more@TURCK
The Magazine for Turck Customers Issue 2 | 2022

The Full Range

Eberhard assembly system for M8 and M12 female connectors uses full Turck portfolio – from sensors and I/O modules to HMI and cloud

Modular Plants – with MTP

Module Type Package could revolutionize the biotech and pharmaceutical industries and shorten the commissioning time and TTM

Tools "To Go"– with RFID

RFID-based self-service stores from ProMart supply construction sites or shipyards with tools and materials – fully automated and unmanned

»Digital Transformation«

The number of challenges that have to be overcome in 2022 has not necessarily got smaller. We have already had to compensate for Corona-related restrictions, raw material shortages or massive disruptions in global supply chains in the past two years. In February, Russia started the war with Ukraine, and as a result we are now dealing with dramatically rising energy costs, inflation and ultimately also a recession.

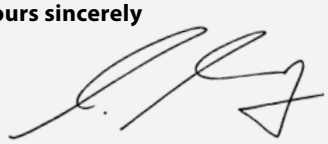
The greater the crisis, the greater the importance of topics like efficiency and innovation, but also sustainability. Crises have always been the accelerators of innovation, so it's no coincidence that the digital transformation is advancing in leaps and bounds, at our desks as well as in production and logistics. We at Turck are also making an essential contribution to this – with digital solutions for recording, processing and transmitting relevant production and status data, from the sensor to the cloud. In 2021, we were thus able to record the most successful year in our company's history and 2022 will also be another very successful financial year for the Turck Group.

Whether smart sensors, IP67 controllers, IO-Link, RFID or cloud solutions – Turck is there whenever the future is defined, with smart digital automation solutions for Industry 4.0 and IIoT. Take a look at our digital showcase, the »Digital Innovation Park« at www.turck.de/dip. We are presenting here the latest solution concepts, from condition monitoring to track and trace, right through to MTP. How machine and plant builders benefit from the Module Type Package is also shown in this issue of your customer magazine starting on page 8.

And you can read how we were able to meet our customers' requirements in practice in the application examples starting on page 20. The special machine builder Eberhard AG, for example, was able to draw on the full Turck range for its connector assembly system, from sensors and I/O modules to HMI and cloud. System integrator CSAE is using Turck's IP67 PLC to build a flexible, modular and easy to adapt pick-to-light system for operator guidance. And with their own LabVIEW driver, our TBEN-S I/O modules are the ideal fit for FutureE's fuel cell test stands. Two more articles will show you how RFID ensures transparency and efficiency by automatically recording goods and goods carriers.

This is exactly what we will be happy to present to you in person when you visit us at the SPS fair in Nuremberg. We are delighted to finally be able to once more talk with you in person about smart automation solutions and innovations for production and logistics, and to present these directly live. We are there for you – in hall 7 at stand 250.

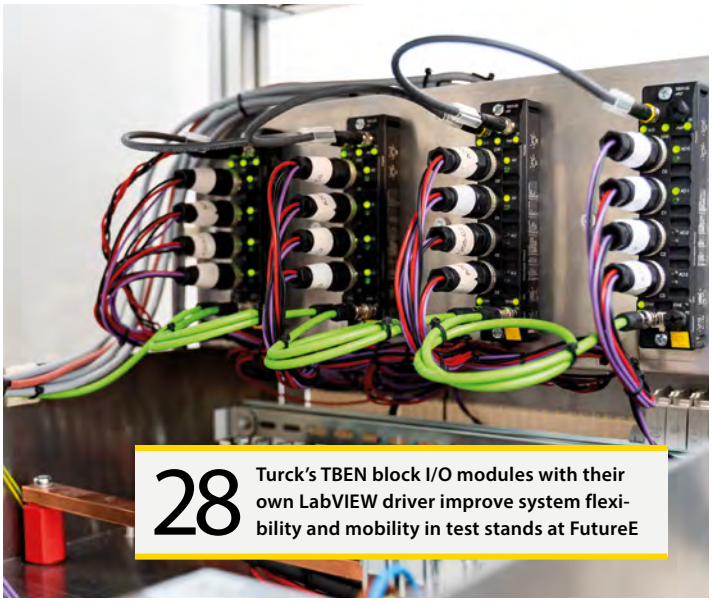
Yours sincerely



Christian Wolf, Managing Director

Content

24 With its "Smart Light Touch" pick-to-light solution, CSAE ensures reliable order picking



28 Turck's TBEN block I/O modules with their own LabVIEW driver improve system flexibility and mobility in test stands at FutureE

