

INDUSTRIAL  
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**8 Motek Special:**  
Inspekto Presents  
Autonomous Machine  
Vision at the Motek  
Show

**10 Digital Thread:**  
SupplyPoint's High-  
capacity Carousel  
System

**19 Efficiency in  
Sensor Form**  
with Cylindrical  
Photoelectric Sensors



**Exclusive Interview:**  
Specialist Optics for Aerospace  
Applications with Mark Pontin,  
Managing Director of Resolve  
Optics Ltd.

page 12

## Energy Efficiency: Reaching IE5 Efficiency with Magnet-free Motors

page 22

Matched with a variable speed drive (VSD), a synchronous reluctance (SynRM) motor with an IE5 efficiency rating provides an effective can help industrial companies achieve their sustainability goal



## 14 Smart Factory: Ice Cream Makes Chewy Encounter with Digital Manufacturing



Electronics:  
Multiple  
Output Cascaded  
Buck Converter Steps  
page 20



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**TIM Global Media BV**

140 Rue de Stalle - 3ème étage, 1180 Uccle-Brussels, Belgium  
o.erenberk@tim-europe.com - www.ien.eu

<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>Flavio Steinbach</b>
<b>Energy Efficiency:</b>	f.steinbach@tim-europe.com
<b>Associate Publisher:</b>	<b>Marco Marangoni</b> m.marangoni@tim-europe.com
<b>Production &amp;</b>	<b>Margherita Stallone</b>
<b>Order Administration:</b>	m.stallone@tim-europe.com
	<b>Francesca Lorini</b> f.lorini@tim-europe.com
<b>Website &amp;</b>	<b>Carlo Cucchi</b>
<b>Newsletter:</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  
mailinger@marcomedia.ch

BENELUX,  
NORWAY, SWEDEN  
Nadia Liefsoens  
Tel: +32-(0)11-224397  
Fax: +32-(0)11-224397  
n.liefsoens@tim-europe.com

FRANCE  
Sylvie Seurin  
Tel: +33-(0)1-34 15 63 92  
s.seurin@tim-europe.com

M'fumu Tiya Mindombe  
Tel: +32 465 443 530  
m.mindombe@tim-europe.com

GERMANY  
Simone Ciolek  
Tel: +49-(0)9771-1779007  
s.ciolek@tim-europe.com

ITALY, SLOVENIA  
Andrea Rancati  
Tel: +39-02-7030 0088  
arancati@rancatinet.it

TURKEY  
Onur Dil  
Tel: +90 212 366 02 76  
Fax: +90 212 366 58 02  
E-mail: odil@tim-europe.com

UNITED 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.  
Tel: +81-(0)3-3260-7871  
Fax: +81-(0)3-3260-7833  
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##### OTHER COUNTRIES

Cristian Son  
Tel: +39 027030631  
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Marco Prinari - m.prinari@tim-europe.com



Anis Zenadji  
a.zenadji@tim-europe.com

## Dear Readers,

At a time when the 3rd jab is put forward in order to fight against the serious forms of the virus and keep the immunity level high, we are pleased to observe the reopening of industrial fairs. Among them, Motek 2021 taking place from October 5 to 8 in Stuttgart looks like a good start. **IENT Europe** will tell you about these few days spent in the company of production and assembly players.

This issue of IEN Europe kicks off the return of the holidays with topics that are still as relevant in view of the hardships we face in this uncertain period: Digital Thread, Smart Factory matters are taking more and more importance in the industry field.

Last, as the **Energy Efficiency** Editor, I invite you to take a look at several interesting stories: "Reaching IE5 Efficiency with Magnet-free Motors" sheds light on how reaching sustainability goals with a synchronous reluctance motor with IE5 efficiency rating matched with a variable speed drive. The Danfoss story on digitalization technology guides us to the transformation the industrial companies need to achieve to reach the governments' goal of net-zero emissions by 2050.

*Anis Zenadji*

Editor for IEN Europe

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## In the next issue:

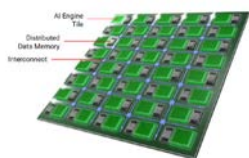
**Sensors & Instrumentation  
Smart Factory - IIoT -  
Industry 4.0 Power Supplies  
and Electronics**

- 5 Products on the Spotlight**
- 6 Industry News**
- 8 Motek Special:** - Inspekto Presents Autonomous Machine Vision
- 10 Digital Thread - Managing Assets While Saving Costs:** High-capacity Carousel System
- 12 Exclusive Interview** with Mark Pontin, Managing Director of Resolve Optics Ltd
- 19 Product Focus:** Cylindrical Photoelectric M18 Series
- 22 Energy Efficiency:** Reaching IE5 Efficiency with Magnet-free Motors
- 23 Energy Efficiency:** How Digitalization Technology Can Increase Excavator Efficiency and Lower Emissions
- 26 Product News**
- 30 Index**



## AI-ENABLED ACAP PLATFORM

For automotive, robotics, and healthcare applications



**Xilinx, Inc.** introduced the Versal™ AI Edge series, designed to enable AI innovation from the edge to the endpoint. With 4 times the AI performance-per-watt versus GPUs and 10 times greater compute density versus previous-generation

adaptive SoCs, the Versal AI Edge series is at the moment the world's most scalable and adaptable portfolio for next-generation distributed intelligent systems. Versal AI Edge adaptive compute acceleration platforms (ACAPs) provide intelligence to a wide range of applications including: automated driving with the highest levels of functional safety, collaborative robotics, predictive factory and healthcare systems, and multi-mission payloads for the aerospace and defense markets. The portfolio features AI Engine-ML to deliver 4X machine learning compute compared to the previous AI Engine architecture and integrates new accelerator RAM with an enhanced memory hierarchy for evolving AI algorithms. These architectural innovations deliver up to 4X AI performance-per-watt versus GPUs and lower latency resulting in more capable devices at the edge. ACAPs can be changed at both the hardware and software level to dynamically adapt to the needs of a wide range of applications and workloads from edge to cloud. Versal AI Core and Versal Prime series are in full production, with Versal Premium ACAPs now sampling.

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## MOBILE THERMAL IMAGERS

Suitable for indoor and outdoor applications



**PCE Instruments'** mobile thermal imaging cameras are designed for machinery and technical equipment as well as for quick and non-destructive inspections of buildings. Regardless of the season, they can be used to find thermal bridges, possible moisture penetration in building components or to locate supply

lines and building components in the wall or ceiling structure. The measurement takes only a few seconds and the thermal imager allows direct measurements in hard-to-reach areas. The higher the thermal resolution and the number of pixels of the infrared image, the more detailed the temperature differences can be on the screen. If the infrared images are not informative enough, the measurement can be repeated as often as desired at the same location, for example after a natural or forced temperature change due to cooling or heating. In addition to the infrared camera, PCE's mobile thermal cameras are also equipped with a regular camera. This makes it possible to superimpose the ordinary and infrared images on several levels, thus simplifying the distribution of the areas of interest on the thermal image, especially for images of components with additional recorded elements.

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## SAFETY SENSOR

Comes with integrated software



**Schmersal Group** enhances its RSS260 sensor with new software for feedback monitoring, automatic or manual restart, reset and emergency stop monitoring. The Schmersal's RSS260 safety sensor performs the tasks of a safety relay

module in the F0/F1 version. It thus monitors the safety gate and contactors that are directly actuated by the sensor outputs. The control is performed by the integrated logic without the need for a separate evaluation device. The F0 version allows an automatic restart when all protective devices are closed. The additional "activation button" without edge monitoring can be switched in the feedback loop, which makes the F0 version suitable for small machines without a protective space accessible from the rear. With its reset function in accordance with EN ISO 13849-1, the F1 version is suitable for small systems where the danger zone is accessible to the operator. The edge-monitored reset button must be pressed before the machine is restarted when the system is in a safe state and no one is in the danger zone. The Q function applies to machines that require the use of an emergency stop switch. The Q function in the last sensor of the chain allows the monitoring of the E-STOP switching elements integrated in a series circuit. A reset button is still required because automatic restart is only allowed after an emergency stop command is reset. The RSS260 reduces wiring and offers simplified installation.

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## NON-CONTACT SWITCH FOR HYGIENIC SWITCHING

Comes with optical ToF (Time of Flight) technology



The Covid-19 pandemic has greatly increased the demand for non-contact push buttons and switches. Various studies have shown that the transmission of viruses and bacteria via surfaces exposed to constant contact with hands is high. A broad range of technologies for contactless switching are

vying for the favor of developers and buyers. But not every product is suitable enough. Besides, false signals under certain conditions (e.g., splash water, rain) can be sent and this trigger unintentional switching. The optical technology ToF (Time of Flight) used in the **Schurter TTS** can be programmed individually, with high precision, so that malfunctions are prevented. The switch is programmed in a way such the standard detection distance is 60 to 0.02 mm. This ensures that wiping over or cleaning the switch surface will not trigger a switching signal. The TTS switches offer extremely high reliability. Since they have no moving parts, their lifetime runs at more than 20 million switching cycles. The visual feedback is ensured by a two-color ring illumination (red/green) in the actuator, which supply voltage is between 5 and 28 VDC. The simple installation of the TTS, which is fixed by means of a nut, and an anti-twist protection allow for easy replacement. The new TTS non-contact switches fit the use in public areas, such as in vending machines, parking systems or in sanitary areas to avoid any contact by hand. Moreover, the detection distance can also be set so that the switch can be used as a photoelectric barrier for other fields of applications.

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## Vaisala has Opened a New R&D and Innovation Center in Finland

Located on the same campus area as Vaisala's head office and production facilities in Vantaa, Finland, the new building hosts around 300 experts, representing 67% of Vaisala's R&D personnel in total. The number of **R&D** personnel has increased by 45% during 2015-2020 (446 people in 2020). There are 37 custom-made laboratories in the new R&D center. These include a spacious EMC lab for measuring electromagnetic compliance, rain tower for simulating natural rain, vibration & free fall laboratory, environmental chambers, where instruments can be tested in extreme temperatures and humidity conditions, and system testing laboratories, where software compatibility and quality is ensured. Construction work of the 7,900 m<sup>2</sup> building begun in January 2019, and employees have gradually started to work in the new premises during the spring 2021.



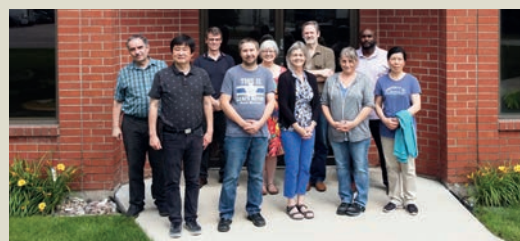
## IERA 2021 Awarded to ABB's PixelPaint Solution



**ABB's PixelPaint** offers an innovative solution to make automotive painting faster, more flexible and more durable. The inkjet head eliminates overspray and applies the entire paint to the vehicle surface, avoiding waste, which is bad for the environment. The two high-precision robots also save time by increasing the speed of the custom paint by 50%, allowing two-tone and custom designs to be applied in one pass while providing a high-quality finish. Finally, it eliminates the process of masking and unmasking each car, helping to reduce bottlenecks. For this 17th edition of the IERA Award, the winners faced strong competition. Among the finalists were INFAIMON and its InPicker, a universal pick and place system for industrial applications, Microspi Industries and their MIRAI software offering control solutions for industrial robots to cope with production variations and Mobile Industrial Robots with their MiR250, a user-friendly mobile robot that optimizes handling flows in all industrial sectors.

## Weidmüller Group Acquires Emphatec Inc. Team and Assets

Specializing in the engineering of customized connectivity solutions for the process industry, including hazardous areas, **Emphatec** complements the solution portfolio of Klippon Engineering, a subsidiary established by Weidmüller in 2021 and responsible for a global network of engineering and service expertise for the process industry. This acquisition will enable the development of product and application specific solutions through Klippon Engineering's sales team, application experts, affiliated production and assembly facilities. "With our concentrated experience from six decades, we are at our customers' side as a competent partner in numerous areas of the process industry. We are strengthening our commitment in a growth market, in keeping with our tradition and history, and are positioning ourselves for future requirements", Dr Timo Berger, Chief Sales Officer of the Weidmüller Group, commented.



