PEPPERL+FUCHS

# News for Factory Automation

1/2017

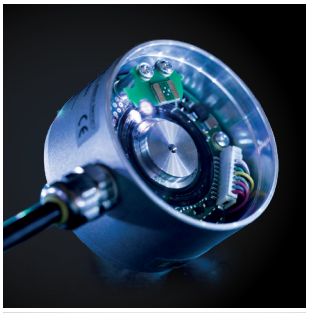
## Perfect Positioning

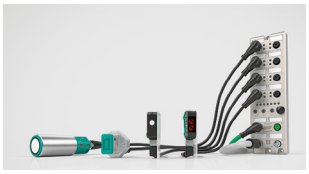
The WCS position encoding system enables highly precise positioning of heavy containers in ports around the world.

## People Make the Difference

Three experts discuss the working world of tomorrow.

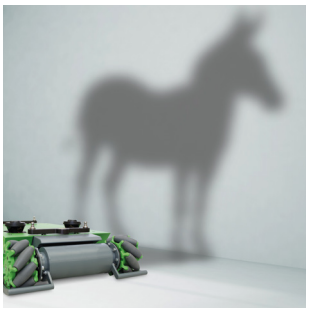
# 04





## APPLICATIONS+ KNOWLEDGE



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# TECHNOLOGIES+ PRODUCTS



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# MARKETS+TRENDS



## Dear Reader,

When Karl Drais's invention laid the foundation for the modern bicycle 200 years ago, he could never have imagined that his idea would move so many people—quite literally. Carl Benz would have had just as little inkling of how many cars would be rolling through our streets 130 years after the birth of the automobile. It is human nature to continue moving forward, rather than to stay put. Scores of significant inventions from recent centuries can be characterized this way, constantly reshaping the way we live our lives.

Pepperl+Fuchs is no different, with plenty of exciting projects in motion—in both the literal and the figurative sense. For example, giant containers at major ports around the world are being positioned precisely using our sensor technologies, and driverless transport systems are delivering goods from A to B completely automatically, relieving the burden on the workforce. But the world of industry in general is on the move, too: digital technologies are opening up previously unimaginable new possibilities, reshaping our day-to-day lives. To participate in this transformation, Pepperl+Fuchs leads the way with new ideas. Join us for a stretch of this exciting journey!

I hope you are inspired by the sights along the way,

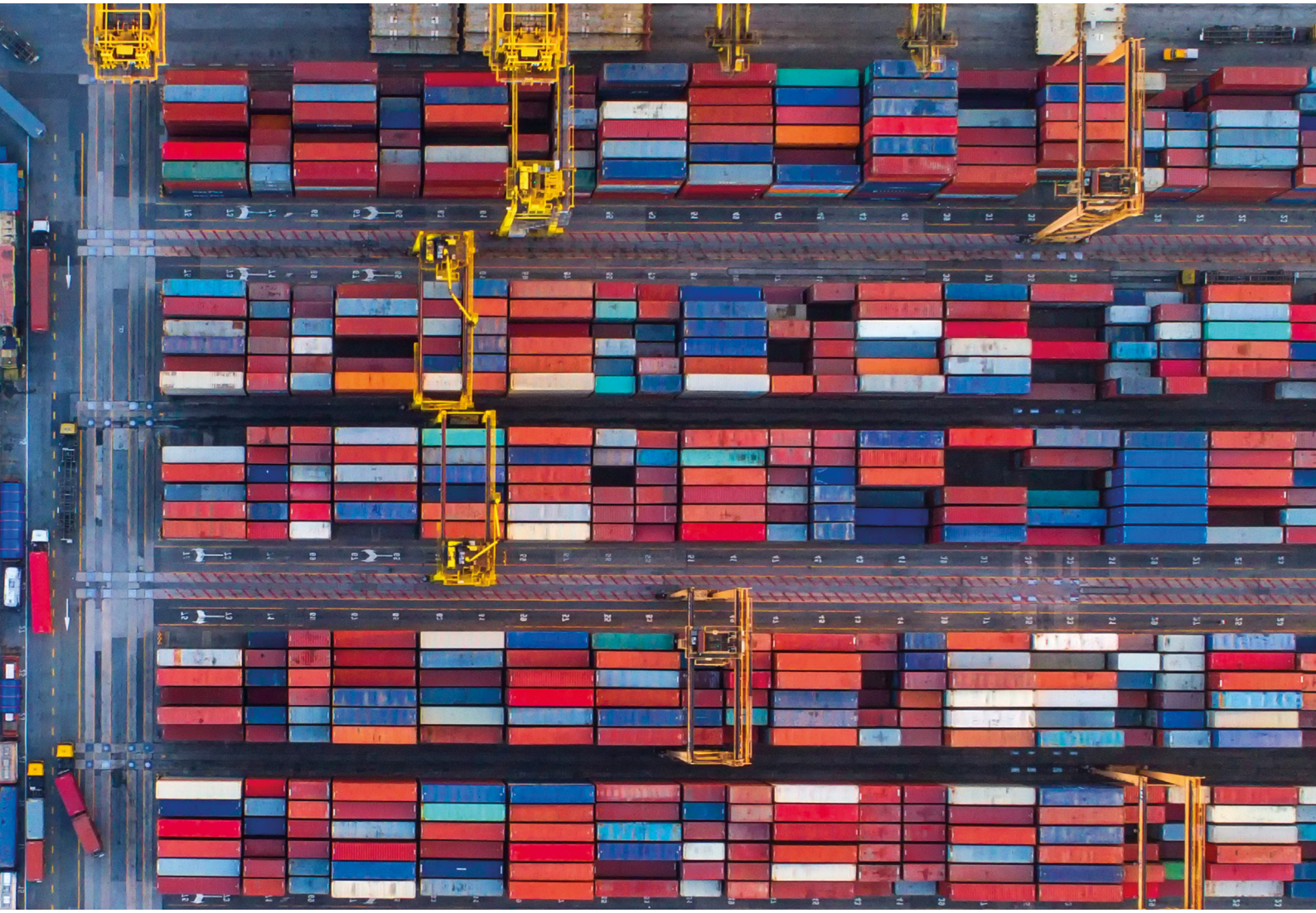
Reiner Müller
President Division Factory Automation Pepperl+Fuchs GmbH

We look forward to receiving your feedback on this issue.
Please e-mail any comments to: **newsletter@pepperl-fuchs.com**

Focus

# Perfect Positioning

**From bird's–eye view, the hustle and bustle in a container port is reminiscent of *Where's Waldo*: in wind and rain, day and night, transport containers are removed and stacked, loaded and unloaded, shipped and sent on their way. Compared to the containers, the WCS position encoding system from Pepperl+Fuchs is minuscule—but for smooth processes, it is of great importance.**



In 2015, over 36 million standard containers were handled in Shanghai, the largest port in the world—that's more than one container per second! In order to cope with such a fast pace, all processes must run smoothly. As soon as an oceanliner docks with up to 20,000 containers on board, the unloading cranes move into position at the quay on rails. They are also true giants: at over 50 meters high, their boom must span the waterside of the large ships, in order to be able to remove the last transport containers from the rearmost corner of the loading area. The cargo ship has barely moored when the container bridges begin their work. One container after another is packed by the gripper, hefted, moved to the landside while suspended and then set down there. Usually, it takes less than a minute until a pallet truck arrives, loads this container, and transports it to the loading area of a mobile portal crane. These so-called "gantry cranes" are smaller than the container bridges, but still big enough to make a 40-foot container look like a shoe box. As "rubber-tired gantry cranes" (RTG) they move back and forth on large rubber tires or on rails.

### The Gateway to World Trade

In the work area of such an RTG, which looks like a gigantic gate, up to six containers can be densely stacked on top of each other and side by side in up to 14 rows. This is done quickly and to save space, because space and time are a rare commodity in the harbor, even more so when the vessel is larger. In modern major ports, processes controlled by people are already largely optimized. Further efficiency requires a higher degree of automation—a perfect scenario for solutions from Pepperl+Fuchs.


## Crucial Position Determination

The gantry crane, for example, can be operated automatically. “The crucial prerequisite for this is that the crane recognizes its exact location at any time,” explains Armin Hornberger, Head of Product Management for Industrial Vision Components at Pepperl+Fuchs. “Maximum precision really counts. The containers should be stacked as closely as possible; larger measuring tolerances add up to significant deviations across long stretches. The new version of our WCS position encoding system optimized for outdoor use offers ideal sensors that are accurate down to the millimeter for position detection of gantry cranes.”