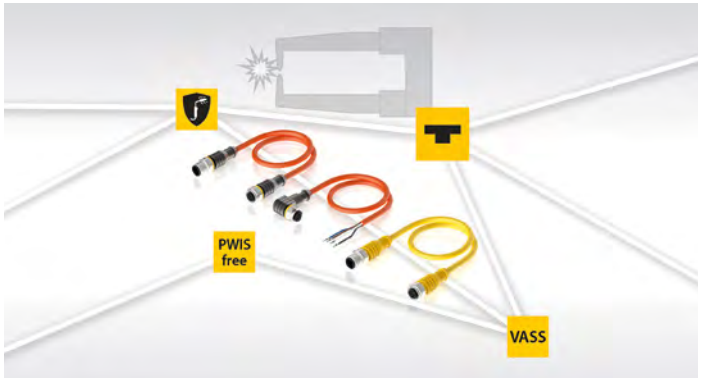
32 RFID-based self-service stores from ProMart provide construction sites with tools and materials

Turck Appoints Further Managing Director

Stefan Grotzke is the new Managing Director of Werner Turck GmbH & Co. KG as well as of Turck Holding GmbH. The 53-year-old will take over the management of Werner Turck GmbH & Co. KG together with Dr. Michael Gürtner. On the management board of Turck Holding GmbH, Stefan Grotzke will take over the areas Production & Supply Chain Management (SCM), while Dr. Michael Gürtner will continue to be responsible for Development & IT. The Managing Directors of Hans Turck GmbH & Co. KG, Christian Wolf and Christian Pauli, will be in charge of Sales & Marketing as well as Finance, Human Resources & Legal in the Turck Holding. Stefan Grotzke has extensive cross-industry experience in the areas of production and supply chain management in international companies. After his studies he was responsible for setting up various production facilities in Germany and abroad for a leading global industrial gases company. During the last fourteen years, Stefan Grotzke was responsible for the operations and the entire supply chain of the production plants at Murrelektronik as Managing Director Operations. "We are firmly convinced that Stefan Grotzke, with his relevant wealth of experience in our industry, will sustainably support the successful path of the Turck Group and further drive the optimization of the production and SCM processes in order to significantly increase the delivery perfor mance and thus the competitiveness of Turck," says Hans Sondermann, Chairman of the advisory board of Turck Holding GmbH. "Together with the three other Managing Directors, Stefan Grotzke will contribute significantly to the positive and sustainable business development of the Turck Group."

Welding Spark Resistant Connection Technology

Turck has increased the welding resistance of its TXO and TXY connector series. The cables thus also meet the latest requirements of the Volkswagen Group (VASS) for use in welding applications. The thickness of the cable jacket in particular was increased in order to achieve even greater resistance to welding sparks. The cables are also suitable for drag chain use and are highly flame resistant. They meet the requirements of both the North American UL FT2 standard as well as IEC 60332-1 and IEC 60332-2-2. Turck offers the PUR cables as 4 or 5-pin variants with straight or angled connectors, both with or without LEDs. The user can choose between standard cable lengths for connection or extension cables with M12 connectors. The cables are available in orange or yellow as standard. Special lengths, custom jacket colors or cables with M8 connectors can also be implemented on request.



IP67 Power Supply Units with IO-Link

Turck is adding compact power supply units with protection to IP67 to its portfolio of flexible power supply units for 1- and 3-phase applications in modular machine building. The robust PSU67 units operate in temperatures from -25 to +70 °C and can be installed directly at the machine without any protective measures needed. The PSU67 power supply units are available with 15, 20 or 25 A as well as with M12, 7/8" or HAN-Q4 terminals. The decentralized power supply units supply 24 to 28 VDC directly in the field without any loss and offer high fail safety thanks to its electronic no load, overload and short circuit protection.