## Imperas Signs A Multi-Year Distribution And Support Agreement with Valtrix

**Imperas simulation technology** and **RISC-V** reference models are now available pre-integrated into Valtrix STING to address the growing global market for RISC-V processor verification. Verification includes a design to be tested, a reference model for comparison and tests to fully exercise the design. Coverage and requirements objectives, including asynchronous events, debug modes, and the resolution analysis process are detailed in a verification plan. User controls for each test parameter allow each test condition to be matched to a particular test configuration for the device under test (DUT).

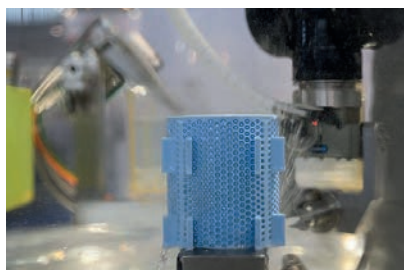


Dynamic testing ensures greater reliability for targeted test suites and interactions with asynchronous events. Dynamic testing teams analyze bugs and then adapt test cases to detect other problems. RISC-V's flexibility enables specific functionality that can be fine-tuned to key application requirements. The adoption of RISC-V for design is pushing SoC teams to adapt their verification and test plans to also cover the full range of processor DV tasks. The verification tasks for specialty processors are shifting from a few consumer IP vendors to all SoC teams. This leads efficiency goals to improve the DV analysis and resolution process to match the processor core schedule to the target SoC design.



## Parts2clean will Return this Year to the Stuttgart Exhibition Center

Companies from the parts and surface cleaning sector are looking forward to the first physical highlight of the year: from 5 to 7 October, Deutsche Messe stages **parts2clean** in Stuttgart. With their broad choice of products, solutions and services, numerous market leaders from Germany and abroad present their range of application-oriented and cost-efficient cleanliness. After a Corona-forced pause last year, parts2clean will return this year to the Stuttgart Exhibition Center. "Together with our exhibitors, we have decided to stage parts2clean as a physical event again.



All companies have a great need to explain their products and solutions to customers in person," says Olaf Daebler, Global Director parts2clean at Deutsche Messe. "We also offer companies and visitors who cannot be in Stuttgart an expanded digital offer, but parts2clean clearly emphasizes on-site interaction and networking." parts2clean focuses on cleaning systems and alternative cleaning processes; systems and components for cleaning facilities; quality control and assurance; cleaning media; services such as contract cleaning, cleanliness analysis and training; corrosion protection; preservation; packaging and logistics; handling systems and automation solutions; cleaning baskets and work piece carriers; clean room and clean room systems; research and development; and digitalization. Each day of parts2clean, Deutsche Messe and the Business Area Cleaning by Fraunhofer organize a forum where experts discuss all topics related to industrial parts and surface cleaning, including the basics and innovations of industrial cleaning processes, challenges from filmic contamination, cleaning for medical and pharmaceutical technology, analytic and technical cleanliness, and automation and digitalization. Electromobility is a new theme in 2021.

## Presto Engineering and Cadence Partner to Expand Semiconductor Package Design Solutions

Presto is adopting Cadence Allegro® X Package Designer Plus, Clarity™ 3D Solver, Sigrity™ XtractIM™ technology and Celsius™ Thermal Solver to design IC packaging solutions. Presto plans to provide Cadence with input on software features, functions and workflows specific to their end-customer and market needs. "Our ability to leverage the Cadence packaging design and analysis workflow will help us broaden our design services for IC packaging customers needing tailored capabilities and specific requirements.



In our efforts to date, we have already seen a 50 percent faster turnaround time due to a reduction in design iterations enabled by Cadence technologies," declared Cédric Mayor, vice president global strategy and corporate development at Presto. SiP and 3D packages tend to require many rotations to optimize BOM and design tolerances to enable full control of chip performance reproducibility. With the addition of the Cadence portfolio, Presto offers a comprehensive set of design and qualification tools to help customers achieve the most efficient design for manufacturing (DFM) process, strengthening its position in microelectronics.

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# Inspekto Presents Autonomous Machine Vision at the Motek Show

**Autonomous Machine Vision AI is the last critical component for complete automation systems**

As a global player of Autonomous Machine Vision (AMV), Inspekto will present its AMV system INSPEKTO S70 Gen.2 for industrial quality inspection during the Motek trade fair to take place from October 5th to 8th, 2021 in Stuttgart. The recently introduced second generation of this system enables reliable quality checks in numerous applications. Based on artificial intelligence and easy to set up and deploy, the system creates the conditions for end-to-end automation.

The international trade fair Motek is the world's leading event in the areas of production and assembly automation, feeding technology and material flow, rationalization through handling technology and industrial handling. After the pandemic-related cancellation in 2020, it will take place again this year from October 5 to 8, 2021 in Stuttgart. At Motek, trade show visitors will experience cross-divisional solutions for the entire world of automation and can find out more about the INSPEKTO S70 Gen.2 machine vision system at Inspekto's booth 7/7216. Thanks to the unique approach of Autonomous Machine Vision AI, this system enables end-to-end automation of many production processes and thus paves the way to Industry 4.0. The INSPEKTO S70 Gen.2 enables high-quality inspection of objects of all kinds and, unlike conventional machine vision solutions, can be installed within a very short time by users who do not have any knowledge of machine vision or AI.

The reason for this is the further development of Inspekto's Autonomous Machine Vision Artificial Intelligence (AMV-AI™). Essential el-



*The new Inspekto S70 Gen2*

ements of this machine vision system are three modules based on artificial intelligence, which ensure the dynamic adjustment of the operating parameters of the image recording system to the respective image processing task in real time, take over the identification, classification and 3D alignment of an object within the recorded image and the actual inspection of objects.

**INSPEKTO S70 Gen.2 is an enabler for SMEs as well as system integrators to implement cost-effective solutions based on an easy-to-use, flexible, and powerful machine vision system**

Unlike traditional machine vision solutions, the INSPEKTO S70 Gen.2 is extremely simple to set up. Users only need an average of 20 to 30 good sample parts and can immediately create feasibility studies for assignments in a wide variety of applications. The system's unique advantage is that it's pre-trained, dramatically shortening the time

needed for set up and for the initiation of image processing. For small and medium-sized companies as well as for system integrators of automation systems, INSPEKTO S70 Gen.2 offers an invaluable advantage over traditional machine vision systems. The simple handling and installation no longer requires vision experts and can be done in a significantly shorter amount of time, which extremely increases cost-effectiveness. In this way, users can gain control of their quality assurance process end-to-end, improving levels of pro-







*Bernd Schumacher, new global CEO - Inspekto*

duction verification. Inspekto is an international industrial company whose development team has accumulated decades of experience in the areas of machine vision, AI research and industrial solutions. The company, with a development centre in Israel, builds on a strong presence in Germany, where the European headquarters are located with a modern demo centre. There, users have the opportunity to have their components individually checked by competent experts in order to quickly find effective solutions. Since earlier this year, Inspekto is led by global CEO Bernd Schumacher, who is based in Germany and is a long-standing international business manager in the high-tech sector. "Machine vision is an important component for the complete automation of many production processes," emphasises Schumacher. "Due to its complexity, this technology was previously often only available to large companies that had access to the necessary internal know-how and capex. INSPEKTO S70 Gen.2 now also enables small and medium-sized companies as well as system integrators in many industries to implement cost-effective solutions based on an easy-to-use, flexible and powerful machine vision system and thus improves their profitability. The value proposition in terms of higher yield and customer satisfaction that our customers can now enjoy is at the heart of our technological breakthrough."

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# SupplyPoint's High-capacity Carousel System Manages Assets While Saving Costs

With Industry 4.0, the company has witnessed an enormous involvement of smart technologies and devices in business that have made processes efficient. This piece sheds light on an example of how SupplyPoint's client was able to ensure optimal management of assets with significant cost-saving benefits

Ordinarily referred to as the Industrial Internet of Things (IIoT), there is a multitude of industrial devices and critical assets with advanced analytics. From hands-free smart computing devices to smart touch devices, IIoT has transformed everyday business functions.

SupplyPoint's client is a global company that manufactures and sells scientific products and consumables. With multiple locations across the US, its critical processes involved the use of expensive hands-free devices like wrist computers and ring scanners costing more than US\$3000 each. These state-of-the-art devices are meant to have a long service life which made it crucial for the business to implement a proper device management system and keep control of these assets. In the past the scanners were not managed with a secure system. They had scanners misplaced, stored in an employee's locker, taken home by accident, and not returned at the end of the shift. It was a constant battle to keep track of each of these items and doing quarterly inventory on these items was very cumbersome and time-consuming. In effect the responsibility lay entirely by the supervisors and not the employee users.

## **ROTOPOINT: a scalable and cost-effective solution for the secure management of a wide range of assets and devices**

The company started looking for a proper, locker-based asset management solution. However, it was observed that most lockers could only store about 30-50 scanners in one go, and with theirs being a large facility, they needed a high-capacity system to store hundreds of scanners. They were introduced to SupplyPoint's ROTOPOINT, which provides a scalable and cost-effective solution for the



secure management of a wide range of assets and devices. Its high capacity made it ideal for the management and storage of high-density items. The distinct advantage of ROTOPOINT for this company was that it could store 252 scanners and they only had to install one ROTOPOINT machine at each facility, as opposed to low-capacity, space-consuming lockers. The system was installed at a few facilities initially and then was rolled across all eight locations. The carousel system makes sure the cycle usage of every single device is balanced. With the 'first in first out system' in place, they don't end up with any scanner being unused. With the system in place, there was no need to stock any additional devices, which saved on unnecessary costs. The supervisor also has a

better snapshot of the overall inventory report. Previously, there had been a lot of expense. Across the past year they had misplaced or damaged many devices and spent over \$250,000. Since implementing this solution, however, they have not lost one device and the solution has paid for itself in a matter of months. They also begun to manage other items with the same equipment at some locations, include safety vests, print heads for ticket printers and maintenance tools. SupplyPoint's asset management system allows for greater freedom and accountability, with nothing going unnoticed, keeping the business moving.

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# OpreX Managed Service: A Managed Service Suite

Plant condition based predictive monitoring and maintenance support for the efficient plant asset maintenance operation

Running a plant on maximum and sustainable performance with highest possible efficiency is a challenge and in many cases of (un)planned shutdown or slowdown, the information that the plant performance is at risk was already available. Another issue is that only 18% of assets have an age-related failure pattern; 82% exhibit a random pattern, so traditional preventative maintenance provides a benefit for just 18% of assets. And traditional selected products features are not integrated and/or connected to people and process, and therefore inherently have low product-values. To address these issues, meet the needs of industry by enabling the digital transformation of plant asset monitoring and condition

based predictive maintenance in production and manufacturing, Yokogawa has developed the OpreX Managed Services, an integrated service of people, process and technologies, resulting in maximum value creation and plant profit, based on the Managed Service Suite platform.

## Functions of the Managed Service Suite platform

- Real-time maintenance data collection of plant field instrumentation, PLC/DCS/SCS, network, and computer devices
- Turn, condition-based data efficiently into actionable information, connecting people to act effectively and efficiently using the integrated



Oprex Managed Systems, Safety plant, Preventative maintenance, Yokogawa, Digital transformation

process, and technologies.

- Plant asset performance, compliance, and security insights via a single dashboard
- 24/7 managed service supported by integrated IT Service Management ITSM, ITIL based monitoring, detection, and its pro-active service alerts of onboarded devices/applications abnormalities or signs of an impending future failure, and incident management.
- Modular and custom flexible offerings to suit enterprise needs and security policies, either on customer's dedicated server or cloud environment.