The new WCS consists of a pollution-resistant coding rail, made of stainless steel for outdoor use, and U-shaped thru-beam sensors with powerful infrared LEDs. The rail is mounted on the side of the path of the gantry crane, and the WCS reader is on the crane itself. The infrared light of the sensor falls through the slots in the rail, the reader collects the resulting code pattern and converts it into an absolute position specification with an accuracy of ±0.4 mm. Even at high speeds, the WCS works reliably in real time and over distances of up to 314 meters.

## From Arctic Port to Tropical Heat

Detection is a noncontact process, the infrared spectral range excludes all ambient light irritation, and temperature fluctuations do not play a role. The major innovation in this version of the WCS is the double housing of the reader. “We have designed the system for use outdoors by providing it with an additional housing made of a highly stable, special plastic, which can also handle strong mechanical effects such as impacts and shocks or heavy hail,” says Hornberger. The sensor corresponds to IP69 degree of protection, is heat-resistant, water-resistant, and dust-tight. It tolerates steam-jet cleaning, and resists even aggressive substances such as saltwater, acids, and alkalis. It



www.pepperl-fuchs.com/news-wcs

is almost completely insensitive to weather influences. Thanks to the built-in heater, which is automatically engaged at low temperatures, temperatures down to -40°C are possible. “This makes this device ideal for ports all over the world, from the Arctic to the hottest regions —and also for other applications under harsh conditions, such as in electroplating plants, in the chemical industry, or waste incineration,” explains Hornberger.

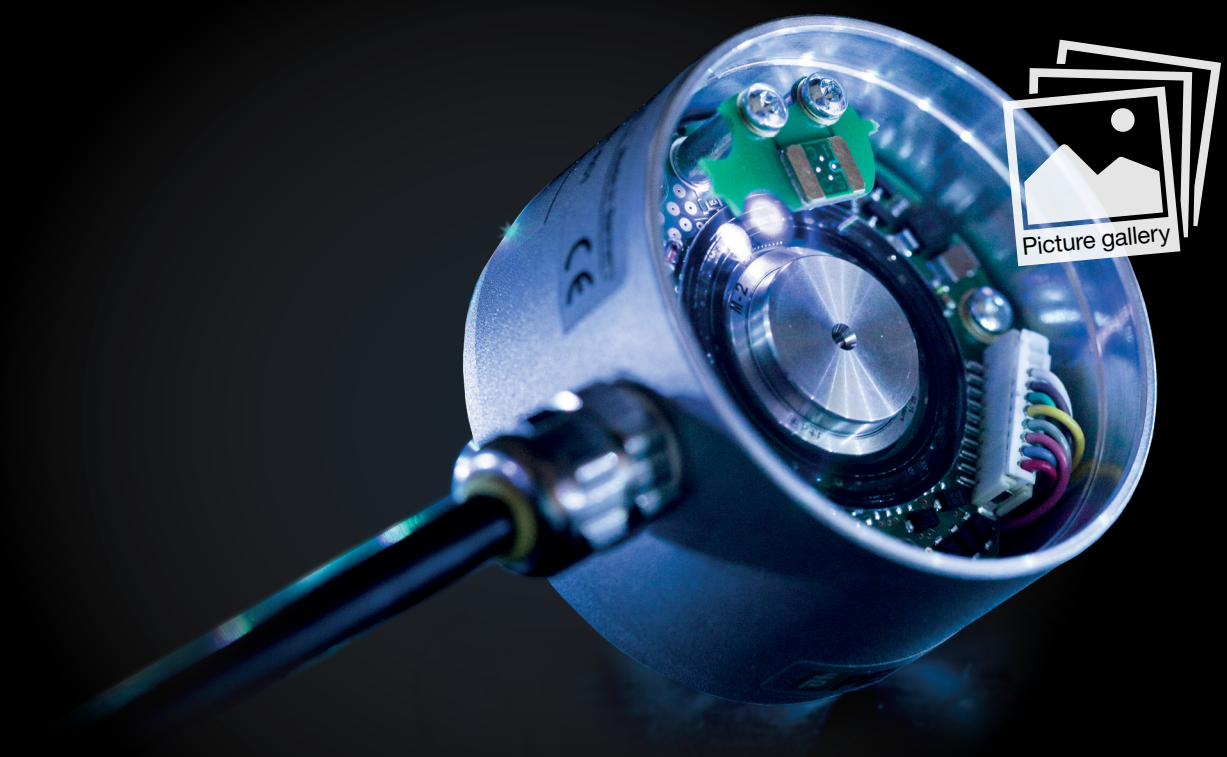
## A Classic Revisited

Flexible connection options allow installation even in cramped conditions. The low total width of the system also saves valuable space. At the same time, the outdoor version of the WCS is compatible with all previous WCS components and can be connected with each control panel to which data is sent via a serial RS-485 or SSI interface. A wide range of interface modules are available for connection to bus systems. “The WCS came on the market in 1989 as the first absolute positioning system in the world. Since then, it has proved itself in numerous applications in intralogistics as well as in elevator technology, and in the automotive industry. The new outdoor version now lays the foundation to completely automate the operation of a gantry crane or similar large devices with long travel paths—even if salty sea air and spray challenge the WCS,” stresses Hornberger. ■

# THE BLUEBEAM GROUP

**In the light of day, the cool blue glow in the metal interior of the opened-up device is hardly noticeable. Only under closer scrutiny can its origin be recognized: a focused light beam, only about the size of a pinhead. The considerable impact of this small blue point is, however, not to be dismissed ...**

"Phase position A:B is far below 10%," states Matthias Padelt, specifically quantifying the effect of the new "BlueBeam Technology." As Managing Director, he is responsible for Pepperl+Fuchs Drehgeber GmbH. When you talk to Padelt and his team—Head of Innovation Management Thorsten Gippert and Head of Product Management Stefan Horvatic—it is easy to see how much lifeblood has flowed over the past few months into the ENI58IL series, the first to use BlueBeam technology. Horvatic points with a pen to the open incremental rotary encoder in front of him: "With this, we are setting a new standard in the market in terms of signal quality."



## Blue Trumps Red

The team achieved this by implementing a blue emitter LED and the corresponding receiver diodes. When used in conjunction with a powerful sensing chip, a significantly better utilization of light is possible than with commonly used infrared technology. But there were some hurdles that had to be cleared along the way.

Gippert recalls: “Selecting the optimal sensing chip, for example, was no easy task. We spent so much time researching until we found a model that met our requirements exactly.” The result of their effort is a higher resolution and greatly improved signal amplitude, as well as reduced jitter.

To further increase the extremely high measuring quality achieved with BlueBeam technology, the adjustment of the code disc was also refined in comparison to the standard procedure. “With the ENI58IL series, we’re moving in a new direction: here, the precise insertion of the disc is checked on a microscopic level during the manufacturing process. This step leads to improved absolute accuracy for applications in which even the smallest deviations cause a noticeable loss of performance—for example, when ensuring the perfect blade alignment on a wind turbine,” says Padelt, outlining the benefits.

## Delicate Technology, Interlocked

In this context, it is not surprising that, during development, the team also worked intensively on the issues of longevity and process reliability. Along with the EMC protection circuit, this is supported by the robust construction with interlocked bearings that withstand high loads and prevent the ball bearing from being crushed. In addition to this powerful interlocking, the delicate BlueBeam technology has a positive impact on process reliability. “With BlueBeam, signals remain stable under high mechanical force such as shock or vibration, as high-frequency scanning offers more tolerance toward such interference,” explains Horvatic about the welcome side effect of the innovation.

## Sophistication Comes Standard

Is ENI58IL an exclusive series only for extremely demanding applications? Gippert forcefully denies this: “Quite the contrary! We provide the features needed for high-performance applications in a series of rotary encoders for the broad market. In doing so, we can handle applications with a sophisticated standard rotary encoder that previously could only be achieved using specialist devices. This is also reflected in the breadth of the available portfolio. We have almost all types of shafts, flanges, and connections.” Horvatic adds: “With ENI58IL, users receive innovation and reliability as standard worldwide, even in the smallest quantities.”