IIoT Functions for RFID Interfaces with OPC UA

A free firmware update makes Turck's IP67 RFID interfaces fit for barrier-free communication in IIoT applications, such as for simple product identification and tracking. While the OPC UA server with the AutoID Companion Specification V. 1.01 ensures smooth direct communication with MES, PLC, ERP or cloud systems, Turck's HF bus mode offers cost benefits for applications with many read points. Users also benefit from the negligible integration effort required for HF and UHF systems. The firmware update makes the TBEN-L5-4RFID-8DXP-OPC-UA the first RFID module with an integrated OPC UA server to support Turck's HF bus mode, which allows the connection of up to 32 HF read/write devices to each RFID input. With four RFID channels per module, this means that up to 128 read points can be captured and parameterized.

Magnetic Position Sensors with IO-Link

The WIM-IOL series complements Turck's range of compact position sensors for the detection of magnetic pistons in pneumatic or hydraulic cylinders. The new series consists of eight sensors with IO-Link 1.1, covering measuring ranges from 32 mm to 256 mm. IO-Link and the integrated pushbutton enable users to teach the measuring range of sensors quickly and conveniently to the stroke of the pistons in the cylinder. This simplifies mounting compared to analog sensors, as these have to be fitted either exactly to the dead points or operate with correction factors in the controller.

Measuring Wheel Systems for Encoders

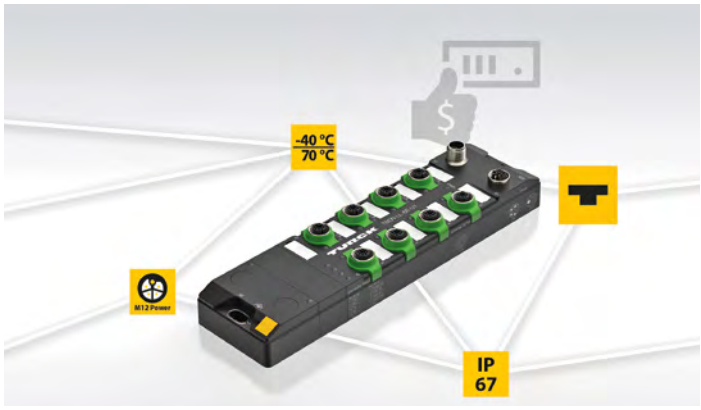
Spring arms and measuring wheels complement Turck's range of encoders with a reliable solution for detecting linear moving objects. The freely combinable spring arms and measuring wheel systems enable the measurement of lengths and speeds with conventional encoders. This makes it possible to monitor the progress or speed of conveyor belts easily. The three spring arms cover different requirement profiles – from price sensitive/space saving to low maintenance/flexible spring arms right through to particularly robust spring arms providing high contact pressure. All spring arm variants were developed for incremental and absolute solid shaft encoders. The spring arms are combined with measuring wheels with circumferences from 200 mm to 500 mm.

IIoT for excom Ethernet I/O System

The FW 1.6.0 firmware update for Turck's GEN-3G and GEN-N Ethernet gateways for the excom I/O system improves the IIoT capabilities and simplifies system maintenance as well as commissioning. HCiR (Hot Configuration in Run) now also allows device replacement, expansions or maintenance during operation in hazardous areas and high-availability applications. Changing configurations during operation is possible with Ethernet/IP (CIP) or Modbus TCP. Turck's new firmware also simplifies the configuration and handling of the system via the gateway's integrated web server.

Condition Monitoring Sensor with IO-Link

Turck's CMTH combined humidity and temperature sensor is now available in a compact variant with improved IIoT integration for smart condition monitoring applications. With a length of only 57 mm and an operating temperature range from -40 up to +100 °C, the IP67 sensor in an M12 housing can even be used in challenging environments. The interface provided also supports easy integration: The standard IO-Link Smart Sensor Profile (version 4.1.2.) with 64 bits on two channels simplifies the vendor-neutral configuration of networked systems. The CMTH is particularly suitable for monitoring the climatic conditions in production and warehouse buildings for all sectors handling goods that are sensitive to humidity and temperature. In simple I/O mode (SIO) the sensor outputs a switching signal for temperature and one for humidity. This mode is particularly suitable for retrofitting climatic data in existing applications where digital interfaces like IO-Link are rarely available. IO-Link mode offers benefits in modern plants or machines as the CMTH smart sensor can not only output continuous process values but can for example also calculate the local dew point. Users requiring long-term analyses will appreciate the pre-configured histogram function. The digital interface also simplifies sensor commissioning. Turck's IO-Link master can commission the device via the master's integrated web browser, without the need for any additional software.



