficiency are crucial. We have been fortunate to work with Polselli, a company that demonstrates its innovative culture by considering the replacement of existing oil-lubricated compressors and systems, including filters, with the ELGi AB Series. In the last six months, the AB units have produced Class '0' certified, high-quality air, significantly reducing maintenance costs, enabling ease of use compared to prevailing oil-free technology, and lower lifecycle costs overall."

POLSELLI S.P.A. HAS SPECIFICALLY SELECTED THE ELGI AB SERIES ON ACCOUNT OF:

UNMATCHED CLASS '0' CERTIFIED AIR QUALITY: A no-compromise oil-free air solution, according to ISO8573-1 and ISO8573-7 and manufactured in an ISO22000 factory. With the IS:10500:2012 certification for condensate water quality, the AB Series guarantees the safest compressed air for sensitive industrial applications.

LOWER LIFECYCLE COST: efficient air end with best-in-class performance and optimal system configuration in single-stage operation.

LOWER MAINTENANCE COST: Enhanced life and performance of the compressor due to fewer moving parts at low operating speeds.

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THREE NEW DIN RAIL POWER SUPPLIES

For industrial applications



Established in Japan 1969, **COSEL** is one of the world's leading designers and manufacturers of high performance AC-DC Power Supplies, DC-DC Converters and EMI Filters, with a product range mostly aimed at

demanding applications within the Industrial, Factory Automation, Medical, Telecoms, Lighting, Audio/Broadcast & Renewable Energy sectors. The company announced the launch of three new DIN Rail AC/DC power supplies for industrial applications. Based on its long experience and expertise in developing high efficiency power conversion solutions for demanding industrial applications optimized for highly automated manufacturing, Cosel's design team has developed without compromise a new family, the WDA family that shortens Time-To-Market. In addition to its electrical performance, built on high runner components with very limited handling during manufacturing, the WDA series offers the best ratio of value vs performances on the market. Available in three power levels, 30W, 60W and 90W, combining a low profile design, a wide input voltage range of 85V - 264V, and high performance levels, the WDA series is suitable for a large range of applications. The WDA comes with a 5-Year warranty and complies with industrial standards.

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400W MEDICAL & ITE GRADE POWER ADAPTERS

With 480W/520W peak power capability



Tumbler Technologies + TRUMPower introduces its TMA400 desktop power adapter series. The power supplies have a touch current of less than 100µA at 264VAC, and withstand voltages of 4,000 VAC from input to output (2MOPP), 1,500 VAC from

input to ground (1MOPP), and 1,500 VAC from output to ground (1MOPP), allowing them to be used for BF rated applications. The series is certified to both the latest ITE and medical grade safety standards, making them extremely versatile for a multitude of applications. Adding to its versatility, the TMA400 series comes available with five single output voltages of 12V, 19V, 24V, 28V, and 48V. The power supplies have a profile of 8.74" (L) x 4.41" (W) x 1.77", are equipped with an IEC 320/C14 AC inlet, and have a standard 10-pin Molex Mini-Fit output connector. The TMA400 series has peak power capabilities of 480W at 115VAC or 520W at 230VAC for 3 seconds. The power adapters have a minimum efficiency of 87.5% at full load, 115VAC/230VAC and 92% at 80% of full load, 230VAC. The power adapters support operating altitudes up to 5,000 meters and operating temperatures between -20°C to +60°C ambient, while derating linearly from 100% load at +40°C to 50% load at +60°C. It has an MTBF of 230,000 hours-minimum at full load, 25°C ambient, calculated per Bellcore TR-332, making it a highly reliable power supply.

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Constant Force Springs for Carbon Brush Application

Ming Tai Industrial Co. manufactures both single coil type constant force springs and twin coil type constant force springs for carbon brush application. The catalog not only introduces main applications of spring in the carbon brush industries, including Commutator, Slip ring, Grounding, and Lightning protection; but also briefs how Ming Tai Industrial Co. provide customer with best design and highest quality manufacture service for constant force spring to meet your need for carbon brush application.