After the last steps of the product launch are taken, the question that remains for the three managers is: What’s next on the agenda? Padelt barely hesitates: “For now, we are eager to hear how this series of rotary encoders is received by our customers. At the same time, we are moving on to new challenges. This much is clear: BlueBeam technology will also be used in future product developments.” ■

**www.pepperl-fuchs.com/news-eni58il**

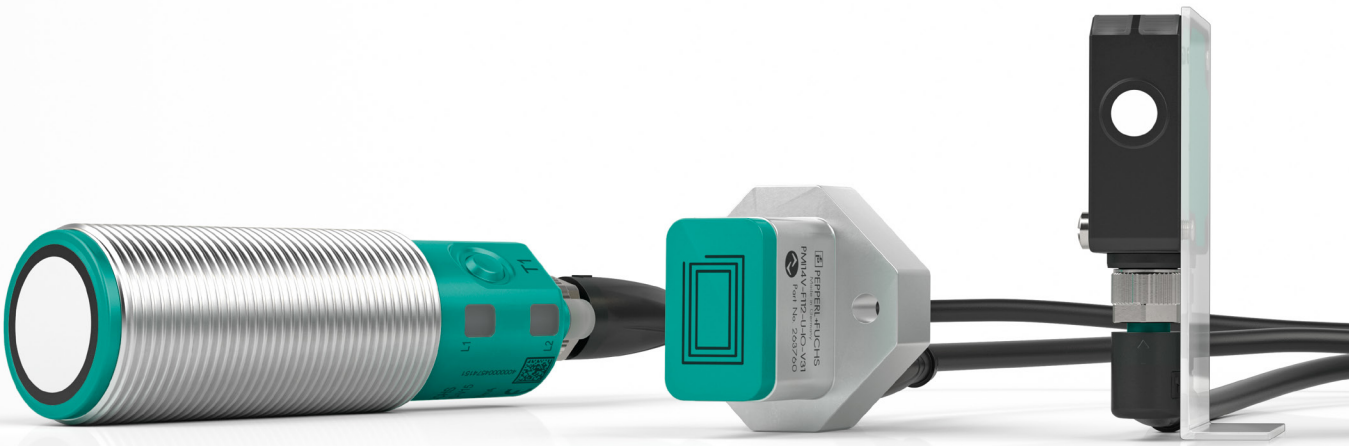
**Matthias Padelt**
Managing Director Pepperl+Fuchs Drehgeber GmbH

**Thorsten Gippert**
Head of Innovation Management

**Stefan Horvatic**
Head of Product Management

# Universal and Intelligent: A New Generation of Ethernet IO Modules

**A module in a robust design for all standard Ethernet protocols, IO-Link, integrated intelligence for decentralized automation and diagnostic tasks—the new Ethernet IO modules from Pepperl+Fuchs not only perfectly meet the requirements of innovative machine and plant builders, but also of Industry 4.0.**




Moving away from the central process control panel toward decentralized control intelligence that independently organizes tasks and communication processes in machines and plants—this is automation of the future. It is also shaped by the increasing demand for more efficient standardization, simpler operation and connectivity, and increased availability of automation components. The new generation of Ethernet IO modules from Pepperl+Fuchs combines all of these features.

## Multiprotocol Capability Enables Uniform Communication Standard

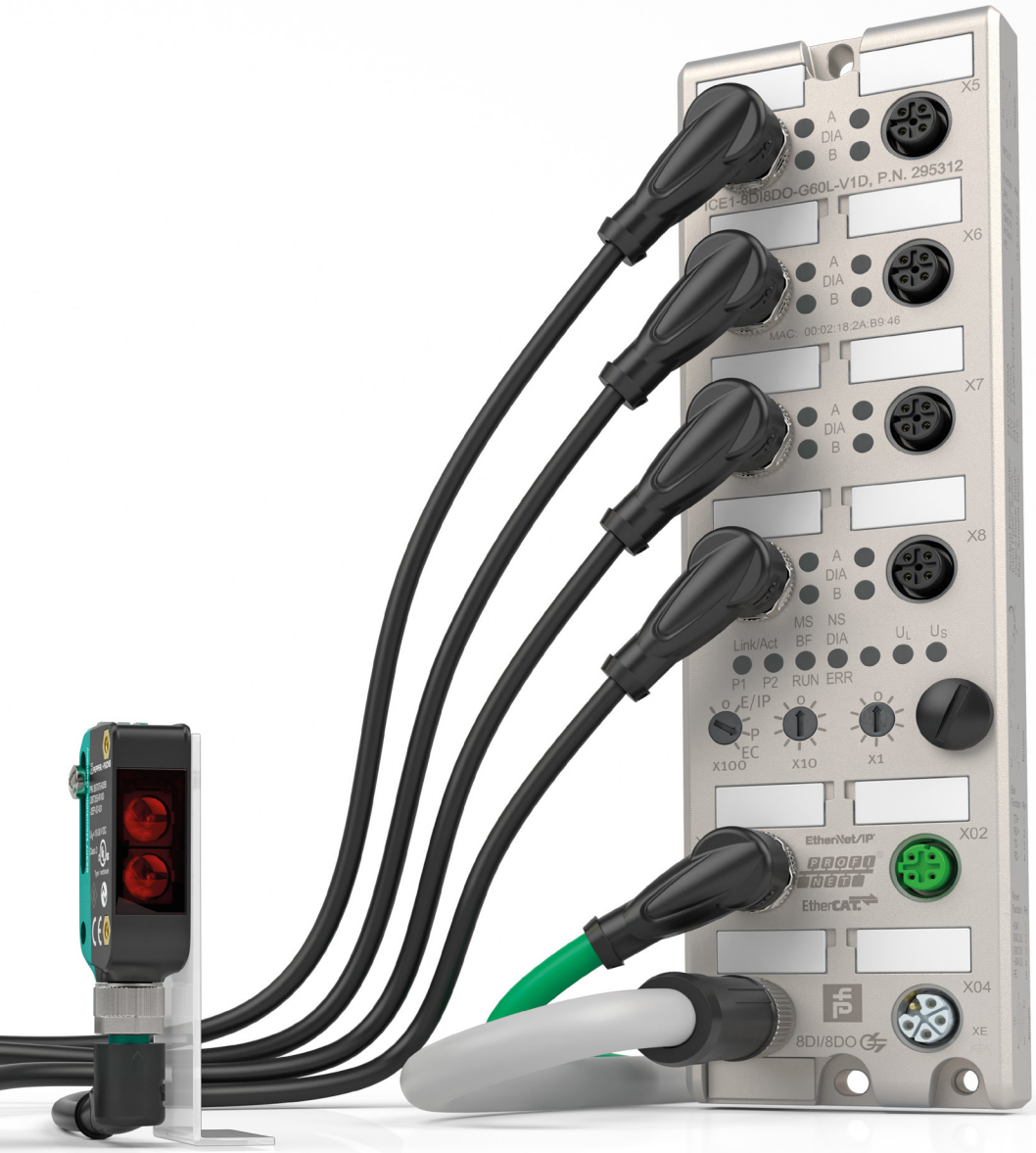
PROFINET, EtherNet/IP, and EtherCAT are the most commonly used Ethernet protocols in automation technology. Until now, machine manufacturers had to choose one of these module types depending on the control panel. The new Ethernet IO modules from Pepperl+Fuchs save you from the “agony of choice” and the resulting variety of variants. Thanks to their multiprotocol function, they are universally compatible with the above-noted Ethernet fieldbuses and thus ensure efficient and cost-reducing standardization of the fieldbus connection of machines and plants.

## Ethernet IO Module with IO-Link: Transparency Through to the Sensor-Actuator Level

One version available in the portfolio of new Ethernet IO modules is equipped with an integrated eight-way IO-Link master, for direct connection of up to eight IO-Link devices. This makes it possible to set up a pre-fault indicator, condition monitoring for preventive maintenance, a simple restart after sensor replacement, or a digital sensor/actuator image of the overall system, to name just a few examples. This transparency through to the sensor or actuator can significantly improve process performance.

## Integrated Web Server and Decentralized Intelligence

All Ethernet IO modules are equipped with a web server. During commissioning, the user can perform the complete parameterization via a web browser. During diagnosis and maintenance, it is possible to access status information and error messages directly. As a result, faults can be targeted and corrected at an early stage.
Decentralized intelligence is also integrated into the modules. This makes it possible to implement logical operations and process-level applications without needing to take a detour via the control panel.




Individual automation tasks can be implemented completely independently in the module—feedback to the controller is limited to a small amount of data, allowing the communication costs to be significantly reduced.

## High Availability with 70% More Power

The new connection technology of the Ethernet IO modules is also in line with industry requirements. The L-coded plug-in connector in the industry-standard M12 offers up to 70% more current rating. This enables parallel wiring for energy management to be reduced and higher peak loads to be covered—all without additional wiring.
Fieldbus modules are used in the field—i.e., directly on the machine. The new Ethernet IO modules are optimally equipped for this often harsh environment. The metal housing provides the maximum mechanical robustness and an extremely tight seal against the ingress of dust and moisture. The electronics inside are also fully molded and thus protected against vibration and shock.