New IP67 Switches

Three IP67 switches expand Turck's portfolio – two unmanaged variants and one managed switch. The two TBEN-Lx-SE-U1 feature eight 100 Mbit ports for the efficient networking of cells that don't require managed functions. Its fully potted design and protection types up to IP69K allow it to be used in the harshest environments without the need for protective enclosures. Short commissioning times are guaranteed since no configuration is required and the power supply is easily implemented with M12 or 7/8 inch connectors. With the TBEN-LL-SE-M2, Turck offers a managed IP67 switch with M12 L coded power supply for up to 16 A per voltage group. In addition to eight 100 Mbit ports, the device has two Gigabit backbone ports, NAT routing, NTP and firewall.

Fast Strain Gauge Transducer for Hazardous Areas

The IMX12-SG is a fast strain gauge transducer for force measurement applications in hazardous areas. It has a repeater function and can be used for signal conversion when the resistance changes on strain gauge bridges. A unique selling point on the market – as well a response time of less than 10 ms, combined with a flexible output circuit configurable with DIP switches and galvanic isolation in a slimline 12.5 mm housing. With its slimline design, the IMX12-SG is ideal for applications with limited space available. Turck's IMX12-SG provides galvanic isolation between the hazardous and safe areas.

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Fast and Flexible

MTP could revolutionize the biotech and pharma industry – the machine description standard enables plant modules and controllers to recognize each other, thus shortening the commissioning times and time to market for the plants

Modularization is a big issue in the biotech and pharma industries; standardized signal transmission and control of the plant modules can significantly shorten the duration of engineering, manufacturing and commissioning

Not only since the Corona pandemic have companies in the pharmaceutical and biopharmaceutical industry been faced with the challenge of developing, approving and producing active ingredients on a large scale as quickly as possible. Speed is required because patent protection for drugs expires after 20 years. However, only some of the time remaining after patenting is available to generate income from patented products, since it usually takes many years from the granting of the patent to the marketable product. Products therefore must be available on the market as soon as possible after a drug is approved. The entire process from development to the saleable product in the pharmacy usually takes around twelve years. Companies must begin building production capacity before final approval for a drug has been granted. If approval is not granted, the company is left with the production facilities and must retrofit them again at a cost of many millions of euros.

QUICK READ

In many industries, modularization and standardization are considered target-oriented strategies to reduce costs, production, delivery and development times. This particularly applies to the biotech and pharmaceutical sectors due to the time pressure arising from the process of approvals and patent protection. Turck is supporting this approach with its first MTP-capable I/O and control components. Thanks to multiprotocol Ethernet, with their three Ethernet protocols Profinet, Ethernet/IP and Modbus TCP, the devices are also suitable for most of the control systems used in the market and thus help to establish standards in-house and still meet the preferences of global pharmaceutical manufacturers.

Much more common, however, is the situation in which approval has already been granted but the plant is unable to start production immediately due to delays in setting up the production line. The drug then goes into what is called overtime. A situation that is very costly. Integrators and plant manufacturers hope for a way out of this dilemma – or at least a less difficult process – by building up production capacities more quickly. Since each plant is usually designed individually, engineering times as well as commissioning and testing often take too long.