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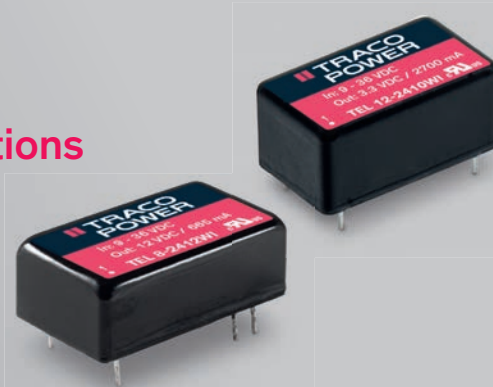
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TEL 8WI	8 Watt	9–36, 18–75 VDC	3.3–24 VDC	DIP-16
TEL 10	10 Watt	9–18, 18–36, 36–75 VDC	3.3–24 VDC	DIP-16
TEL 10WI	10 Watt	9–36, 18–75 VDC	3.3–24 VDC	DIP-16
TEL 12	12 Watt	9–18, 18–36, 36–75 VDC	5–24 VDC	DIP-16
TEL 12WI	12 Watt	9–36, 18–75 VDC	5–24 VDC	DIP-16
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Interview with Mark Pontin – Managing Director of Resolve Optics Ltd.

## Designing & Producing Specialist Optics for Aerospace Applications

**Demand for custom lens designs that meet the exact needs of camera and sensor organizations targeting aerospace application is rising dramatically**

In this interview with Mark Pontin, Managing Director of Resolve Optics Ltd, we asked the company about the design and production of specialist optics for aerospace applications, as well as their participation to the European Union Horizon 2020 program to develop an ultra-large format aerial surveillance camera.

**IEN Europe:** How are Resolve Optics lenses and optical systems used in aerospace applications? What are the key advantages of your solutions?

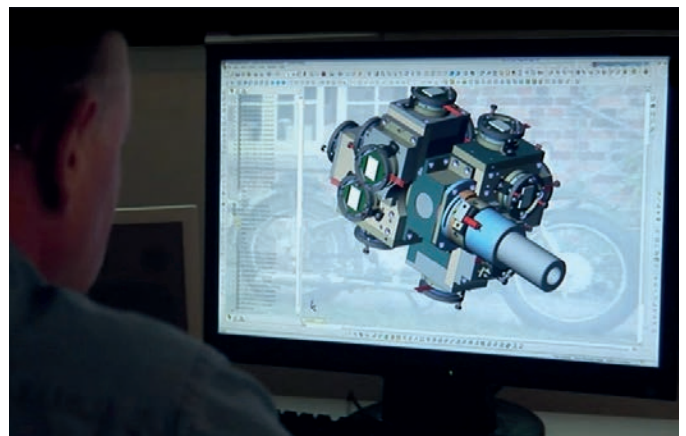
**Mark Pontin:** The range of aerospace applications where our lenses and optical systems form a critical part of a sensing or imaging system is growing year on year. Recently we have supplied key optics for head-up-displays for commercial and military aircraft, ultra-high-resolution lenses for airborne aerial surveillance and radiation resistant lenses that operate at the heart of a satellite based remote monitoring system. Drawing upon 30-years of experience we can offer expert design, development and manufacture of bespoke lenses and optical systems that offer many advantages over regular off-the-shelf commercial grade optics for use in environmentally challenging aerospace and spaceborne applications.



*Spaceborne applications place great demands on optics*

**IEN Europe:** What are the main challenges in the development of a lens or optical system to be used in aerospace applications?

Resolve Optics: Producing a lens or optical system for aerospace use requires careful consideration of its resistance to vibration, shock, temperature and water ingress in addition to ensuring high reliability and top performance. Designing lenses to survive and maintain a quality of image and mechanical movement in challenging environments is not something you can leave to theoretical analysis alone, it also requires a level of physical testing as well. The majority of customers, that require a lens or optical system to survive the challenges of helping collect high



*Optical design expertise*

quality images from a fast moving aircraft, will want to put their system through rigorous environmental testing to minimize the possibility of failure in operation. Environmental testing for vibration, shock, water, dust, temperature, pressure etc. is extremely expensive so for Resolve Optics it is imperative that we take every precaution possible to ensure our lenses and optical systems are designed to withstand each customer's environmental specification. This requires us to use the stress analysis tools in our 3D CAD software to identify and design out any areas of weakness. Once we have a design that is as rugged as possible, we will then test the lens on our in-house vibration and shock test equipment. Using the correct vibration profile enables us to simulate the conditions the lens will need to survive.

Producing a rugged lens or optical system optimized to your environmentally challenging application is a complex task. However, our team of experienced optical, mechanical, and electronic engineers and designers have a proven track record of producing top quality, robust fixed focus and zoom lenses and high-performance optical systems for aerospace applications.

**IEN Europe:** Compared with standard off-the-shelf lenses, what benefits do application optimized lenses offer to aerospace organizations?

Off-the-shelf lenses are typically manufactured for mass market applications where unit cost is the dominant driving force. However, when it comes to an application that optically requires something a little more





demanding such as high performance, high-resolution, compactness, environmental resilience or a large format image the off-the-shelf market will force you to accept a compromise in one or more aspects of optical performance. The result can be that the range of applications solvable using the off-the-shelf lens is restricted or you have to change your product to accommodate the lens resulting a bulkier less attractive product. In addition, going for an off-the-shelf lens you have no control over the security of your lens supply and have to accept sub-optimal optical performance leading to a loss of competitive advantage. As a result, demand for custom lens designs that meet the exact needs of camera and sensor organizations targeting aerospace application is rising dramatically.

**IEN Europe:** To survive and maintain a high quality of image in tough environments, such as on satellites and spaceborne research platforms, what are the main challenges for optical lenses?

**Resolve Optics:** Many different types of optical imaging and sensing systems are used to observe and measure the Earth and the universe at large. However, designing optical systems for satellites and spacecraft is challenging due to the harsh conditions that space places upon components and systems working in this remote environment. Designing high performance optical systems for confidential space projects is something that we have done for over 20 years. Lenses that are used in space applications have to meet certain basic requirements to survive the harsh environment of space. Lenses must be constructed of specific materials that will not outgas when exposed to a vacuum such as exists in space. Consequently, all significant air spaces should be vented to avoid pressure on the elements and distortion of the lens.

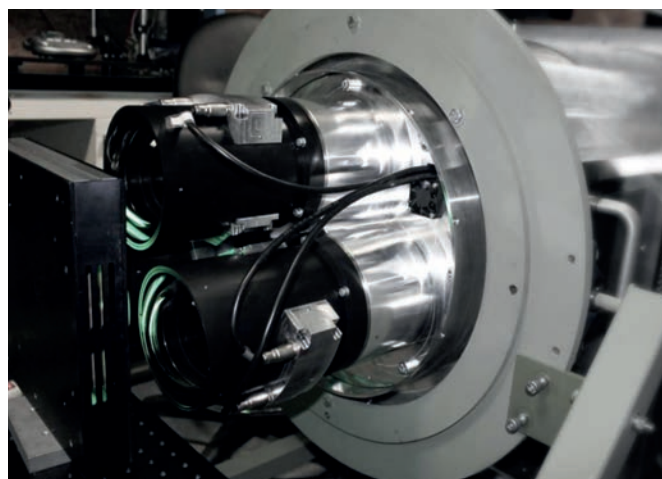
All materials right down to glues and greases must be approved and tested for outgasing. A major consideration for spaceborne optical systems is their radiation resistance. All optical elements within lens designs we undertake for spaceborne projects are made using cerium oxide doped glass or synthetic silica enabling them to withstand radiation doses of up to 100,000,000 rads and temperatures up to 55°C without discoloration or degradation of performance.



Aircraft Head-Up Display (HUD) Lens



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Ultra large format aerial surveillance camera lenses

These radiation resistant lenses provide high image resolution and minimum geometric distortion from 400 to 750nm.

**IEN Europe:** I understand that you have recently participated in an EU project to develop a next generation ultra-high resolution aerial surveillance camera – can tell us about your involvement in this project?

**Resolve Optics:** A few years we were chosen as the optical design and development partner within a consortium that received €1.68 million funding from a European Union Horizon 2020 program to develop an ultra-large format aerial surveillance camera. Aerial Surveillance work depends on the weather, and is challenged every day by how much data you can acquire when the sky is clear. Incorporating 3 ultra large format, low distortion custom lenses, developed by Resolve Optics, the B66 extra-large format camera produces high quality aerial surveillance images two to three times larger than the standard image size generated by other large format cameras on the market. As a consequence, not only are less images required for geographic data mapping but also these images require less processing time saving operators time and money. Recently this powerful aerial surveillance camera was to undertake a photogrammetric survey of coastal erosion in Northern France.

**IEN Europe:** What other markets might be able to benefit from the optical innovations you have pioneered for spaceborne applications?

**Resolve Optics:** Spaceborne applications present a challenging environment, subject to radiation, where camera lens servicing or replacement is highly undesirable. Overcoming these same challenges has enabled us to become a leading supplier of fixed focus and zoom radiation resistant lenses for applications in nuclear reprocessing and power generation. Our expertise in radiation resistant optics has also been of interest to medical research instrumentation companies. In this market our radiation resistant lenses form targeting elements in synchrotron radiation therapy machines and also in commercial x-ray instrumentation.

Anis Zenadji

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# Ice Cream Makes Chewy Encounter with Digital Manufacturing

**Lotte has implemented Mitsubishi Electric's e-F@ctory to the production of the Japanese famous Yukimi Daifuku ice cream to keep its consistent texture, quality and taste**

Since its launch in 1981, Lotte's Yukimi Daifuku has been loved by people of all ages as a popular Japanese household favorite. Many have tried the unforgettable flavor and texture of the vanilla ice cream balls wrapped in soft, chewy mochi rice cake. "Delicious whenever eaten, regardless of the season," however, to achieve that deceptively simple goal of consistent texture, quality and taste is actually more difficult than most people would have thought. To solve this challenge Lotte has introduced Mitsubishi Electric's e-F@ctory to the production of Yukimi Daifuku.

"Before introducing e-F@ctory, there was an issue of inconsistency in the rice cake quality," said Hiroshi Sugimoto, Manager of the Facilities Department, Urawa Plant, LOTTE Co., Ltd. "When wrapping the ice cream, the hardness of the rice cake used to vary depending on the temperature and water content. Some operations were dependent on people, and losses arose out of the need to finely adjust the machine parameters."

"The e-F@ctory system allows us to conduct improvement activities such as enhancing the



*Yukimi Daifuku has been loved by people of all ages*

operating rate, stabilizing quality, and optimizing staffing for production activities. The extendibility of the system, depending on what we want to do, was also appealing," Hiroshi Sugimoto added.

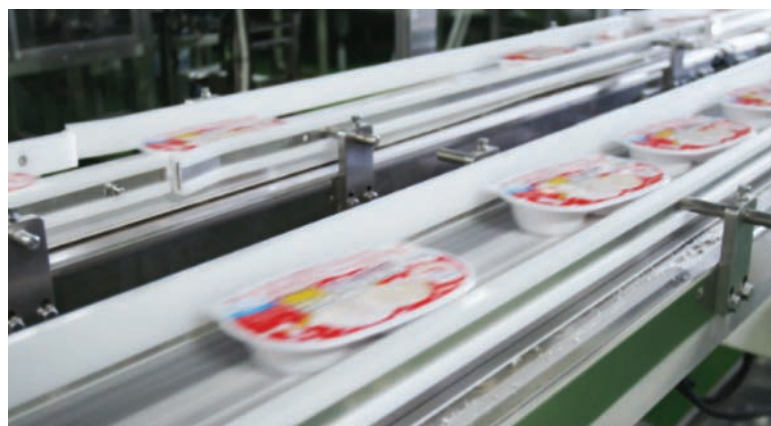
At each of the Yukimi Daifuku production lines the state of the product and the operating status of the machines is collected by PLCs installed in each process. Vast amounts of

data, such as vibration data from the rice cake hopper to data from the conveying inverters is collected. All of the data can be understood in real-time not only through the overall SCADA monitoring system, which is installed in the control room, but also through on-site computer displays.