## Versatile and Future-Proof—A Powerful Complete Package

This generation of innovative Ethernet IO modules combines a new dimension of universal connectivity with industry-standard integration possibilities. Their decentralized intelligence allows applications to be managed independently and need-based communication to take place in the machine via the selective transmission of data. With the new Ethernet IO modules in our Sensorik4.0® portfolio, we are taking another step toward Industry 4.0. ■

**www.pepperl-fuchs.com/news-ethernet-io**

# One for All

**Ultrasonic sensors from Pepperl+Fuchs are a permanent fixture in the field of industrial automation. With the new UC-F77 series, you can now enjoy the advantages of the technology combined with an unparalleled range of features and adjustment options. This is how a type of ultrasonic sensor can provide a flexible solution for many applications.**


**www.pepperl-fuchs.com/news-F77**

"The internal working title for the UC-F77 is a 'High Feature'. It became clear to us during development that we were creating a real powerhouse. It's nearly impossible to bring together more functions and performance in such a compact design," reports Product Manager Carsten Heim. This "powerhouse" is available in standard or side-looker models. In both versions, the sensor is as small as its detection range is impressive—at just 31 mm high, it can detect objects at a distance of up to 800 mm.

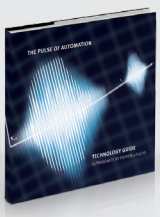
But even at close range, the sensor stands out due to its special capabilities, according to Heim: "It has an extremely small blind zone, meaning even objects in close proximity to the sensor are reliably detected." In addition, the switch points, output mode, output logic, and sound beam width can be easily adjusted directly on the sensor via push button. Thanks to this interplay of long- and short-range performance, a compact design, and extremely high adaptability, the F77 is suitable for universal use in a wide variety of applications.

Another aspect that distinguishes it from the competitors is its phenomenal process reliability: in addition to precisely adjusting the sound beam on the device itself or in PACTware™, users can also accurately suppress echoes from false targets. Furthermore, the F77 is the only sensor of its size to offer automatic synchronization. This means that there can be up to ten sensors in operation in the same cycle or in multiplex mode without external intervention. This prevents cross-talk between sensors that are mounted within close proximity of each other and ensures the shortest possible response time.

Rounding out the broad range of functions is IO-Link integration, which enables quick commissioning via the control panel and reveals valuable diagnostic data. "Being versatile is the specialty of the F77. It is aimed at users who want to handle the largest possible range of applications with a single type of sensor and in doing so expect the finest granularity when it comes to adjustment options," states Heim, summarizing the target group for the new development. ■

## Ultrasonic Sensors Technology Guide

More than 30 years of expertise in ultrasonic sensor technology, condensed into a single document: download the free compendium about factory automation's compact jack-of-all-trades.



**www.pepperl-fuchs.com/news-technology-guide**

# Think digital, add value

**Surely you know the situation: a machine element fails, a device malfunctions. It's completely unexpected, and the next maintenance cycle isn't for another year. And then on the same day, a large, urgent order comes in ...**


Imagine if your machine had reported it to you in time. Imagine if the machine had not only detected that it needs new wear parts but had already ordered them from the manufacturer—while also determining an optimal maintenance schedule. What sounds like a scenario from the future becomes reality within the context of digital transformation. This new reality needs new experts who can creatively deal with the challenges and questions posed by Industry 4.0: What is the best way to network production and IT? How can masses of data be taken from heterogeneous devices, plants, and machines and channeled into useful information?

Neoception GmbH, a new start-up company and subsidiary of Pepperl+Fuchs, specializes in connecting plants with the digital world. This networking grows out of creative consulting for the joint development of new Industry 4.0 services and business models that are tailored to customers and their customers. What follows is agile software development that continuously takes customer feedback into consideration to find quick solutions for the "Industrial Internet of Things" (IIoT). "Neoception finds added value in your plant by skillfully combining future-oriented sensor technology with unconventional software solutions that are safe, expandable, and customized to the needs of OEMs and plant operators," explains Dr. Jörg Nagel, Director of Technology and Operations.

The IIoT start-up enables new value-added services, including predictive maintenance, sales forecasts, and storage cost reduction. These services are constantly improved through direct information feedback, making full use of the information available in networked production. Operating these services and developing the necessary IT structures to do so allows customers easy access to new technologies. Neoception designs sustainable solutions and applications that always use the latest technology, meaning the user no longer has to worry about safety, processing power, bandwidth, or software updates." It is precisely because we have a small and agile team that we are able to respond flexibly to customer wishes and are able to create tailor-made solutions," explains the DevOps Engineer Benjamin Stracke. "Industry 4.0 comes from an overarching vision," says Tobias Kehl, Software and Project Engineer. "We make it possible not only to capture data, but to use this to generate knowledge. The collected findings build the basis for informed decisions and the joint development of digital, scalable, and successful business models." ■

# The Eye of the Donkey

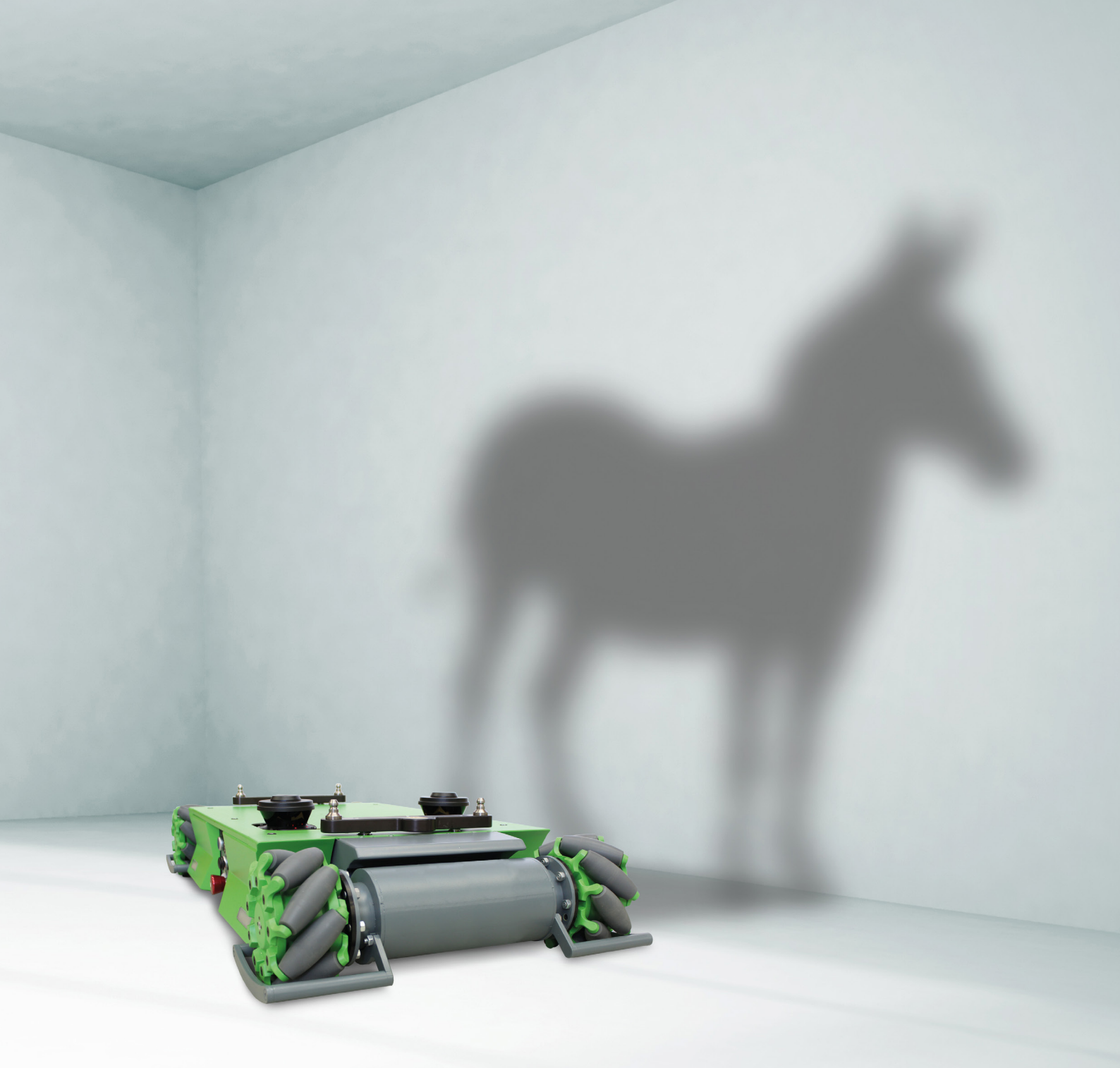
**A vehicle on Mecanum wheels can move in any direction, similar to a hovercraft. It provides flexibility and saves space—invaluable benefits in intralogistics. The PGV positioning system from Pepperl+Fuchs is used so that the miracles of movement from the company imetron always find their way.**