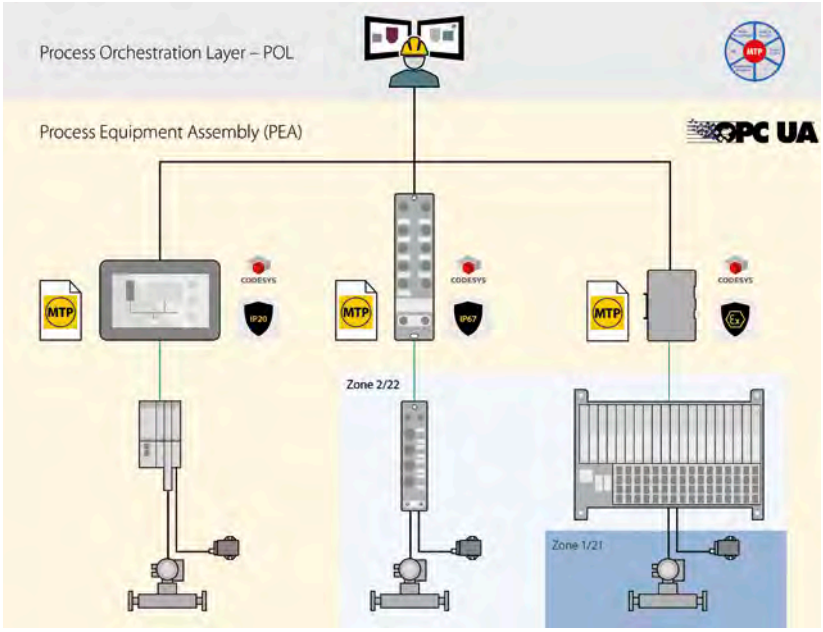
Modular plant concepts could considerably expedite the setup of production plants. This is because many plant components or machines in the biopharmaceutical industry can in principle be standardized – from upstream with bioreactors and filtration units, to midstream with centrifuges, microfiltration and ultrafilter units, right through to downstream. If all these units are joined together like building blocks

TURCK'S MTP SYSTEMS IN DETAIL

Turck supports modular machine and plant building with its I/O and control components with multiprotocol Ethernet and MTP

Turck's I/O and controller portfolio already offers different MTP solutions with IP67 and IP20 protection. Turck's compact edge controllers can be used for the fully autonomous control of machine modules or skids, such as fermenters or stirrers. The control tasks of the edge controllers are not only programmed in Codesys but also the pre-processing and filtering of the data. This effectively reduces the data flow to the cloud, which not only benefits the bandwidth but also offers a certain security benefit. The Codesys vendor-neutral system platform enables the use of different fieldbus/Ethernet protocols in an automation system. The edge controller generates the MTP file based on Codesys. It is then stored and installed in the Process Orchestration Layer (POL). The instructions are transferred via the OPC UA industrial communication standard, which is supported by a large number of devices from different manufacturers. MTP enables PEAs (Process Equipment Assembly) to be integrated quickly in modular plants.

Turck's excom I/O series is available for use in Ex areas. It promises maximum availability and configuration options during operation, and with the latest Ethernet gateways also supports Multiprotocol Ethernet



The infrastructure graphic shows different scenarios for MTP communication – also for Ex areas

with standardized interfaces to form a complete system, both the time required for engineering, the actual production and the commissioning can be significantly shortened.

MTP: semantics for machines

Control systems, however, have so far not been able to detect machine modules automatically. The semantics were not available by which the control level can understand the functions, capabilities and tasks of machine modules. Anyone who used a PC in the nineties could understand this situation. Although the peripheral components like printers, mice, keyboards all provided the same standard functions, they had to be set up manually with drivers in the operating system. Today a new printer is normally detected correctly and can be used straightaway when you connect it.

Process orchestration layer POL: conducting instead of controlling processes

The Module Type Package, or MTP for short, is designed to build this bridge between machines and the control level and become the driver for machine modules. The MTP files describe their functions as well as their most important parameters and characteristic values. The task of the control system is handled in the MTP world by a so-called Process Orchestration Layer, or POL for short. Processes are thus no longer controlled but only conducted. The POL sets the beat and piece of music like a conductor and keeps an eye on the overall work – without telling any individual musician when and which note to play.

The POL and other machines can read and understand MTP files and accordingly interact with them. The function of the module is detected, and its process control is based on the description in the MTP file. In this way, plant modules from different manufacturers can be used flexibly and combined to form complex overall plants. MTP thus considerably reduces the programming effort required when commissioning new plants. Genuine "plug and produce plants" are coming within reach.

RFID is a simple and reliable solution for the identification and verification of modules, containers or hoses, as shown here

Different network protocols prevent standardization
The different controllers of the end customers represent another obstacle for modular plant concepts for conventional controllers and control systems. They usually require the use of different I/O components, actuators and sensors, which in turn requires increased effort in engineering, in e-planning and ultimately also in warehousing.

Turck offers efficient solutions with its multiprotocol Ethernet I/O and control modules that can be used in Profinet, Ethernet/IP or Modbus TCP without any intervention by the user. The devices themselves detect which protocol is being used in the network and adapt themselves to it automatically. This therefore enables the machine builder to install multiprotocol devices independently of the end customer's network.