"By introducing this system, data became centralized, making it possible to view and investi-



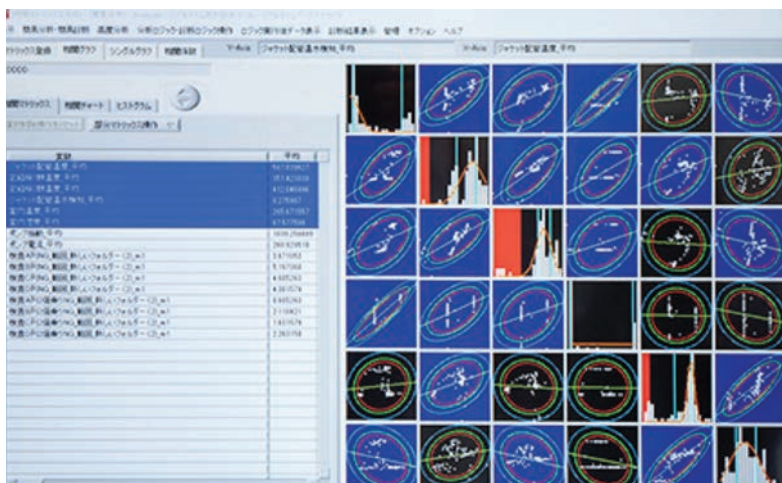
*Lotte is a leading manufacturer of confectioneries, ice cream, general merchandise, and others.*







The Real-time Data Analyzer (left) is running in the Mitsubishi Electric "MELIPC" industrial PC where it gathers and analyzes data and conducts diagnostics



gate conditions whenever we want," remarked Hiroshi Akimoto, Section Manager of Facilities Department, Urawa Plant, LOTTE Co., Ltd. "Because the data volume is extremely high, having all the data centralized in one place has a positive effect. One big benefit is that we can now gather and analyze data and conduct data diagnostics using a real-time data analyzer. This system not only helps us stabilize the state of the rice cakes used for the Yukimi Daifuku, but also promotes improvement activities within the plant."

"Another benefit is the adjustment of the blending ratio of rice cake and ice cream," Hiroshi Akimoto continued. "This was usually done by experienced operators, who monitored the state of the rice cakes as they come out of the

wrapping machine by kneading them with their fingers. We thought it would be great if

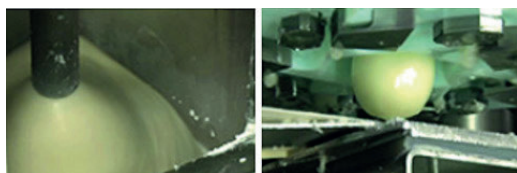
we could automate this process. By automating such processes, which were conventionally performed based on human senses, and by capturing signs of any poor quality in the wrapped rice cakes beforehand, we can eliminate problems. That was our ultimate goal."

"As you know, ice cream is a cold material. This cold ice cream is combined with rice cake, which is warm when it is made," said Takayuki Manako, Executive Director & Plant Manager of Urawa Plant, LOTTE Co., Ltd. "This technical aspect of combining a cold item with a warm one in a good balance is what makes Yukimi Daifuku a complex product. But I think this challenge is something that inspires us to find new ways to overcome it. The temperature in the manufacturing room varies all year round. We strive to maintain consistent conditions, but at the same time, we try to reliably cre-

ate even better conditions. We introduced the e-F@ctory manufacturing concept with the expectation of realizing this in the future."

"In the course of daily production, machines do not operate in the same condition every day. Previously experienced staff members checked and adjusted the settings of the machines," Takayuki Manako continued, "but with e-F@ctory we can visualize the condition of machines and the machines themselves can issue instructions to make adjustments. Another thing is that maintenance and failures are unavoidable with machines. We expect that these can also be better managed by using e-F@ctory's symptom management features."

"The use of IoT has only just been introduced to the production of Yukimi Daifuku, however, the Urawa Plant has many other lines making chocolates and ice creams, so Yukimi Daifuku is not our only challenge," Takayuki Manako added. "We aim to horizontally deploy this system and construct a smart plant in which 'symptom management' and 'operating rate improvement' are implemented on numerous lines. Stable plant operation and manpower savings will eventually make a major contribution in terms of costs and so on. If we consider LOTTE as a whole, our goal is to further evolve this technology and extend it to other plants."



Rice cakes are made by steaming and kneading (left), then combined with cold ice cream (right). The rice cake temperature is key to Yukimi Daifuku's soft and supple texture, which is the key feature of this popular ice cream

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# Developing Digital Capability: How any Factory can be Smart

While the view conjured up by thoughts of smart factories is often one of pristine green field sites with the latest technologies in place, the reality for many manufacturers is very different



Legacy equipment and unconnected lines are more often the norm, along with a wide variety of technologies and differing levels of capability. However, the benefits of digitalisation can be enjoyed by any manufacturer.

When we refer to digitalisation capability, we are really talking about the ability to interface data at line level – typically from machine level devices – and escalate it into the IT world. Many manufacturing sites will have a disparate range of legacy machines that perform their function well and, in many cases, efficiently, but do not offer any digitalisation capability. In a 2013 report, The All-Party Parliamentary Manufacturing Group suggested that this was a result of the British culture of taking pride in making things last as long as possible, contrary to the culture of some other countries that take pride in having the latest equipment.

The challenge this creates today is that when these legacy lines were commissioned, the benefits of collecting data at line level or integrating it with the IT level wasn't understood, and many systems were designed with basic logic functions, using simple analogue I/O. This creates challenges for manufacturers looking to start their smart factory journey.

In addition, some sectors, like food and beverage, can find it hard to justify the investment in technology, where short-term contracts make long-term investment a risk. Plus, most manufacturers are reluctant to disrupt a machine or line if it is working well.

Of course, the most straightforward solution is to retrofit a new control system architecture and place the automation technologies onto it; i.e. maintain a machine's mechanical structure and update everything else around it. While this is the preferred option for some manufacturers, many factories are not able to pause a line for the time needed to undertake a retrofit. For this reason, an incremental approach may be more suitable; looking at explicit parts of a machine and establishing what can be achieved with individual improvements.

## Defining digitalisation objectives

The starting point of any digitalisation journey is to define a clear set of objectives. Becoming digitalised is not an objective in itself. Generally, the desire to develop digitalisation capabilities will be triggered by challenges or opportunities which have already been





the necessary intelligence within their lines. They may know basic information about how many items they produce, but generally, there is no deterministic information such as how productive the line is, how long it is idle or stops for, or how long one part of the machine is waiting for another to finish its process. Deterministic information allows manufacturers to build a level of intelligence that can tell them what to change, or what needs to be added to a machine. And the answer may be simple.

#### Adding a data acquisition layer

If the baseline analysis identifies insufficient system capability to run the required sensors and capture the data they produce, then a secondary data collection layer, using

identified. For example, is the business operating over its capacity? Are production issues causing missed deadlines? Are parts not being delivered on time? Are there quality issues?

Having a clear, prioritised list of objectives is vitally important to understand what needs to be solved before trying to solve it. This will often involve identifying where the greatest return on investment (ROI) can be made, as this is where the quickest digitalisation wins can be found. This might mean replacing repetitive manual tasks with automated capabilities such as robotics, enabling device condition monitoring for prescriptive maintenance function or understanding the causes of quality issues and updating processes and procedures to eliminate them.

#### Understanding the baseline

Next, it is important to analyse the legacy platform by undertaking a technology assessment of plant and capital equipment to establish a baseline of what can already be achieved. In simple terms, this means looking at whether there is any intelligence within the equipment and its wider systems, whether it is connected, and whether it has IT/OT capabilities which can escalate data into the IT domain. For example, many manufacturers have their equipment connected to an ERP system, providing some degree of connected infrastructure. This stage should identify the types of machines, automation architecture and capabilities that are present to provide a holistic view of the status of the plant. Many SMEs have relatively simple sites, so this need not be an overly complex process. A technology assessment may identify that the field level data needed to understand any identified challenges may not be available within the existing systems. Typically, manufacturers with legacy equipment do not have

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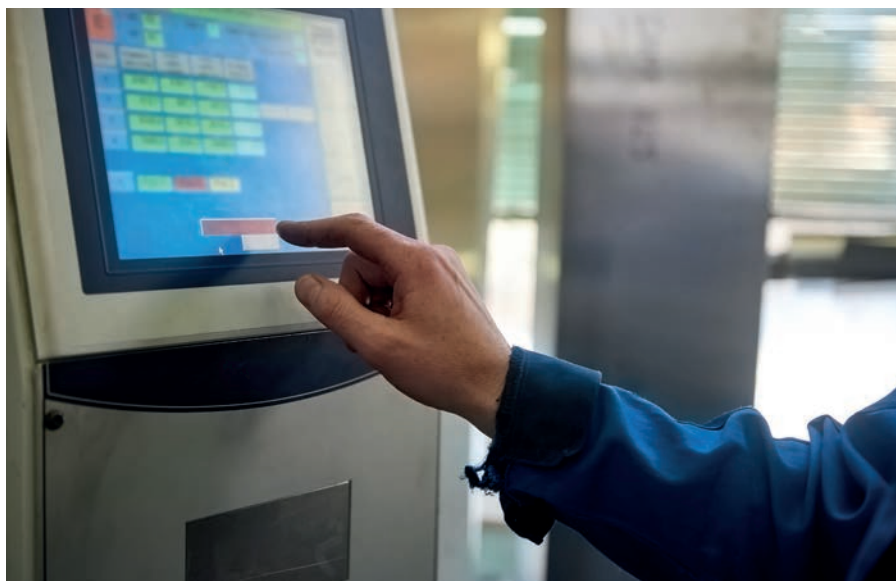
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technologies such as Omron's Sysmac Automation Platform and field level deterministic sensors, can be added. This can work independently to the machine and not interfere with it in any way. This is a particular advantage with legacy equipment as if something were to go wrong, the original equipment may not be able to be replaced. Depending on the machine's scale, this data collection layer could be a system controller with fieldbus communication that allows I/O to be deployed remotely. Alternatively, a central PLC could be used to collect information. The installation will be relatively straightforward, requiring a modest investment, because it is not actually controlling anything on the machine; it is simply collecting data. In addition, some or all of this investment could be redeployed further along the journey, when the project moves from identifying problems to managing them. Essentially, manufacturers can benefit from secondary architecture to which other sensors or automation technology can be added in the future.

The results from the baseline assessment – in terms of scale and investment required to get a facility modernised – could be overwhelming. But remember that an entire site does not need to be tackled in one project. It is far more practical to compartmentalise and prioritise the elements which will give the greatest return, in terms of productivity and efficiency.

In addition, there are several schemes and organisations to help businesses on their journey towards a smart factory. These include the High Value Manufacturing Catapult Centres, which are industry-biased and provide innovation support to businesses. Technology vendors and their integration partners can also provide valuable support.