“We named our industrial vehicle series ‘DONKEYmotion’, after the long-eared pack animal,” explains Project Manager Markus Mayr from imetron, the mechatronics specialists in Freiburg. “Like a donkey, it transports heavy loads with a towing load of several tons. At the same time, the ‘Donkey’ can head in any direction, travel variable-radius curves, or turn on the spot and is thus particularly agile.” The secret to this unlimited mobility lies in the so-called Mecanum wheel, which has, in contrast to ordinary wheels, no end-to-end running surface. Rotating, barrel-shaped rollers are mounted on the rim at a 45 degree angle to the wheel axle. The direction of rotation and the rotation speed of each wheel is determined individually via a control panel, resulting in extremely high surface mobility.
“Unlike a forklift truck, for example, our Donkey does not need any space for maneuvering,” says Mayr. “In addition, a vehicle of corresponding size completely disappears under one euro pallet because these are loaded from above, and no part of the vehicle protrudes.”

But it is not only the high mobility of the Mecanum wheels that makes the Donkey a sought-after addition to intralogistics: as an automated guided vehicle (AGV), it enables the automation of transport tasks. An optical read head from Pepperl+Fuchs ensures the required path tracking: the PGV100 is therefore formally known as the eye of the donkey.

## Pioneering Technology

imetron uses this sensor, consisting of a 2-D camera and an LED light unit, in two ways. In one vehicle variant, it reads Data Matrix code tape on the ground so that the AGV follows the exact position of the tape at any point along a given path. The other variant of the Donkey requires only individual QR codes instead of the tape. Due to its high flexibility, the PGV100 covers this scenario just as successfully. “From the code, the sensor deduces the orientation of the vehicle in addition to precise position determination,” explains Mayr. “So the Donkey can drive



independently from code to code. It is able to perform high-precision ‘parking’ at a defined location, for example, to provide a heavy component for mounting. The PGV system ensures reliable path tracking and precise positioning, even on a highly reflective surface.” Thanks to its large reading window, damaged and dirty codes pose no problems for operation. In the construction of the AGV, the extremely space-saving design of the sensors also proved to be a real advantage.
“Connection to the vehicle control was also dealt with quickly thanks to the CANopen support of the PGV. Generally, mounting was extremely simple thanks to the plug-and-play nature of the sensor,” says Mayr, describing the implementation. In addition, the PGV from Pepperl+Fuchs also impressed the experts at imetron with its robustness: the housing with IP67 degree of protection encases the electronics for signal processing, including fieldbus interfaces. Since its work is noncontact and is completed without moving parts, it is also maintenance-free and durable.

**One Donkey for All Situations**

imetron uses the sensor in all sizes of vehicle, from the compact model up to the heavy-duty Donkey, which carries up to 10 tons. The Donkeys are enjoying growing popularity, reports the project manager: “In addition to intralogistics, our customers come from many different areas. Our vehicles can, for example, replace a rotating stage in trade fair presentations or in the theater, act as a mobile mounting base, or serve as a tool changing truck. Like the Donkey’s movement, there are also no limits to its applications.” ■

**www.pepperl-fuchs.com/news-pgv**

# Harnessing the Swarm

**If you stroll through Karlsruhe, you can almost feel the pulse of science: research centers, universities, and academies shape the city. The Karlsruhe Institute of Technology, KIT for short, is world renowned. Here, progress toward Industry 4.0 is at full speed. A network of scientists and technology partners, of which Pepperl+Fuchs is also a member, has now implemented true "swarm intelligence" in production processes with the KARIS PRO project.**

It is a fascinating sight when the swarm starts moving: mobile, cube-shaped conveyor units rush around in the factory like industrious ants, transporting crates of goods or organizing themselves into a team to pick up an entire pallet. Sometimes they work together in a row like a large roller conveyor to move items, only to come together to form a new shape a little later when there's a new order. The best part: the system handles this independently without the need for a central control panel.

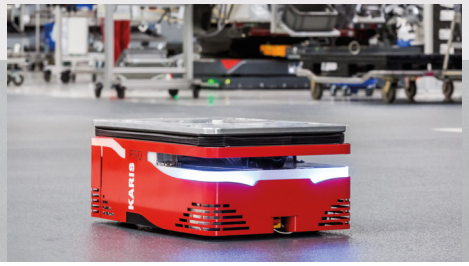
Orders are made available via an ERP system, and the independent conveyor units "negotiate" with each other via WLAN about which unit will do what, based on various parameters. Which units are currently available? Which units have the shortest path to the transport goods? Which units have enough battery power? "What we have created here is a real cyber-physical production system that breaks with the conventional notion of rigid processes and is much more efficient," says Andreas Trenkle, Project Manager for KARIS PRO at KIT.

## The Sum of the Parts

This has been made possible thanks to the expertise available at the Institute for Material Handling and Logistics, as well as advice and components from well-known automation companies. They formed a partnership with Trenkle, and his colleagues and supported the researchers diligently. This included Pepperl+Fuchs, represented by Team Leader R&D Identification Systems Dieter Schneider and his team. Trenkle explains: "The specialist knowledge of numerous experts has been brought together for the KARIS PRO project. A laser scanner detects the surroundings, a special drive stops the vehicle in the event of possible collisions, and the tailor-made chassis ensures maximum flexibility when twisting and turning in a confined space, to name just a few of the installed components." What is the role of RFID in this project? "RFID is a key technology for the intrinsic intelligence of KARIS PRO as it passes on information about the goods to the conveyor units. After all, they need to know what they are moving and where," Schneider points out.

Dieter Schneider gives insight into the project:

www.karispro.com



## From Standard to Custom-Made

The task for him and his team was to reliably measure all of the standard dimensions of the boxes. It also had to be taken into consideration that the RFID tags can be installed either on the bottom or on the side of boxes, allowing the production staff to reach them more easily. “The fact that we had to install the RFID read/write head in a specified position directly next to a large number of other electrical components was technically very demanding throughout the project. At the same time, reaching the required output power was a tough nut to crack,” says Schneider. This meant that the RFID experts from Pepperl+Fuchs had to dig deep into their bag of tricks: “We modified one of our IQH1-type read/write heads so that it has three spatially arranged coils. The capacitors can be switched on or off independently of each other. This does not interfere with the resonant circuits of the coils, as the reader adjusts itself to the environment automatically. This means we are in the position to detect the tags reliably and at various points in the box.”

## Both Sides Benefit

By adapting the system and combining individual automation components, a complete solution was created step by step that connects the present to the future. Trenkle provides an insight into the current status: “KARIS PRO is already in pilot deployment in large automotive companies. Universal use of the system can be transferred to other areas outside of industrial production in the same way.”
Dieter Schneider assesses the successful cooperation as a gain for both sides: “We were able to support KIT’s practical research with our solution. Being that we are a sensor manufacturer, the findings of this project regarding swarm intelligence are, of course, extremely interesting for Pepperl+Fuchs. After all, we are in the process of actively defining what the manufacturing of tomorrow will look like.” ■

**With Christian Schwöbel, Head of Global Technology Management and Production in Mannheim, Benedikt Rauscher, Head of Global IoT Projects, and Till Hoffmeyer-Zlotnik, New Business Development Sales Engineer, we have brought together three employees from different areas at Pepperl+Fuchs to exchange their views.**

***Everyone is talking about the "digital revolution." What does this mean for the workplace and what is hidden behind the big keyword "digitization"?***

*Christian Schwöbel:* First of all, it must be said that we already live in a digitized world. Think of video conferencing: that we are able to see colleagues in production facilities on the other side of the world on a screen, is only possible thanks to digital technology. In the same way, processes such as vacation requests take place electronically in companies today—this is also digitization. Such digitized workflows are also found in production. For example, there is increasingly the possibility to make status and process results available and able to be evaluated in digital form. For us in-house, this is actually already commonplace. So it is not the case that yesterday everything was analog and today it is digital. We only notice it more, simply because more and more is being digitized, and digital technologies are penetrating more and more areas.