Offline tests shorten commissioning
Machine builders can expedite the process even more by testing the machine modules or skids already in their own production facilities. The so-called factory acceptance tests (FAT) can also be performed offline, i.e. without a connection to the subsequent plant control system, by using the integrated control functions of the TBEN I/O modules. Turck's I/O components enable the simulation of live operation with their integrated ARGEE logic software, which simulates the inputs of connected machines. If the possibilities of the I/O modules are not sufficient with ARGEE, Turck offers its IP67 TBEN-PLC controller, a fully-fledged Codesys 3 programmable controller, which also supports the three protocols of the multiprotocol standard.

IP67 components and quick connectors reduce wiring effort
The high degree of protection of the TBEN series also contributes to the faster commissioning of the plant. Thanks to IP67, the assembly and wiring of large control cabinets can be kept to a minimum. The use of quick connectors means that in principle only the process connections, power supply and network cables need to be connected on site. In real applications it is rare for all components to be available in IP67, but the assembly of the control cabinet is nevertheless considerably shortened or can be largely pre-assembled. Turck's new IP67 PSU67 power supply units also eliminate the need for cabinets for the power supply.

In this application, Turck's IO-Link master module with Profinet S2 system redundancy controls actuators in a bioreactor

Multiprotocol I/O systems for all zones, protection types, availability requirements

The Turck multiprotocol device series has continued to expand over the years. Customers wanting the flexibility of a modular system will find the BL20 and BL67 system solutions suitable for installation in the control cabinet or directly in the field. If, however, I/O blocks are required, Turck offers the devices of the TBEN series for cabinet-free installation directly at the machine, or the FEN20 series I/O block for installation in protective housings.

If an application in hazardous areas requires maximum availability and configuration options during operation, users choose a system from the excom series, which also supports the three multiprotocol networks with the latest Ethernet gateways – both as a system for mounting in zone 2 or as an N series for mounting in the safe area.

Modbus TCP as parallel channel for diagnostic data

The multiprotocol capabilities of the devices offer other benefits besides variant reduction and simple standardization and modularization: The devices can thus also be used via Modbus TCP in parallel to Ethernet communication via Profinet or Ethernet/IP as a channel for data access. User data and analysis data can be easily branched off via this channel to external IT systems and evaluated for diagnosis and monitoring tasks independently of plant operation.

IO-Link and RFID for automatic skid identification

The documentation of where and when mobile units are used, particularly those used at different points in the plant, is advisable – and this is usually also required by certification guidelines or laws. The use of machine modules can be identified and documented with IO-Link or RFID easily, reliably and without the risk of manipulation. If the modules use IO-Link components anyway, the entire machine can be identified via the Application Specific Tag of these components. Diagnostic data for predictive maintenance can also be communicated via IO-Link. Many components already offer this option as a standard feature, without the need for complex programming. Increased internal device temperature or reduced signal strength provide early warning of wear, contamination, or other problems. If no IO-Link components are used, RFID tags can be used to identify the modules via their UID. The UID is a unique one-time identification number of the tags, which cannot be changed after production. Turck is the only manufacturer on the market to offer RFID read/write devices with the Ex-e protection type for identification in explosion-protected areas, which can be used directly in Ex zone 1/21 without a protective housing.

MTP in practice

One of the first projects today using MTP in a real environment is in the laboratory of a major pharmaceutical manufacturer. This system can combine different laboratory devices such as stirrers, reagent containers with sensors and the filtration unit as modules. The benefits of modular systems cannot be fully leveraged until the module is provided with a decentralized controller – either with IP67 protection directly in the field or with compact PLCs in decentralized control cabinets.

In this project the customer chose Turck's decentralized I/O blocks and the TBEN-L-PLC decentralized controller with IP67 protection. This saves the user the time required to install additional housings and offers flexibility in the handling of the overall system. Laboratory staff can refit the TBEN-S modules without any tools in order to set up different measuring tasks. Another benefit: The integrated WebVisu visualization software enables the information on the HMI to be displayed in the field – even if the POL running on a central Windows computer is unreachable.