#### De-risking

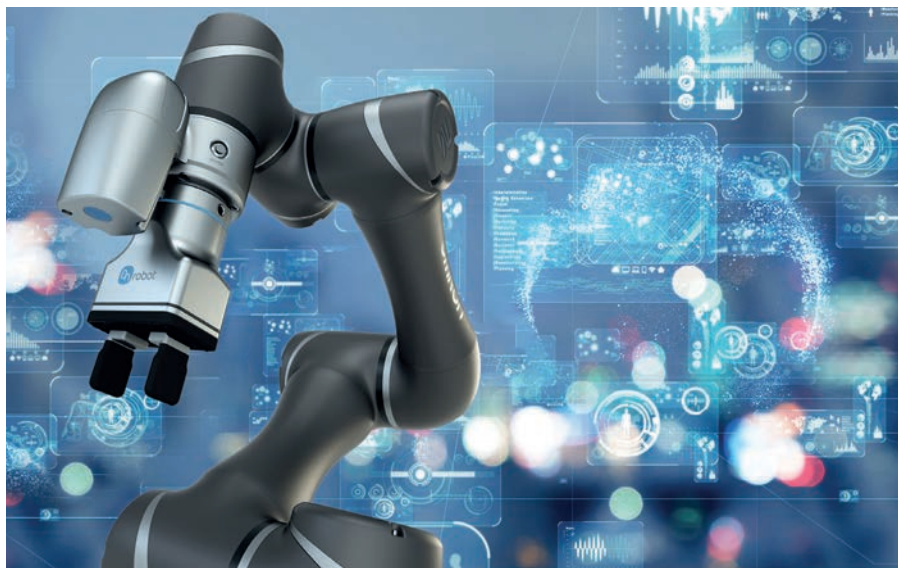
Capital investment in digitalisation can be de-risked by building in flexibility and agility to enable the solution to adapt to future changes within the business. Modern automation systems have this capability built in, and if they are intelligently employed, users can be sure that they will be able to fulfil future requirements. Furthermore, organisations such as Omron are developing different methods of de-risking projects and improving the accessibility of technology, such as through a servitisation approach or alternative financial models. From this perspective, the customer is charged for equipment based on an outcome or performance-based metric, or via a financial leasing solution, as an alternative to a one-off capital investment. This changes the investment decision dynamic from capital costs to operating costs and either solution can offer manufacturers a financial or operation benefit.

#### Conclusion

Reaping the rewards of a smart factory is definitely not limited to greenfield sites. With the right approach, all manufacturing operations – regardless of the age of the equipment in use – can benefit from developing a digital capability, providing they take the right steps. Namely, to identify the business challenges; define the technology baseline; prioritise the areas for improvement; then engage with a technology vendor, systems integrator or support initiative and create a compelling business case.

*Daniel Rossek, Regional Marketing Manager - OMRON UK*

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# Efficiency in Sensor Form - Offered by the Cylindrical Photoelectric M18 Series

Pepperl+Fuchs' cylindrical photoelectric sensors of the M18 series offer five functional principles in three designs - each with a uniform interface

The M18 sensors can be used as thru-beam photoelectric sensors, retro-reflective photoelectric sensors, retro-reflective photoelectric sensors for transparency detection, and diffuse sensors with or without background suppression in almost every standard application.

Due to the standardized sensor portfolio, product selection and operation using a potentiometer are particularly simple and straightforward.

This allows users quick and simple commissioning of several M18 sensors with different designs, lengths, or sensing modes without having to familiarize themselves with different user interfaces. The reduced complexity of the M18 series not only allows time- and cost-saving sensor integration and commissioning, but also simultaneously ensures an increase in efficiency when using multiple M18 sensors.

## Flexible and Functional for a Wide Range of Applications

The photoelectric cylindrical M18 series sensors are designed for functionality and can be flexibly selected depending on the application requirements. They are available with connector or fixed cable and as side or front looker variants. Additionally, users can choose between 40 mm and 60 mm housing lengths.

The rugged metal housings of the M18 sensors are particularly suitable for demanding applications due to the high mechanical stability of the metal thread. As a result, higher tightening torques can be achieved than by

sensors with plastic threads.

For space-saving installation, Pepperl+Fuchs offers cost-efficient side looker housings with shortened length of 40 mm. As a side looker variant, the space-saving sensor can be integrated into roller conveyor applications, for example. This allows installation from below and a view around the corner. The user interface and the status LED on the back of the sensor are clearly visible at all times. This combined with a variety of sensing modes and designs makes the user-friendly M18 sensor series ideally suited for a wide range of standard applications.

## Highlights of the M18 Series

- Five sensing modes in three designs for standard applications
- Time- and cost-saving integration as well as sensor commissioning due to intuitive and proven user interface
- Rugged metal housing for demanding applications
- Shortened design for confined installation situations
- Simple and fast product selection due to standardized sensor portfolio

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## Multiple Output Cascaded Buck Converter Steps

Michael Shriver, Senior Applications Engineer at Analog Devices figures out the use of the LTC3372 as a highly configurable device from 60 V to 0.8 V

The LTC3372 is a highly integrated dc-to-dc converter solution suited for automotive, telecommunication, industrial, and other applications that require multiple low voltage rails derived from input voltages up to 60 V. The LTC3372 contains both high voltage and low voltage converter systems within its thermally enhanced 48-lead, 7 mm × 7 mm package. The high voltage (HV) buck controller can step down an input voltage of up to 60 V to a pin-programmed 5 V or 3.3 V. This 5 V or 3.3 V output is then used to feed the LTC3372's configurable, multiple output, multiphase low voltage (LV) monolithic buck regulator.

This low voltage portion of the LTC3372 consists of eight 1 A, parallel power stages. These stages can be arranged in a number of

The LTC3372 from Analog Devices

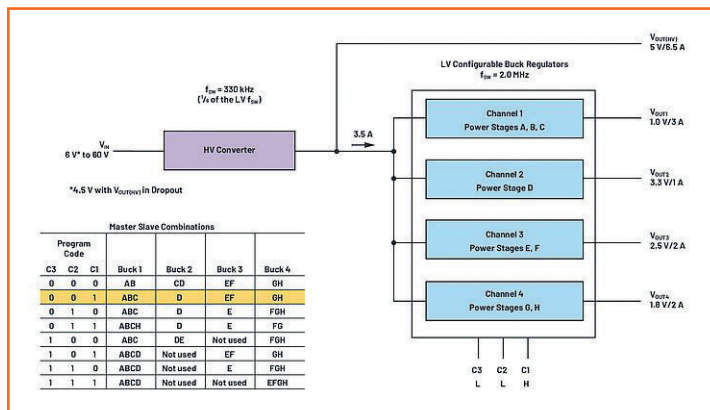


Figure 1. A block diagram of an LTC3372 converter

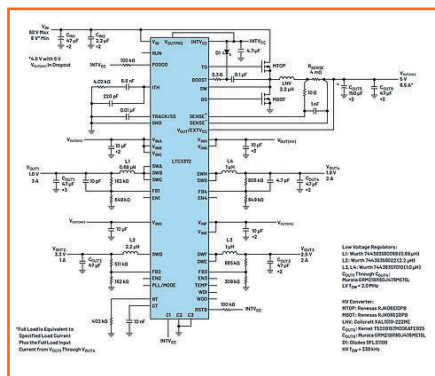


Figure 2. An LTC3372 converter with the LV regulators set up for the ABC-D-EF-GH configuration. Its block diagram is shown in Figure 1

ways to provide two, three, or four channels, with each channel consisting of one to four stages each, depending on the per channel load requirements. As shown in Figure 1, up to eight different configurations are possible by setting the bits at C3, C2, and C1. This level of flexibility allows the designer to use one IC for a wide variety of designs with a minimal number of external components and a small overall footprint. In addition, the output of each channel can be set from 0.8 V to LVIN. The switching frequency range is 1 MHz to 3 MHz. The HV controller drives external N-channel MOSFETs and operates over a 4.5 V to 60 V input voltage range. Depending on the component selection and layout, the HV converter can support load currents over 20 A. This is enough to satisfy the demands of the LV regulators in addition to the system loads riding on the HV output. With only the HV controller on and providing 5 V, the no load Burst Mode® IQ is 15 µA, yielding high efficiency at light loads. An internal clock divider sets the switching frequency of the HV converter to 1/6 of the LV frequency.

### 45 W, 5-Output, Compact Converter from a 6 V to 60 V Input

Figure 1 and Figure 2 show the block diagram and schematic of an LTC3372-based solution, respectively. Its LV regulator section provides outputs of 1.0 V at 3 A, 3.3 V at 1 A, 1.8 V at 2 A, and 2.5 V at 2 A, at a switching frequency of 2 MHz from the 5 V output of the HV converter (labeled as VOUT(HV)). The 5 V HV rail supplies 6.5 A to the system and 3.5 A to the input of the LV regulators at a switching frequency of 330 kHz. The input voltage range of the HV converter is 6 V to 60 V. This converter can be powered from a wide variety of sources, including a 12 V automotive battery with surges up to 60 V, a 48 V telecom or automotive battery, or an offline supply. The high





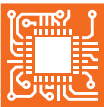


Figure 3. Efficiency of the LV regulators shown in Figure 2

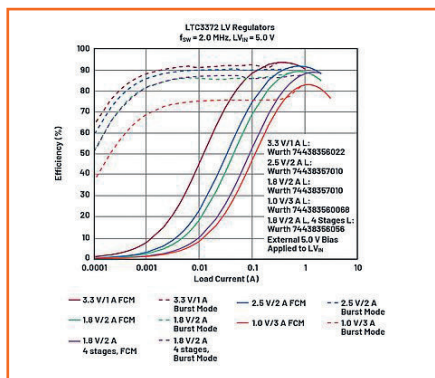
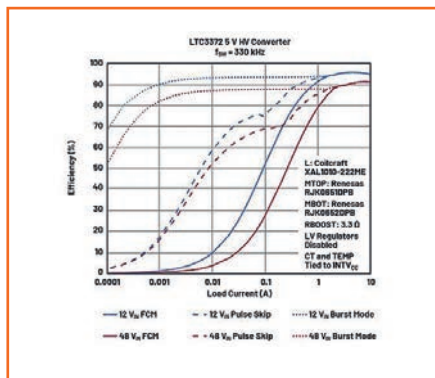


Figure 4. Efficiency of the HV converter shown in Figure 2



level of integration and the 2 MHz switching frequency of the LV regulators allow the solution to fit a 2.2 in2 footprint.

As shown in Figure 1 and Figure 2, the LV regulators are set up for the ABC-D-EF-GH configuration by setting pins C3 and C2 low and pin C1 high and tying the appropriate SW nodes together. By paralleling enough 1 A power stages to satisfy the maximum load requirement—and not more—the efficiency peaks around 50% load, where the typical sustained loads occur. Adding more stages results in higher full load efficiency, but lower efficiency at mid loads. If, for instance, the 1.8 V/2 A LV rail was built from four paralleled power stages instead of two, the efficiency would be lower for loads of 50% or less in FCM—see Figure 3. When Burst Mode operation is selected, the efficiency stays high over a broad range of loads. The efficiency of the 1.8 V/2 A rail is 82.2% and higher for load currents of 1 mA and above.

The strong gate drivers of the LTC3372 HV provide the HV 5 V rail with a full load efficiency of 94.6% at 12 V input and 90.9% at 48 V input—see Figure 4. With Burst Mode operation selected, the efficiency is 90.1% for a load of 1 mA and a 12 V input.

#### High Level of Integration in a Small Package

The LTC3372 comes in a thermally enhanced 48-lead, 7 mm × 7 mm package. Additional features of the LTC3372 include: a PLL/MODE pin to either synchronize the controller to an external clock or program light load operating modes of forced continuous mode, Burst

Mode operation, or discontinuous mode (HV only); a watchdog input and output; a TEMP pin to monitor die temperature; a PGOOD pin for the HV converter; an RSTB pin for the LV regulators; and more.

#### Conclusion

The LTC3372 provides the designer with a flexible, highly integrated solution for providing multiple outputs from a high input voltage. Its HV converter can provide a 5 V or 3.3 V output from input voltages up to 60 V. From this intermediate rail, the monolithic LV regulator can provide up to four outputs with maximum output currents ranging from 1 A to 4 A and voltages down to 0.8 V.

Michael Shriver, Senior Applications Engineer - Analog Devices

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# Level Switches

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Specific Gravity : 0.6  
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Compact and Precise

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Maximum Operating Pressure : 0.5MPa  
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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## Reaching IE5 Efficiency with Magnet-free Motors

Matched with a variable speed drive (VSD), a synchronous reluctance (SynRM) motor with an IE5 ultra-premium efficiency rating provides an effective combination that will help industrial companies achieve their sustainability goals



*Industrial case studies with SynRM motor and VSD packages show dramatic reductions in energy consumption*

has no windings at all. Instead, it contains stacked steel plates with intervening spaces that form a light but robust structure. Furthermore, the rotor does not contain magnets or rare earth metals.