*Till Hoffmeyer-Zlotnik:* In sales, this is shown by the simple example of how we communicate with customers today. In the past, a written request arrived by mail that was electronically recorded and edited

# People Make the Difference

**Digitization, the Internet of Things, Industry 4.0—keywords that are pervasive and hotly debated. Again and again, the question arises of what this means for the workplace of the future.**

by an employee, and then a written quotation was sent. Today, the request itself is digitized and you do not need to be in direct contact with people, but rather with software. Continuing along this line, the person in such processes perhaps has at some point taken more of a supervisory function. Think of orders for large online retailers: from receipt to shipping, today all information and interactions run through software and systems—the process is not controlled by people. In future scenarios in the industry, one machine will place the order of your spare part directly with another machine.

*Benedikt Rauscher:* Exactly, an important change in the industry is coming our way—provided that we are creating the technological basis for it. Today, we have a kind of “Internet of people”. This means that a person provides information on the Internet. In the “Internet of Things”, it is no longer the person that provides the information, but the machine itself—and for another machine. Naturally, this has an effect on the way we work.

**Christian Schwöbel**
Head of Global Technology Management and Production in Mannheim

**Benedikt Rauscher**
Head of Global IoT Projects

***How does the vision of Industry 4.0 fit into this?***
*Benedikt Rauscher:* Industry 4.0 uses the Internet of Things to make processes and workflows more efficient. Machines should be able to communicate with each other in a plant and even beyond the walls of a company. Processes such as ordering a spare part don't then need to "detour" via a third point, which saves a lot of time. Such a message could be "I am almost finished with component A and am sending it to you for further processing." This will speed up the processes because employees do not need to first record and enter a status and initiate or control further steps, but instead much more is automated.

***Does this mean that, at some point, we will no longer need people in production?***
*Christian Schwöbel:* The scenario of the human-free factory is raised again and again but has still not occurred, and I don't believe that it will. Of course, the topic of digitization in production is also about automation. Steps and processes should be linked together so that machines work independently or communicate with each other, because people will most likely play a different role in the future. But this does not mean that people will no longer be needed. On the contrary: tasks are, in my opinion, much rather complex. The cognitive abilities of people will be essential in the future, because you must also be able to deal with the systems.

*Benedikt Rauscher:* These skills cannot be replaced by a machine or a robot. But such developments may support people and streamline processes, meaning that the person can focus on other tasks. Let's take sales as an example again. If machines regulated standard orders themselves, employees in sales would have time to handle more "creative" things.

*Till Hoffmeyer-Zlotnik:* They will also need the extra time, because digitization will lead to changes in customer requests and needs. While the customer previously looked at what the market had to offer and then requested a component such as a proximity switch, today the customer comes to the company with a concern that they want to resolve, without emphasis on a particular product. Industry 4.0 awakens the needs of customers, and sales receives the bouquet of needs. Experts who can deal with such requirements and develop solutions specifically for these needs are imperative in companies.

***So do these developments also have an effect on sales?***
*Till Hoffmeyer-Zlotnik:* Absolutely. Today, we work in fixed structures. With requests for solutions and products that are tailored to the needs of our customers, this is likely to increasingly change to working in and on projects—across company divisions. As individual as the customers' wishes in the context of the digital transformation are, the sales approaches must be equally individual and unique. At the same time, this means that departmental boundaries are blurred. However, the introduction of new technologies such as virtual reality also has an influence on work. Field service employees will perhaps meet with customers in virtual space at any time instead of traveling to them—such future scenarios are also conceivable.

***What does digitization mean for a company like Pepperl+Fuchs and its structures?***
*Christian Schwöbel:* We can assume that various areas will become even more intermeshed in the future. Sales, product management, development, and, last but not least, production will be enhanced in the future and work more closely together. If you accept that the

**Till Hoffmeyer-Zlotnik**
New Business Development Sales Engineer

products and solutions will be increasingly customized and even individually produced, you will see that it is just not possible any other way. Areas may also come together that previously had never come into contact.

*Benedikt Rauscher:* In my opinion, communication and team work will therefore have much greater significance in the future. Because as much as we digitize, we will still need to talk and work with each other—and even more so than ever. Individual business units or even different companies must come together, using their combined expertise to create a solution, particularly with complex projects. Social skills therefore gain importance in the process of digitization rather than becoming less important, as some might assume.

***... and for the individual workers?***

*Benedikt Rauscher:* Undoubtedly, more flexibility will be required of us in the future, with regard to what the tasks are and the way we work. We need to be open to new things. "Lifelong learning" is a good keyword here, because it will probably not be the case that you can perform the same task for your whole career. Job tasks are also changing alongside technological advances.

*Christian Schwöbel:* But one thing is certain: people are and remain important, and are in fact more important than ever. Because after all, it is people that address, implement, and then maintain developments such as those needed for Industry 4.0 scenarios. It should also be borne in mind that a complex development lies behind all of the simplicity that so much technology offers. Right now, we can only speculate about the jobs of tomorrow.

*Till Hoffmeyer-Zlotnik:* Digitization can also create more flexibility for the individual, when, for example, it is no longer necessary to be on site, because the work can be accomplished from anywhere via the Internet. However, the existing rules in the company must be reconsidered for this, starting with the workspace and concluding with the time model. So digitization not only affects production and sales, but the whole company.

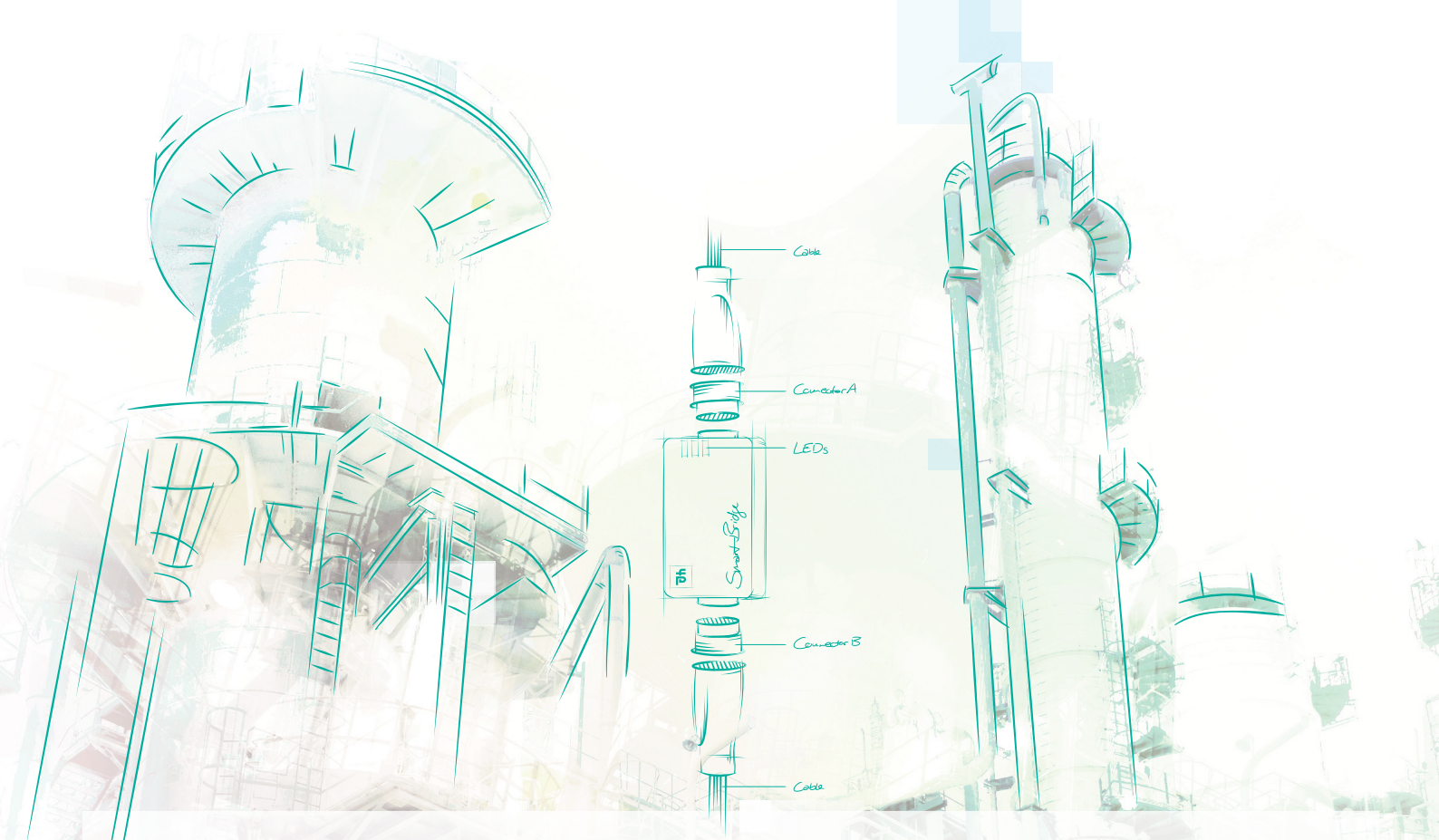
*Benedikt Rauscher:* Digitization is actually also a change process. It is not just about developing digital technologies. Learning to deal with more and more digital technology and using it to our advantage is ultimately the big change facing us all. ■