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FAST ASSEMBLY WINCH DRIVE SERIES

Comes in 5 sizes with up to 160,000 Newtonmeter



Bonfiglioli presents the new high performant 800 series which comes in 5 sizes from 25,000 to 160,000 Nm in marine-resistant paint, suitable for blast cleaning. Easy and fast assembly of the 800 series gearboxes into the winch drum is a key feature of

their design. Maintenance requirements are made as simple as possible, e.g. with an easy access to the brake, ready made brake replacement kits as well as easy access to oil filling, draining plugs, and oil level pipe/indicator. Thanks to a certified modular architecture the new 800 winch drive series is extremely flexible. Additional standard stages widen the available range of torque and speed. A broad spectrum of motor flanges allows the combination with preferred electric as well as hydraulic motors and right-angle stages allow space saving winch designs. Therefore the new winch drive series 800 widens the freedom of all people involved: from the design phase to life-long maintenance. All Bonfiglioli drives are designed to meet high performance requirements under the special conditions at sea with a torque range from 1.000 to 3.000.000 Nm. The drives have been approved in accordance with the standards set by the American Bureau of Shipping (ABS). Certificates from Det Norske Veritas and Germanischer Lloyd (DNV GL) and the China Classification Society (CCS) are also available.

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HR RADIATION TOLERANT LENSES

For the new generation of radiation hard CMOS cameras



Resolve Optics is now supplying HD (1080p) resolution lenses optimized for the new generation of radiation hard CMOS cameras. The desire from nuclear plants for clearer and brighter images to enable them to better monitor their facilities and processes has accelerated

the move from expensive, lower resolution tube cameras to higher resolution CMOS based cameras. Drawing upon over 2 decades of serving the nuclear industry - Resolve Optics is now able to offer radiation tolerant lenses that can produce clear, sharp images free of the strong yellow tint that traditionally has been a limiting issue particularly when used on colour sensors. The non-browning glass used in Resolve Optics high-resolution radiation tolerant lenses withstands long-term exposure to radiation up to a dose of 100,000,000 rad without significant discoloration. An example of this new generation of high-resolution radiation tolerant lenses is the Model 357. Operating at f/3.6, the Model 357 provides high image resolution and minimum geometric distortion from 400 to 770 nm, and can image objects from 1.5 m to infinity. When focused at infinity, this 1/3rd or 2/3rd inch format lens achieves high image resolution at full aperture throughout the zoom range without refocusing.

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HAND-HELD HOT MELT APPLICATOR

Optimizes and facilitate gluing processes



Raptor Handy, winner of the prestigious ADI Awards and Reddot prizes for its user-centred design, is made available to

maximize and ensure operator safety. With a top and bottom hose inlet, both versions of the applicator guarantee spiral spraying application thanks to its new mechanical design, which also allows for easy part exchange. As a result of a comprehensive modification process, it provides wireless communication thanks to wireless implementation and an internal switch, thus achieving automation, security and comfort with a single function.

The new hand-held hot melt applicator from Raptor by **Meler** guarantees high performance thanks to the thermal stability of the nozzle which allows for high precision application. With Easy-Clean technology, Raptor Handy facilitates nozzle cleaning thanks to fast response in the adhesive flow output. The considerable reduction in the weight of the applicator improves daily operations, while offering 360° hose rotation with both options and the possibility of nozzle exchange in both versions of the Raptor Handy.

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PULSE & ANALOG CONVERTER

Enables to convert standard pulse output flow meters



Titan Enterprises has released its new programmable pulse and analog converter as part of its flow measuring instrument and display range. The Pulsite® Link allows the user to convert

standard pulse output flow meters, such as Titan's positive displacement flowmeters and precision turbine flowmeters, to give linearised analog and NPN/PNP outputs. The device will accept both pulse and reed switch devices and provides 5Vdc to the installed flow meter. Titan's proprietary Interface Software allows the user to configure and test the system via USB and a computer. Calibration data can be entered in order to linearise the flowmeter signal for greater accuracy. The Pulsite® Link is an ideal instrument for increased accuracy on mechanical flow devices, data monitoring, test rigs and control systems. The Pulsite Link offers NPN, PNP pulses and analog output of 0-5Vdc / 0-10Vdc or 4-20mA and the ability to configure flow alarm outputs. It is ideal for integration for PLC with increased accuracy on mechanical device, for data monitoring, test rigs, and control systems. The inbuilt sensor power supply is of +5Vdc, with analog response rate from 100ms. Coming with an IP64 enclosure, it operates in temperatures between 0 et +65°C.