Another difference is that SynRM rotors have no squirrel cage or windings to generate currents and heat, so energy losses in the rotor are virtually nil.

### Benefits Extend Beyond Higher Efficiency

SynRM motors offer benefits in addition to their verified IE5 efficiency. One advantage is their cooler running temperature that extends the life of stator windings, bearing lubricants and the bearings themselves. It also reduces the need for cooling of workspaces.

Their relatively simple construction reduces the risks of failure, while making IE5 SynRM motors easier to service and extending their servicing intervals. A further bonus is that IE5 SynRM motors are significantly quieter than traditional induction motors, so working environments are more comfortable.

The synchronous reluctance (SynRM) motor is a significant development in energy efficient operation. The EU Ecodesign Regulation for low-voltage motors has established minimum efficiency levels based on the International Efficiency (IE) classes defined by the International Electrotechnical Commission (IEC). From July 2021, IE3 is the minimum standard for most industrial motors, including those used with VSDs.

There is also the IE5 ultra-premium rating. This goes well beyond the EU Ecodesign regulation, but some manufacturers are already supplying motors compliant with it. Industrial operators can upgrade now and enjoy practical and economic advantages – as well as demonstrating their environmental responsibility.

Using IE5 SynRM motors can reduce energy losses by 40% as well as significantly reducing energy consumption compared to the IE3 induction motors mandated by the latest regulations. The exact energy savings depend on the specific application and operating con-

ditions. However, industrial case studies with SynRM motor and VSD packages have shown dramatic reductions in energy bills compared with the motors replaced.

### What Makes a SynRM Motor Different?

Externally, a SynRM motor looks like a standard induction motor. The difference is on the inside, as the innovative rotor structure



*An ABB IE5 Synchronous Reluctance Motor*





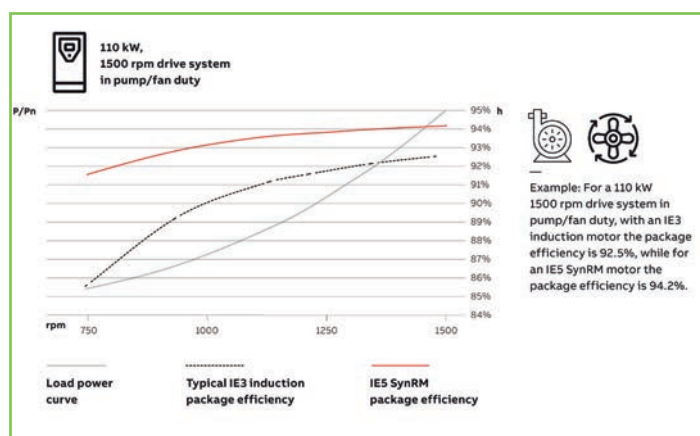


Figure 1 – At partial loads, an IE5 SynRM motor and VSD package offers a significant energy efficiency advantage over an IE3 induction motor

### Partial Load Efficiency

Where IE5 SynRM motor and VSD packages really shine is when they are used at partial load. As shown in Figure 1, the benefit is about 2% at full load, while at partial load it can be as much as 6-7%. This is on top of the savings already offered by installing a VSD.

### Campbell's Australia Cuts Costs with SynRM

An ABB SynRM and VSD package resulted in a considerable drop in energy costs at Campbell's Australia. Over a 12-month period, energy consumption at the plant was reduced by 14%. A total of almost €10,000 was saved annually in energy costs, also leading to an annual reduction of approximately 131 tonnes of CO<sub>2</sub> emissions.

*Stefan Flöeck, Division President for IEC low voltage motors - ABB Motion*

►► 61058 at [www.ien.eu](http://www.ien.eu)

### IE5 SynRM Motor and VSD – The Perfect Package for any Application

A SynRM motor is always installed with a VSD to form an optimized package that offers flexibility and precision to replace standard induction motors in any application. The VSD controls and optimizes the operation of the motor, adjusting its

speed and torque to match the load. This means that the motor does not need to run at full speed all the time, and it means that no energy is wasted through mechanical speed control. In the most common motor applications, such as pumps, fans and compressors, a VSD typically saves up to 25% on energy consumption.

# How Digitalization Technology Can Increase Excavator Efficiency and Lower Emissions

The construction sector is a significant contributor to global CO<sub>2</sub> emissions. While there are several potential pathways to carbon neutrality, manufacturers know that business as usual is no longer an option

In the construction sector, mobile machinery and stationary industrial equipment produce approximately 400 megatons of CO<sub>2</sub> every year. With governments worldwide aiming to achieve net-zero emissions by 2050, it's clear that the industry has a long transformation ahead of it.

Danfoss Power Solutions believes that digitalization is one of the most essential tools for enabling the transition towards a low-carbon society and improving energy efficiency across off-highway and industrial applications. The company is paving the way for an off-highway revolution through its Digital Displacement® pump technology, which introduces new competencies to the world of hydraulics. Niall Caldwell, Danfoss Power Solutions' Senior Director of Research & Development for Digital Displacement®, explains how the technology can be applied to advanced excavator control

to increase efficiency and reduce emissions.

### What exactly is the Digital Displacement® pump?

The Digital Displacement® hydraulic pump can be easily integrated into standard diesel,

hybrid and fully-electric off-highway machines. It enables direct, real-time control of each cylinder within the pump, with software in the controller used to determine the best possible function for every activity a machine or vehicle needs to perform. Additionally, the pump con-



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N° 9 - SEPTEMBER 2021

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tains sensors that provide data on outlet pressure, shaft speed and crankcase temperature. The controller then turns these insights and demand from the machine user into a stream of valve actuation pulses.

The multi-outlet, digitally-enabled pump offers multiple benefits compared to traditional pumps, such as improved productivity and control, better fuel consumption and the potential to downsize engines or battery packs.

## Bringing the digital excavator to life

Danfoss Power Solutions envisages that Digital Displacement® will be suitable for all construction, agriculture and other off-highway vehicle markets. However, the company has found that the technology can significantly impact excavators in particular, with research showing that hydraulics systems on excavators can achieve fuel savings of 30% by installing Digital Displacement® pumps. Furthermore, Danfoss Power Solutions has already identified a pathway in which these savings can be increased to 50% in the future. Hydraulics are at the heart of most excavators. However, due to the growing demand for electric solutions, they are coming under more and more scrutiny as they cause high amounts of system-related losses. Digital Displacement® directly tackles losses linked to the pump and brings new capabilities to the way hydraulic power is created. There are four main benefits the Digital Displacement® pump offers that improve the efficiency of hydraulics systems, as well as the overall performance of excavators.

### 1. Better pump efficiency

Danfoss Power Solutions has benchmarked its Digital Displacement® pump against axial

piston pumps. The company has found that the technology performs very efficiently when operating over a wide range of loads, offering an overall efficiency greater than 90% even when running down to 20% displacement. This results in less energy loss as the system generates less heat. Furthermore, machine functions, user experience and operator interface are all unaffected, while the Digital Displacement® pump also fits into the same space as traditional axial piston models. This means that OEMs don't need to make any adjustments to size or space when designing excavators.

### 2. Improved system efficiency

The Digital Displacement® pump has been designed with multiple independent fluid outlets all contained within a single body. However, they can all do different things and can change their functions in real-time. For instance, one outlet could be handling pressure control while another performs another type of control action. A single controller manages all possible processes with a master torque limit. Additionally, it is possible to combine the outlets with digital valves, allowing flow to be allocated where needed in the hydraulics system of an excavator. This functionality helps remove throttling in the system and guarantees that flow is generated efficiently.

### 3. Efficient energy recovery

Excavators lose energy that could be recovered and reused when operating, such as lowering or swinging the machine's boom. During extensive testing, Danfoss Power Solutions has found that the Digital Displacement® pump can save 87% of the energy used when going through the entire cycle of moving the excava-

tor boom and put it back into excavator operational use. A saving of this scale is new territory in hydraulics, with the company excited about the potential this offers for fuel savings and productivity improvements. By combining Digital Displacement® technology with similar system architectures such as electric motors, Danfoss Power Solutions believes it can get to above 50% fuel savings and improve productivity by upwards of 25%.

## 4. Digital control supporting global megatrends

The parameters of the Digital Displacement® pump are set using software, meaning there is no need for this to be performed manually, as you would expect with traditional pumps. This digital control allows design changes to be implemented quickly, speeding up the entire delivery process. Being entirely software-controlled also means that all pump functions can be changed and configured for specific applications. At the same time, it can also rapidly and accurately limit its input torque, maximizing the power that's delivered by the engine of an excavator. Having the choice of multiple control functions and the ability to change the function of individual outputs offers system engineers the chance to use the Digital Displacement® pump functions in different ways and various duty cycle modes. The software behind the Digital Displacement® pump also connects several global megatrends. For example, the pump's quick response rate – which is nearly an order of magnitude better than most traditional hydraulic pumps – can be synchronized with other system activities. As electric motors and inverters are also software-driven, a combination of the Digital Displacement® pump and an electric drivetrain means that all system parameters can be precisely controlled, enabling extremely efficient system architectures. This increased control is something that can transform the construction market as more OEMs switch to electrification. Digital Displacement® technology can also play an influential role with autonomous vehicles, with the software's predictable and accurate output being highly beneficial for control systems. Moreover, the built-in software modules of the pump can be easily configured to connect and communicate with controllers, offering further benefits to OEMs. These advantages include the ability to utilize model-based design and generating data for system monitoring.

## A roadmap to lower emissions

While no formal CO<sub>2</sub>-reduction targets are currently imposed on the construction industry,



proactive measures are becoming more and more visible across the sector. Emission-free zones have been introduced, tender requirements are becoming more prevalent and individual targets are being set by OEMs and local governments. However, there remains a shortage of products available on today's market to help construction companies significantly reduce their CO<sub>2</sub> emissions.

Excavators account for 50% of all CO<sub>2</sub> emissions generated by construction machinery, making it paramount that new solutions are introduced to the market to bring this figure down. Although alternative powertrains are already available for mini excavators, this is not having a significant impact on emissions. This is why Danfoss Power Solutions has taken a deep, holistic look at the excavator market and set up a scenario where emissions from medium and heavy excavators can be reduced by 30% by 2030.

Rather than considering the impact a particular technology could have on an individual excavator, the company's analysis includes the total effect and market adoption requirements. It also has studied the complete CO<sub>2</sub> footprint of an excavator – whether a hybrid

or fully-electric model – rather than only looking at the on-site emissions reduction impact. Danfoss Power Solutions has found that in even the most optimistic scenario, electrification solutions alone will only reduce emissions from excavators by 12% by 2030. However, the greater efficiencies offered by Digital Displacement®, when adopted in tandem with electrification, offer a no regrets pathway to reducing excavator emissions by 30% by 2030. This is through a twofold benefit of lowering commercial barriers to electrification and unlocking significant CO<sub>2</sub> emissions reduction from conventional excavators with internal combustion engines. Digital Displacement® opens the door for electrification by reducing the size of batteries required in excavators, a move that is beneficial in terms of cost and supply. The technology also compensates for the potential lack of nearby charging infrastructure as it requires less charging power, while the fact it needs less energy for charging also means it reduces power taken from the grid.

#### Where next for Digital Displacement®?

Danfoss Power Solutions is currently bringing all of these benefits together and develop-

ing Digital Displacement® pumps ready to be commercialized for the mobile machinery market. The company is in the process of testing three models at various phases of the design process, two of which have already undergone widespread, rigorous testing both internally and with existing customers. It plans to bring the first Digital Displacement® pump designs to market before the end of this year, with each model building on and improving the capabilities of the previous to provide additional benefits to OEMs and match their individual, varied needs. The third pump model will be ready for market at a later date, as it is being designed with a new frame size and structure to enable it to be used in larger excavators.