# Lateral Thinking Required

**Innovation—a keyword that is used all the time in the context of Industry 4.0. According to Duden, it means the "realization of a new, advanced solution for a specific problem." But how does an innovation come to life? At Pepperl+Fuchs, there is a team dedicated to finding new solutions relating to Industry 4.0. Take a behind-the-scenes look with us.**

"Creativity isn't something that you can switch on and then off again after an hour," says Michael Bozek when asked if his activities still leave time for creativity. Together with the team leader Benedikt Rauscher, he is working on approaches for future Industry 4.0 scenarios. His work rarely focuses on a single product; to the contrary, much more holistic solutions are in demand today. With this in mind, Pepperl+Fuchs has created an overarching "Industrial Internet Solutions" team that operates outside of the business units and draws on expertise from each of the product areas. But how do they develop innovative approaches? The ideas for new applications come from a wide variety of situations. When, for instance, Rauscher and Bozek exchange views with industry experts and market competitors through activities in organizations such as the VDI or the ZVEI, it always inspires new ideas. "When we meet with like-minded people who are working on the same future


**Michael Bozek** Product and Business Development Manager for Industry 4.0 **Benedikt Rauscher** Head of Global IoT Projects




From Automatic Asset Administration to Overall Equipment Effectiveness—see for yourself what the team has already developed with Pepperl+Fuchs partners:

**www.pepperl-fuchs.com/news-sensorik40**

**www.io-link.com → IODDfinder**

scenarios as us, we get an ever-increasing picture of where the journey can go and what solutions will be needed," says Bozek. "Sometimes you have an idea in mind, but sometimes a concrete concept only comes after a discussion with colleagues." That is why cooperating closely with the product groups at Pepperl+Fuchs is just as important. Product development itself is not one of the tasks of the innovation teams; instead, they look at technologies across the board and consider how they can be used innovatively in new applications.

## Envisioning the Future Together

As part of their work on associations and committees, Bozek and Rauscher also work with representatives from other organizations to build the foundation for a vision of Industry 4.0. For example, in order to network plants thoroughly permanently, components need to have a common "language". "At the moment, there is a multitude of technologies. We must create a common technological basis," explains Rauscher. "We hope that at some point the same applies for a sensor as for a USB stick. You connect it and it runs immediately, no matter where it is or which company is using it."

IO-Link is an important part of such visions. An important step in this direction was implemented this past year: with the IO-Link community, Pepperl+Fuchs has established IODDfinder—a database that makes all the files necessary to integrate IO-Link sensors available centrally. "Where users previously had to search for a sensor manufacturer, today they can find over 3,500 products from 40 companies in one place," reports Bozek. "This makes it much easier to find these files and to integrate IO-Link sensors into the digital image of a plant."

## "Industry 4.0 Won't Work without Cooperation"

Generally speaking, the user's benefit is always the focus. That's why the innovation team develops complete IIoT solutions with partner companies, in addition to working on standards. Such collaborations are of growing importance in the course of industrial change. "Consortia are being formed to pool the core strengths of individual companies," explains Bozek. This provides customers exactly what they need to prepare their plants for the future, without having to seek solutions from different places. "For us, but also for other companies, this is a whole new form of cooperation," Rauscher adds, "and it is the right way forward, because Industry 4.0 won't work without cooperation."

Bozek and Rauscher are now well connected, both within the company and outside of it. So they know who their best contact is for each solution and who to bring on board. At the end of the day, the result is not just innovative approaches that contribute to the end-to-end networking and communication of machines and plants—but also valuable partnerships. ■

# Material Flow with Vision

**The stacker cranes are constantly in motion. They flit back and forth non-stop between the racks, where the constant stream of boxes briefly comes to a stop. The tireless machines in the Global Distribution Center (GDC), which opened in 2016 in Singapore, are more than just technical assistants.**

“Logistics automation in the Mannheim headquarters was a pioneering achievement over twenty years ago, but the technology from that time just reached its limit at some point,” explains Logistics Manager Markus Külken. “In addition, more space was required, and procedures needed to get significantly faster to keep pace with the growth of the business. So we decided to build a new distribution center with the highest possible level of automation.” The tried-and-tested technology from Mannheim was subsequently implemented internationally with great success.