►► 62867 at www.ien.eu



IP54 DEVICE CONNECTION WITH CORDSET

IEC 60529 compatible appliance inlet



Protection against dirt particles and moisture is becoming increasingly important. With the product type 6080 and the associated V-Lock power cable, **SCHURTER** is launching an IP54 device connection that also meets very high demands. The newly developed SCHURTER 6080 is an IEC 60320 and IEC 60529

compatible appliance inlet. In combination with the dedicated power cord, an IP54 protection rating is achieved when plugged in. An IP54 connection provides excellent protection against dust particles and is splash-proof. The blue color of the V-Lock cable socket already indicates that something is different here. The appliance inlet as well as the connector of the power cord have been equipped with special sealing elements to achieve a higher IP-Protection. The new device plug connection also has the industry proofed V-Lock cord retention system. Mechanical safety clips, which often must be designed for specific types, are no longer a necessity. Wherever dirt, dust particles or splash water may occur, the new SCHURTER technology is the perfect choice. This may be the case in harsh working environments in industry.

►► 62885 at www.ien.eu

BATTERY MANAGEMENT SYSTEM

For high power Electric buses, trucks and vehicles



Sensata announced it has debuted a new Battery Management System (BMS), the Lithium Balance n3-BMS, for high voltage applications at the Battery Show North America. The Lithium Balance n3-BMS is

ideal for applications with power up to 1000 volts/2000 amps, especially for battery makers and manufacturers of electric trucks, buses, and other heavy commercial vehicles. The demand for ISO 26262 certified components is on the rise as battery packers and electric commercial vehicle OEMs prioritize functional safety in their platforms while striving for faster time-to-market. However, the ISO 26262 certification process is complex, costly and can take years to complete. An off-the-shelf, Automotive Safety Integrity Level (ASIL C) certified solution like the Lithium Balance n3-BMS can reduce the development time and associated costs. The unique layered software structure of the n3-BMS provides customers with the option to customize the battery management system with their own code and algorithms without impacting the ASIL C certification. The BMS software architecture consists of a "Base Software Layer" (BSW) and an "External Software Layer" (ESW) which are connected by an open API link layer. Since all the safety-critical functionalities of the BMS are in the BSW layer of the software, developers are free to implement their own software code and algorithms in the ESW without any risk to the ISO 26262 certification of the system.

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FREE DIGITAL SUBSCRIPTION

ELECTRIFIED COOLING AND HEATING

With no fossil-fuelled boilers



Trane®, provider of indoor comfort solutions and services and a brand of Trane Technologies, announced the CITY Advantage, its new compact scroll water-cooled chillers and water source heat pumps with low global warming potential (GWP) R-454B refrigerant. The CITY Advantage models expand the Trane CITY portfolio of compact

products designed to provide all year-round cooling and/or heating with a reduced footprint to fit small commercial buildings, industrial facilities and processes. The Trane CITY Advantage water to water heat pump units offer the highest seasonal efficiency values and address the environmental and sustainability efforts in urban areas offering an efficient alternative for gas or oil fuelled boilers and compatibility with geothermal applications. Thanks to the R-454B refrigerant – the lowest GWP refrigerant for scroll technology on water cooled scroll units – the Trane CITY Advantage offers market leading operating maps with leaving water temperatures of up to 65°C. The new CITY Advantage models with R-454B are substantially more efficient when compared to equivalent R-410A technologies, offering even 11% better Seasonal Energy Efficiency Ratio (SEER) in cooling mode, and up to 5% better Seasonal Coefficient of Performance (SCOP) in pure heating mode.