Danfoss Power Solutions intends to revolutionize the excavator market through a combination of leading technologies. Through its innovative Digital Displacement® technology and Danfoss Editron electric drivetrain systems, the company is delivering solutions that meet the challenges faced by major OEMs in the construction market and driving the industry towards net-zero emissions.

►► 61142 at [www.ien.eu](http://www.ien.eu)

# Nidec ASI Continues its Efforts for Greener and more Sustainable Mobility

The company introduced its Ultra-Fast Charger designed for next-generation electric vehicles

Nidec ASI announced the installation of an Ultra-Fast Charger (UFC) station in the ROA Group service area on the Telesina (Benevento) state road 372. The installation of this system contributes to the gradual generalization of electric mobility in Italy, a sign of its commitment to a more sustainable model of development and tourism. This engagement is also reflected within the Group itself, by the renewal of the company's fleet of vehicles, which has become entirely electric, and by the installation of two UFCs in the Milan and Montebello offices. This system allows cars equipped with the latest generation of batteries to be charged up to 80%, in parallel or in series, in less than 15 minutes. Its compact size allows it to provide an extensive distribution network to meet the needs of

the electric car market players.

#### A Modular Design for a Greener Future in Line with the Priorities of the Stimulus Plan (Development of Green Infrastructure)

The system developed reduces the impact of charging points on the national grid by modernizing the electrification process of electric car charging infrastructures. The UFC allows cars, buses, and commercial vehicles to be charged without drawing electricity directly from the grid, thus avoiding power peaks and possible blackouts. It also incorporates an energy storage battery that acts as a "buffer" between the power grid and the charging point. The chargers can be connected to LV or MV grids and can provide up to 320 kW of power to a vehicle with an



energy consumption of only 50 kW. Nidec ASI will deliver to the ROA group a Powersafe 1.0 with two 79kWh battery packs equipped with a charging point with two 160kW outlets and 2 certified meters. Also powered by an existing photovoltaic system, the system will be able to use 100% green energy while reducing the impact on the grid. The ROA Group will benefit from a rapid return on investment, guaranteeing a source of revenue from the charging of electric vehicles and from the supply of electricity to the national grid thanks to the B2G (Battery-To-Grid) function, which allows part of the energy stored in the Powersafe to be used for the electrical consumption of the service station.

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N° 9 - SEPTEMBER 2021

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## SINGLE BOARD COMPUTER

Designed for real-time mission-critical applications

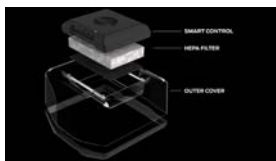


**Distec** expands its product portfolio with the iBase "IB836" 3.5" single board computer (SBC). Designed for real-time mission-critical application areas such as transportation, industrial automation, IIoT, measurement technology and medicine, the long-term available SBC is powered by Intel® Atom™ x6000 series industrial processors. The board also benefits from 2 DDR4 memory slots with 32GB capacity. The SBC has 3 Intel Gigabit LAN interfaces and its sturdy design is engineered to support a wide temperature range from -40° to +85°C. Three independent displays with resolutions up to 4Kp60 can be driven through two DisplayPort connectors (DP & USB Type C) and an internal eDP or 24-bit dual-channel LVDS output. The compact design measures 102mm x 147mm and operates from an industrial voltage input of 9 to 36 volts.

►► 61163 at [www.ien.eu](http://www.ien.eu)

## SMART FILTRATION SYSTEM FOR 3D PRINTERS

Removes up to 95% of ultrafine particles



**MakerBot Clean Air™** is a smart-controlled HEPA filtration system designed for the MakerBot METHOD® and MakerBot METHOD X® 3D printers. It filters out ultra-fine particles during the printing process through the built-in HEPA filter. Tests at MakerBot show that they are effective in removing up to 95% of ultrafine particles compared to printing without this device. METHOD, METHOD X and SKETCH™ 3D printers already possess several safety features. Designed with enclosed build chambers, this prevents touching the parts or extruder during printing. METHOD printers include an automatic pause system when the chamber door is opened during printing while SKETCH printers benefit from a built-in particulate filter ensuring safer printing in school environments.

►► 60898 at [www.ien.eu](http://www.ien.eu)

## COMPUTER-ON-MODULE WITH 4 TO 16 CORES

With 4 SODIMM sockets delivering 128 GB DDR4 RAM



**Kontron's COM Express® Basic Type 7** Computer-on-Module delivers server-class performance with AMD EPYC™ Embedded 3000 SoC processors. It provides excellent networking and connectivity capabilities with 4 10GbE interfaces and up to 32 PCIe

Gen 3 lanes. An optional NVMe card can also be integrated into the existing 2 SATA ports. With its robust and compact 125 x 95 mm design, it enables high-performance headless server applications (no display), including embedded edge and micro servers, medical imaging, 5G, AI, machine learning/camera inspection and test & measurement. Designed for harsh environments, the COMe-bEP7 operates over a wide temperature range from -40°C to 85°C. It also includes 4x USB 3.1, 4x USB 2.0 as well as LPC, SPI Flash, SMB, Dual Staged Watchdog and RTC.

►► 60906 at [www.ien.eu](http://www.ien.eu)

## SPECIALIST LENSES FOR CCTV CAMERAS

Designed for visual inspection in nuclear power stations



Following on from the widely reported accidents at Chernobyl, and more recently the Fukushima Daiichi nuclear power plants, the need for CCTV camera systems that can operate even when subject to high radiation was clear. All optical elements in **Resolve Optics** radiation-resistant lens designs for CCTV cameras are made using cerium oxide-doped glass or synthetic silica. This allows the fixed focus and zoom camera lenses to withstand radiation doses

up to 1 billion rads and temperatures up to 100°C without significant discoloration or performance degradation. These specialist lenses also provide high image resolution and minimum geometric distortion from 400 to 750 nm.

►► 60895 at [www.ien.eu](http://www.ien.eu)

## SELF-REGULATING HEATING CABLE

Provides superior levels of high power retention



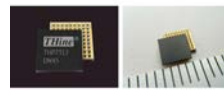
**nVent** released the nVent RAYCHEM HTV self-regulating heating cable designed for critical industrial applications subject to high temperatures.

The cable operates at continuous operating temperatures of 205°C/400°F and can withstand temperatures up to 260°C/500°F. It retains 95% of its power output after 10 years of performance at 205°/400°F significantly reducing risk of downtime while increasing safety and productivity on site. Enhanced performance are achieved through the use of a semi-conducting polymer nanocomposite. Internationally certified for use in hazardous areas, the self-regulating cable offers professionals the opportunity to advance their process integrity and operational efficiency for decades to come.

►► 60904 at [www.ien.eu](http://www.ien.eu)

## STANDALONE IMAGE SIGNAL PROCESSOR

For 4K 30 Fps Video



**Thine Electronics** introduce the THP7312-P image signal processor (ISP) supporting video streaming resolutions of up to 4K 30 fps in YUV format. The ISP features a RAW8 output option to interface and

collaborate with the ISP block of large-scale SoCs. The RISC-based 32-bit wired image signal processor in these ICs enables high performance such as <1ms low latency and <0.5W power efficiency. Two package options are available, a BGA (8.0 x 8.0 mm) and a smaller WLCSP (3.9 x 4.0 mm). The THP7312-P is supported by the ISP firmware development tool. The Camera Development Kit (CDK) tool includes a hardware kit (THEVAP7312-P) containing the THP7312-P which allows customers to develop their own customized ISP firmware IP to drive and manage the production of their CMOS camera sensor module.

►► 60907 at [www.ien.eu](http://www.ien.eu)





## DISPLACEMENT MEASURING SYSTEM

More flexibility with new measuring ranges of 6 and 8 mm



The eddyNCDT 3060 displacement measuring system from **Micro-Epsilon** has been enhanced with new measuring ranges of 6 and 8 mm, offering more flexibility. This opens up new fields of application in a wide range of industry

fields. With its new measuring ranges, the eddyNCDT 3060 displacement measuring system thus helps solve new, demanding measurement tasks in industrial processes with the highest precision. The sensor portfolio, which is compatible with the controller, now comprises more than 400 models. The eddyNCDT 3060 combines precision, high speed and temperature stability. This system's measurement tasks comprise precise gap monitoring, determination of shaft movements and monitoring the radial run out of machine parts and drive components.

►► 60955 at [www.iem.eu](http://www.iem.eu)

## 10 GBPS FULL BANDWIDTH DIGITAL ISOLATOR

Compact solution with simplified connectivity



**Analog Devices** released the ADN4624 digital isolator with 4 isolated 2.5 Gbps channels, the first in a new iCoupler digital isolator series. It enables direct isolation of high-speed serial LVDS or CML at full speed and eliminates the

complexity of deserialization. It enables seamless data transfer in the electrical domain and enables new system architectures in digital health, instrumentation and smart industry. Compliant with medical standards, it reliably isolates high-fidelity video and imaging links, precision analog front ends, and serial interconnects as an alternative to bulky, specialized fiber solutions. The ADN4624 provides precision timing with ultra-low jitter to achieve full ADC performance and resolution, including precision ADC sampling clocks.

►► 61004 at [www.iem.eu](http://www.iem.eu)

## HD VIDEO SOLUTION FOR ADAS

Video transmitted by modulated analog signal



**Renesas** provides the RAA279971 AHL encoder and RAA279972 decoder using a modulated analog signal to transmit video. This enables the use of traditional twisted

pair cables and standard connectors as well as existing analog video cables and connectors, and achieves transmission rates 10 times lower than those required to transmit HD signals digitally. The MIPI-CS12, BT656 and DVP inputs and outputs provide a flexible interface to support old and new image sensors. AHL offers a bi-directional control channel to initialize, program and monitor the camera module. Robustly designed against noise, it also has the ability to control the camera simultaneously on the same wire pair (UTP) during video transmission. The AHL supports resolutions ranging from VGA to 720p/60 or 1080p/30 which allows more flexibility to implement non-standard vertical resolutions.

►► 61006 at [www.iem.eu](http://www.iem.eu)



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## LINEAR POSITION SENSOR

Engineered for valve position detection



**Alliance Sensors** introduces its PG Series LVDT linear position sensors. Features built into the design of the PG Series LVDTs include non-detachable core connection/operating rod, installation specifications (such as

standard body clamps, flange mounts, ball couplings and rod eye ends) two dual-contact shaft seals that prevent contaminants from entering the LVDT bore, no connector thanks to a sensor with screw terminals that accept 24-14 AWG wires, continuous sensor operation up to 350 degrees F (175 C), and finally, built-in over-temperature indication and two-year warranty. LVDT sensors feature a versatile mounting configuration and a large diameter, thick-walled housing. The control rod is 3/8 inch in diameter and contains the core so it cannot vibrate or come loose.

►► 61003 at [www.iem.eu](http://www.iem.eu)

## HEAT SINKS FOR SIC, GAN POWER MODULES

High cooling capacity and minimal pressure drop



**Mersen** introduced IsoMAXX cold plates for liquid cooling systems. Meeting the high demands of modern power electronics, IsoMAXX cold plates are vacuum brazed and designed for low pressure drop. With an average

thermal resistance of 6 °C/kW. And at ~600 mbar, they guarantee a lower pressure drop compared to previous models. IsoMAXX cold plates provide an optimal temperature range for power electronics, where all individual chips and modules on the cold plate remain at the same temperature. No minimum spacing is required between modules, allowing versatile integration no matter how many modules are needed for a particular application. This allows development engineers to design solutions with minimal space requirements and increased efficiency.