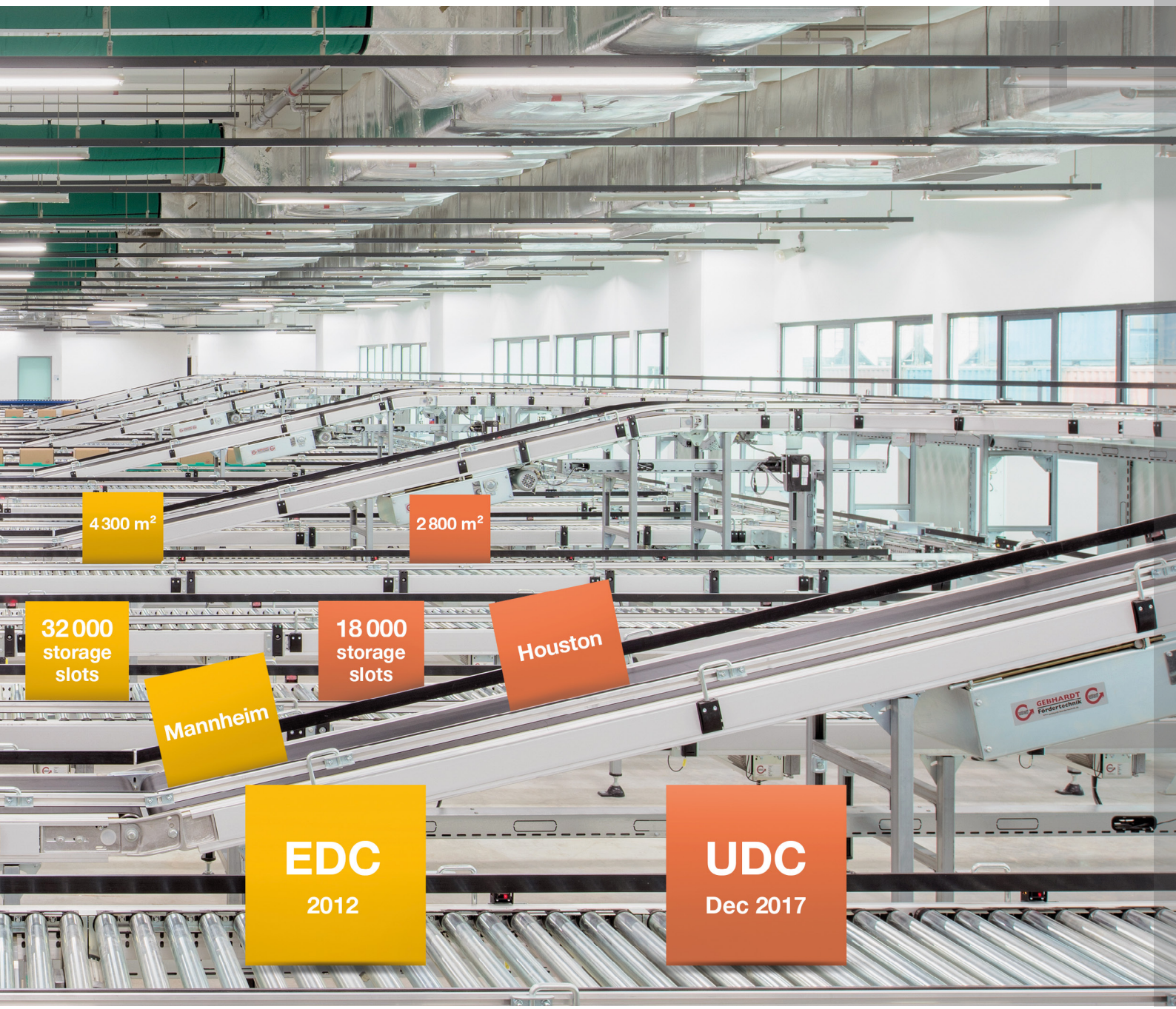
### Same but Different

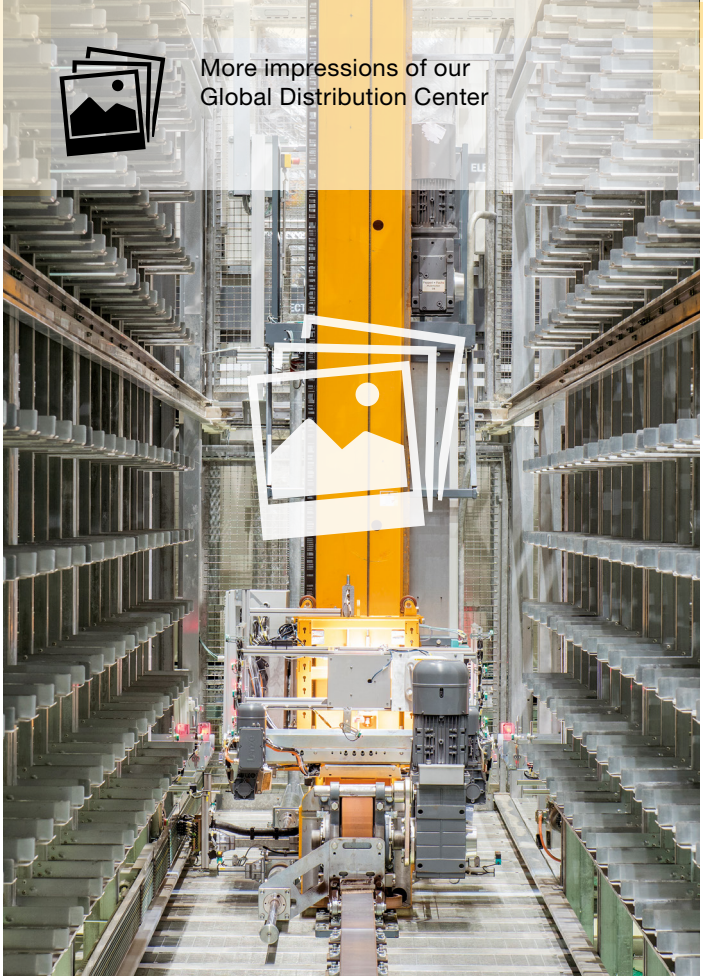
At first glance, you can hardly tell whether you are in Mannheim or Singapore, since the two distribution centers look amazingly similar to each other. The new American equivalent, the US Distribution Center (UDC) in Houston, will be opened this year with the same “look and feel”. The similarity of the centers is of course not a coincidence. Mannheim has served as a model for proximity to customers and reliable delivery. Based on this, the structure and technology were transferred to Singapore and Houston and developed further.

An important component is automated small parts storage in high racks. There, the goods are stored in boxes on trays, which are transported by fully automated stacker cranes to the required place. Based on the goods-to-man principle, they go to the workspaces on roller conveyors. Of course, Pepperl+Fuchs products complete the central tasks of acquisition, control, data transfer, and testing in all distribution centers, and therefore prove their value again and again in logistics applications.

### Fully Automatic Storage

In addition to the state-of-the-art automation technology, the main difference between the new and old storage systems is a comprehensive warehouse management system (WMS). It is integrated into the company-wide enterprise resource planning (ERP), displays individual processes in much more detail than in the past, and can control entire logistics processes. In addition, all Pepperl+Fuchs locations are now integrated into the material flow more consistently, as Külken explains: “Each box that leaves one of our production sites gets a ‘number plate’ in the form of a barcode. It stores the material and quantity and can





More impressions of our Global Distribution Center

be matched with the code in the system. If the box arrives at one of the three distribution centers, it is now automatically inventoried and stored." Only in the case of deliveries from external companies is human intervention needed—for now, because we are in talks with suppliers about how their boxes can be incorporated into the automated system.

### Humans in the Midst of Automation

Employees are primarily involved in picking the goods, where individual orders are compiled and packaged. Light signals, which indicate the requested parts, assist them in repacking the goods from warehouse boxes into the shipping boxes. This technical assistance, also called pick by light, reduces search times and the error rate, and supports the employees' concentration. If possible, however, the full bin retrieval principle is used: even in production, the packaging sizes are matched to various customer requirements, so that entire boxes can be forwarded unopened and without human intervention.

### Ideal Conditions in Singapore

The amount of time saved just by automatic storage is explained by the director of the GDC in Singapore, Han Thanh Hong: "Previously, when a 40-foot container was delivered, we needed two days to inventory the goods and transport it to the racks. Today, we can do it in three hours." The structure and technology of the Mannheim logistics center was not applied one-to-one in the GDC. "We used the experiences from Germany and developed the system further. The updated version was then transferred back to Mannheim after the introduction in Singapore, so that we are now at the same, improved level."

The starting position in Singapore was similar to Mannheim. The old logistics center was bursting at the seams, and accelerating the processes was becoming more and more urgent. 80 percent of Pepperl+Fuchs products come from locations in the city-state as well as Vietnam and Indonesia. So it was obvious that the new global distribution center should be built in the southeast Asian region. "Singapore, with its modern infrastructure and traffic connections, business-friendly regulations, and good conditions for import and export transactions, offered the best environment," said Han Thanh Hong.

Join us on a video tour through the European Distribution Center!


### Refining What Has Been Tried and Tested

Structure, technology, and the "operating system" in Houston are in line with the other two centers. The new UDC there will first serve the North and also later the South American market. "We can also use it as a regional showroom for our logistics products," says Külken. "We can demonstrate the performance of our sensors in operation to interested customers there."

What will benefit customers most, however, will be quicker, more reliable delivery, which will be made possible by the optimized, high-quality logistics processes. Incidentally, these are subject to a continuous improvement process, known within the company as LOOP (Lean Operation and Organization in Processes). "This process may reveal that an additional tool at a specific workspace can save a lot of time," explains Külken.

The storage facilities have also been able to take the next steps toward digital transformation. "Thanks to the high level of automation, 'digital logistics' is tangible and can be integrated into ongoing processes. With constant access to all data and different possibilities for fine-tuning, the processes in our distribution centers also conform to the principles of vertical and horizontal networking. The dynamic maintenance management is already making real-time data available to intelligent systems—be it the information from motors and brakes on the stacker cranes or the photoelectric sensors on shuttle cars. These forecast models allow machine learning and thus pave the way for predictive maintenance, which will significantly reduce sudden failures," says Külken. ■

# EVENTS 2017

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01 02 03 04

**OFFSHORE TECHNOLOGY CONFERENCE (OTC)**
May 1 – 4 // Booth 1105 // Houston, Texas, USA

**SMART AUTOMATION AUSTRIA LINZ**
May 16 – 18 // Hall DC, Booth 0224 // Linz, Austria

**SPS IPC DRIVES ITALIA**
May 23 – 25 // Hall 3, Booth G 046 // Parma, Italy

**CWMTE—EXHIBITION OF LIJIA INTERNATIONAL MACHINERY**
May 26 – 29 // Booth B225, N2 // Chongqing, China

05

06

**MANUFACTURING EXPO**
June 21 – 24 // Hall 101, Booth 1F09 // Bangkok, Thailand

07

08

**FENASUCRO**
August 22 – 25 // Booth 29C // Sertãozinho, São Paulo, Brazil

09

**TAIPEI INTL' INDUSTRIAL AUTOMATION**
September 6 – 9 // Taipei, Taiwan

10

**OTD STAVANGER**
October 17 – 19 // Booth E-4408 // Stavanger, Norway

**CEMAT ASIA**
October 31 – November 3 // Shanghai, China

11

**IAS 2017**
November 7 – 11 // Shanghai, China

**EUROPACK-EUROMANUT-CFIA**
November 21 – 23 // Hall 6 // Lyon, France

**SPS IPC DRIVES**
November 28 – 30 // Hall 7A, Booth 330 // Nuremberg, Germany

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