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ON-AXIS PARABOLIC MIRRORS

For applications in high-power laser physics research



Benefiting from an ultra-stable manufacturing environment and employing proprietary production techniques the highly experienced and skilled engineers at **Optical Surfaces** can, depending on the surface accuracy required, generate very fast focusing on-axis parabolic mirrors ($< f$ 0.7). On-axis parabola are the fast-focusing mirror of choice suitable for both broadband

and multiple wavelength applications due to their completely achromatic performance. To optimise their performance - Optical Surfaces offers a range of protective mirror coatings including metallic, multilayer dielectric and ultra-hard coatings for the most demanding high-power lasers. Manufactured from materials including glass, ceramic, and silica - fast focusing on-axis parabolic mirrors from Optical Surfaces are designed to optimise the performance of ultra-high power pulsed lasers. All surface accuracies are checked by interferometer and are guaranteed to be better than $\lambda/10$ p-v wave accuracy with low scatter. In combination with the latest dielectric coating technology - Optical Surfaces fast focusing on-axis mirrors provide minimum pulse distortion and the maximum usable bandwidth. For use with high-power femtosecond lasers operating at 750 to 850 nm, these fast-focusing mirrors can be used at power densities of up to 100 mJ/cm² for continuous 50-fs pulses without deterioration.

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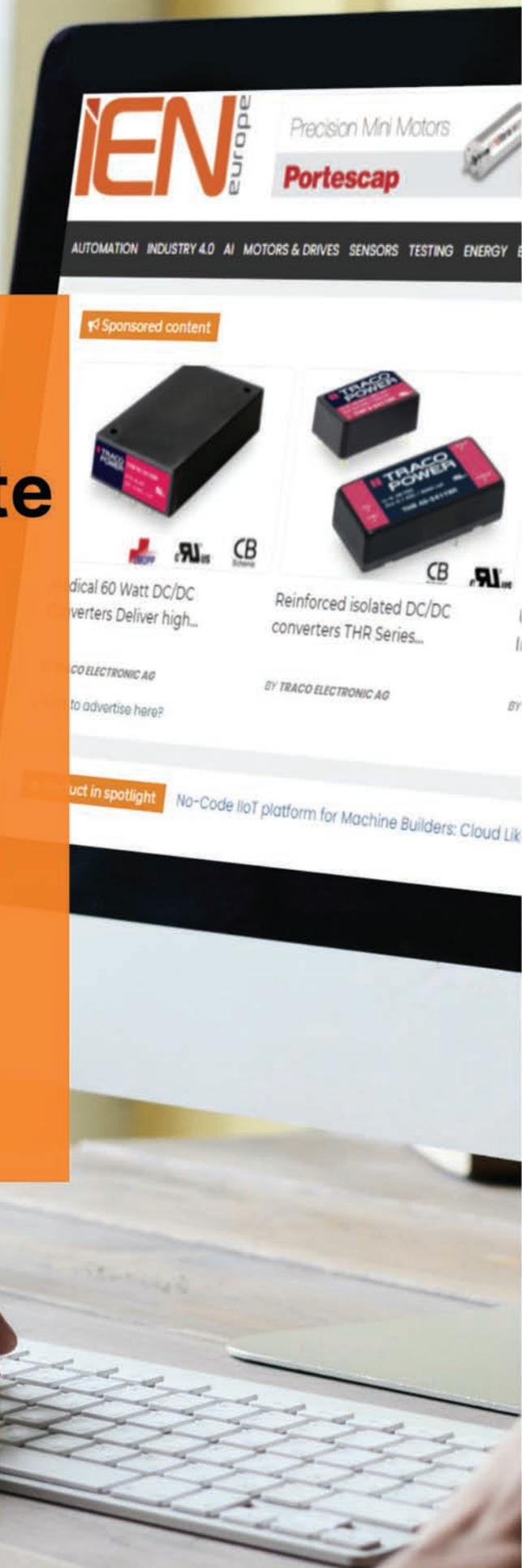
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We see

new insights into energy consumption supporting environmental sustainability goals.

Manufacturing plants typically lose 30% of compressed air due to pneumatic system leakages. This impacts energy efficiency and environmental sustainability goals. Emerson's Industrial Internet of Things (IIoT) solutions and analytics software provide actionable insights to reduce waste and optimize the energy consumption of your machines.

Discover how digitally transforming your operations can help meet your sustainability goals:



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