►► 61005 at [www.iem.eu](http://www.iem.eu)

## SMART & EASY-TO-INSTALL IR SENSORS

Designed for process control applications



The latest Thermalert 4.0 Series pyrometers from **Fluke Process Instruments** are engineered to get accurate, real-time infrared temperature measurements for process control applications. The latest

update features a wide range of integrated infrared sensors with numerous spectral ranges. Each pyrometer conforms to Industry 4.0 standards, combines innovative digital technology with standard two-wire installations for all setups (such as optional HART communications) and can be ordered with ATEX and IECEx certification and has ability to withstand ambient temperatures up to 85°C (185°F) without extra cooling. With multiple communication options, this smart pyrometer provides the features needed to understand temperature data and control process in a compact, integrated package that is easy to install and operate.

►► 61031 at [www.iem.eu](http://www.iem.eu)

## CODED QUICK RELEASE COUPLINGS

Fool-proof stainless steel connection components



**Eisele** offers easy-to-clean, fool-proof, quick release couplings that are suitable for a wide range of applications from compressed air to food, including extreme temperatures applications.

Available in round, triangular, hexagonal or octagonal versions, they are manufactured from stainless steel 1.4404 and are equipped with FDA-compliant seals. They prevent the penetration of contamination through the outer contour in connected state. The quick release couplings are available with one-sided or two-sided shut-off function, for more safety. The operating working pressure is from 0,5 to 10 bar (7.25 to 145 psi). The connectors of the INOXLINE series consist of a coupling and a plug nipple. The all-metal couplings only weight around 55g. The special FPM seals withstand operating temperatures from -50°C to +200°C.

►► 61034 at [www.ien.eu](http://www.ien.eu)

## INDUSTRIAL IMAGE ANALYSIS SOFTWARE

Provides highly reproducible analysis using AI



**Olympus Stream™** image analysis software adds TruAI™ deep learning technology in

version 2.5 that allows users to train neural networks to automatically segment and classify objects in microscope images for a variety of material inspections. The trained network can then be applied to other analyses for a similar application. A powerful interface for training and managing neural networks. The interface allows users to label images and perform batch training. Networks can be configured with multiple input channels, trained to identify up to 16 classes, and imported or exported. The TruAI solution allows training details to be reviewed or modified. Users can also obtain repeatable and quantitative results through the software's Count and Measure solution. Finally, the software update provides users with access to Olympus workflow customization services to address specific application scenarios, challenges and user goals.

►► 61044 at [www.ien.eu](http://www.ien.eu)

## AUTOMATED PRECISION CUTTING EQUIPMENT

For porous plastic components



**Porvair Sciences** is investing in the installation of new automated precision cutting equipment to meet a substantial increase in customer demand for precision components made from its Vyon® high performance porous plastics.

The equipment is recommended for pipette tips. Vyon provides consistent and efficient flow qualities. Vyon is available in polyethylene and polypropylene and is manufactured with a controlled and consistent pore size distribution. This design allows for many filtration, separation and liquid handling applications in industries such as healthcare, pharmaceuticals or life sciences. Thanks to regulatory certified polymer powders, Vyon components offer outstanding chemical compatibility for analytical laboratory applications such as chromatography sample preparation.

►► 61047 at [www.ien.eu](http://www.ien.eu)

## SMART PERFORMANCE INDUSTRIAL PC

For higher computing performance



Equipped with 8th or 9th generation Intel® Core™ processors, the KBox B-202-CFL from **Kontron** handles computationally intensive processes and large amounts of data. The "Smart Performance" variant includes a 270 W power supply that allows

the use of high-performance graphics cards up to 120 W. This variant enables high graphics performance and image quality for graphics-intensive applications with possible applications in the fields of digital signage, infotainment and optical quality control. In addition, graphics or network cards can be added via the PCIe interface. The "Smart Storage" variant supplements the basic configuration with a 2.5" SATA SSD and an M.2 SSD, offering the possibility of mirroring data in RAID Level 1 with two additional 2.5" SSDs (fixed or removable).

►► 61043 at [www.ien.eu](http://www.ien.eu)

## CARBON-FILLED PEEK GRADE

Enhanced performance for braking systems



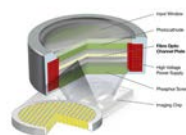
Designed for precision components in e-mobility brake systems and electronic pumps, **Solvay's** KetaSpire PEEK KT-850 SCF 30 grade provides better sealing performance than standard PEEK grades filled with 30% carbon fiber. KetaSpire®

KT-850 SCF 3 allows for the replacement of metal with polymer pistons. ABS/ESC pistons contribute to the proper functioning of the system's hydraulic unit, which combines an electronic pump, an electronic control unit (ECU), valves to control brake pressure at the wheels, sensors to measure road speed, and the plunger responsible for actuating the valve movement by controlling the supply of brake fluid. The KetaSpire® KT-850 SCF 30 grade allows for greater metal (aluminum) replacement while optimizing the material's flow characteristics and surface finish of the parts.

►► 61046 at [www.ien.eu](http://www.ien.eu)

## FIBER OPTIC CHANNEL PLATES

Prevent the image sensor from deterioration



Fibre Optic Channel Plates (FOCP) are widely used as optical devices to replace optical lenses because they require no focusing distance. Comprised of a bundle of micron-sized optical fibres - FOCP are used as a lens to transmit light or an image with

extremely high efficiency and low distortion. In each single fibre of a FOCP the light is transmitted by total internal reflection that occurs at the boundary between the core glass and the cladding glass due to the difference in their refractive index. FOCPs are widely used to couple light to solid state imaging devices such as CMOS and CCD image sensors. Used as the light receiving surface of an X-ray imaging device, the low distortion FOCP processed by **Optical Surfaces** is a key component preventing the image sensor in the camera from deteriorating due to exposure to X-rays.

►► 61048 at [www.ien.eu](http://www.ien.eu)



## AGGRESSIVE FLUIDS EDITION PORTABLE COUNTER

For use with phosphate esters



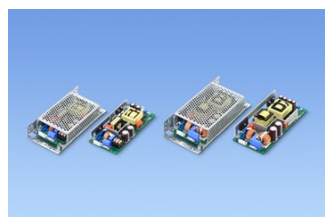
**MP Filtri** released the new LPA3 'aggressive fluids' edition which can now be used with Skydrol and HyJet, and has been upgraded for industry with specialist seals, a new internal architecture, and a new firmware suite. Featuring innovative optical and photodiode technology offering complete 8 channel measurement, the LPA3

provides an accurate and comprehensive hydraulic health check - while its real-time monitoring and proactive maintenance technology safeguards machinery, enhances performance and productivity, while reducing unplanned downtime. The LPA3 is fully portable at just 10kg - enabling operators in all industries to enjoy the functionality of the lab even when out in the field.

► 61052 at [www.ien.eu](http://www.ien.eu)

## CONVECTION COOLED POWER SUPPLIES

With 200% peak-power



**COSEL** announced the addition of 150W and 300W free air convection cooled power supplies, the LHP150F and the LHP300F. Designed for industrial applications requiring high levels of safety, the LHP150F

and the LHP300F are certified according to EN62477-1 (OVC III). The products work over a wide universal input voltage range of 85 to 264VAC and have a high typical efficiency rating of 93%. The LHP150F and LHP300F are available in five different output voltages commonly used in industrial automation and processes, with 200% peak power capability for up to 10 seconds for dynamic loads. The standard product is an open frame PCB type, with a chassis and cover available as an option.

► 61165 at [www.ien.eu](http://www.ien.eu)

## ROTARY POSITION SENSORS

Accurate positioning of automotive robots



**Newtek** RV series of Rotary Position Sensors ensure the performance accuracy of industrial robotic systems used throughout automotive assembly plants. Automotive robots perform arc and spot welding in

attaching chassis components on an assembly line and painting, sealing, and coating automotive bodies. Rotary position sensors provide highly accurate angular displacement measurements to ensure the correct positioning of robotic arms. With a shaft that rotates 360° with no stops, the RV Series of Rotary Position Sensors measure shaft angle position over a nominal range of  $\pm 30^\circ$ . Without internal components to wear or degrade, this RVDT technology offers long mechanical life even in the harsh, wet, and dirty locations of automotive assembly.

► 61166 at [www.ien.eu](http://www.ien.eu)



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## OUTPUT TURBINE FLOWMETERS

Titan reported on flow meter performance



**Titan Enterprises** reported on flow meter performance of pulse output turbine flow meters and how each factor influences the accuracy of flow measurement. The mechanical properties of the flow meter and the physical properties of the

fluid combine to influence the general performance of the flow measurement device. Whereas turbine flow meters, such as Titan's Beverage flow meter and 800 series, offer the high level of repeatability and reliability required for accurate batch delivery systems, Titan's Atrato® and Metraflow® ultrasonic flow sensors and the larger oval gear flow meters, are highly accurate over wider flow ranges, especially with viscous liquids such as oils.

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## SYSTEM-ON-MODULE

With Microchip's PolarFire SoC FPGA



The M100PFS System-on-Module (SoM) from **Aries Embedded** is a platform based on Microchip's PolarFire® system-on-chip (SoC) FPGA family. The module features its IP reference design, a customized zero-stage bootloader, U-Boot as a

generic bootloader, Linux with Yocto support, and Hart Software Services (HSS). The embedded board impresses with its low power consumption, very good efficiency and high system security in a variety of different use cases. It is ideal for applications such as safety-related systems and artificial intelligence, where a high-performance, secure and energy-efficient computer architecture is to be combined with an FPGA. Its wide range includes applications such as smart embedded vision, industrial automation with robotics, telecommunications and IIoT.

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## VISION SENSORS

A flexible vision tool set in one camera



The universally applicable VOS 2D vision sensors made by **Pepperl+Fuchs** provide fast and reliable measurement data for precise quality control. With flexible configuration options and evaluation methods, the camera-based sensors can be used in a wide range of automation applications. Pepperl+Fuchs offers a customizable camera portfolio with standardized connections—consisting of sensors, illumination and lenses—which can be combined to meet the challenges of a wide array of applications. All sensors have standardized connections for possible expansion with external components—such as separate illumination, C-mount lenses with different focal lengths, or even waterproof lens housings with IP67 protection. In addition to integrated illumination, the VOS1000 and VOS2000 vision sensors have a mechanically adjustable focus, which provides measuring distances from 0 to 1000 mm.

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## Companies in this issue

Orange for companies advertising in this issue

<b>A</b>	ABB MOTION	22			NIDEC INDUSTRIAL AUTOMATION	25
	ALLIANCE SENSORS	27			NVENT	26
	ANALOG DEVICES	20, 27		<b>O</b>	OLYMPUS	28
	ARIES	29			OMRON ELECTRONICS	16
<b>C</b>	COSEL	29			OPTICAL SURFACES	28
<b>D</b>	DANFOSS	23		<b>P</b>	PCE	5
	DISTEC	26			PEPPERL+FUCHS	19, 29
<b>E</b>	EISELE	28			PORVAIR SCIENCES	28
<b>F</b>	FLUKE PROCESS INSTRUMENTS	27		<b>R</b>	RENEASAS ELECTRONICS	27
<b>I</b>	INSPEKTO	8			RESOLVE OPTICS	12, 26
<b>K</b>	K.A. SCHMERSAL	5			<b>RIKO FLOAT TECHNOLOGY</b>	<b>21</b>
	KONTRON	26, 28		<b>S</b>	SCHURTER	5
<b>L</b>	<b>LEMO</b>	<b>7</b>			SOLVAY	28
<b>M</b>	MAKERBOT	26			SUPPLYPOINT	10
	<b>MBO OSSWALD</b>	<b>17</b>		<b>T</b>	THINE ELECTRONICS	26
	MERSEN	27			TITAN ENTERPRISES	29
	MICRO-EPSILON MESSTECHNIK	27			<b>TRACO ELECTRONIC</b>	<b>11</b>
	<b>MITSUBISHI ELECTRIC</b>	<b>9, 14</b>		<b>X</b>	XILINX	5
	MP FILTRI	29		<b>Y</b>	YOKOGAWA	11
<b>N</b>	NEWTEK SENSOR SOLUTIONS	29				

### SEPTEMBER

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**05 - 07**

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**12 - 16**

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