Conclusion

The path to a modular biopharma plant is not an easy one. The established routines must be broken down first and investments must be made in the modified production and development strategy. Cost benefits and synergy effects only materialize after a certain lead time. Once modularization is ultimately established, benefits can be achieved in all stages of the product life cycle. Manufacturers then also consistently decentralize the control capacity and logic of their machine modules. The three Profinet, Ethernet/IP and Modbus TCP protocols cover a large part of the market.

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IO-Link Unlimited

As a specialist in smart sensor technology, Turck brings intelligence to the machine, thus creating the link to Industry 4.0 and IIoT. In an interview with Andreas Gees from the trade magazine elektroAutomation, Turck's Product Marketing Manager Sai Seidel-Sridhavan and Aurel Buda, Director Product Management Factory Automation Systems, discuss the role of IO-Link as the basic technology in the portfolio and what further developments can be expected in this technology.

» Our customers will ultimately find the complete IO-Link portfolio at Turck, from sensors to RFID read/write devices, power supply units and lights, right through to hubs and masters for I/O systems and block modules – virtually from the sensor to the cloud.«

Aurel Buda | Director Product Management Factory Automation Systems

IO-Link has gained in importance particularly with regard to the concepts for the IIoT. What role does this communication technology have for Turck?

Seidel-Sridhavan: As a founding member of the IO-Link community, we have always worked with our customers to achieve the goal of digital communication from the control level to the last meter in the machine. At that time, we invested in a technology whose development we could not initially foresee. Today IO-Link is an important part of our corporate strategy. Every sensor and communication product we develop for factory automation is available in at least one IO-Link version. Choosing IO-Link is often a strategic decision and IO-Link devices are released first. Besides its use for RFID, IO-Link is one of our two core technologies for digital data from the machine and its use in automation. IO-Link is first and foremost an interface between sensor and controller, but it also provides the basis for implementing IIoT concepts.

Buda: Turck not only produces many different types of sensors for control tasks or process monitoring, but also many more for extensive IIoT solutions. Our customers will ultimately find the complete IO-Link portfolio at Turck, from sensors to RFID read/write devices, power supply units and lights, right through to hubs and masters for I/O systems and block modules – virtually from the sensor to the cloud. All this is complemented by the offering of smart software that makes it much easier for users to deploy the technology. We see IO-Link as the interface between the control and IIoT worlds and so we are also intensively involved in condition monitoring.

IO-Link initially had acceptance problems. This has changed. Why has Turck developed such an extensive portfolio of devices with IO-Link?

Buda: The efficient networking of even a simple switch in a machine and thus bidirectional communication to the field level is a significant use case at Turck. IO-Link is open and fieldbus-independent. We also support this with our Ethernet multiprotocol strategy in the masters. Sensors range from simple proximity switches to complex devices that provide additional information about their operating status as well as environmental conditions. Our radar sensors, for example, support condition monitoring with integrated analyses of humidity, vibration, temperature, etc. With IO-Link, Turck operates in an ecosystem in which standardized

Smart software features simplify engineering, commissioning and maintenance of Turck's IO-Link devices

actuator solutions from other manufacturers are also available. That is why we have got prepared for actuator technology on the IO device side. We connect IOs to the master via IO-Link to collect simple sensor signals, but also to switch valves with higher currents.

Seidel-Sridhavan: cceptance has grown with the increasing availability of IO-Link-capable actuators and many device manufacturers have discovered this interface for themselves. Initially, condition monitoring and IIoT generated interest, but the ecosystem was not complete. Today we are talking about a broad ranging ecology of sensors, valve terminals or power supply units. It has become clear that IO-Link is not only relevant for sensors, I/Os and controllers. Manufacturers are spared the need to integrate different interfaces. Users benefit from this single interface, with identical cables, connectors and software.

IO-Link gained acceptance when the first concepts for IIoT appeared. In the past, users used IO-Link to configure sensors.

Buda: IIoT, condition monitoring, predictive maintenance, process optimization and asset management have boosted the acceptance of IO-Link. Our message has always been that IO-Link also allows a cost-effective infrastructure. IO-Link communicates via an inexpensive standard cable. Although valve terminals or hubs can also be networked using Industrial Ethernet, the costs are significantly higher in this case, whereas the costs of a sensor have not increased due to the integration of IO-Link. And the transfer of process, identification and access data ultimately forms the basis for digital twins and asset management.

Turck offers solutions from the sensor to the cloud. Which IO-Link software variants are used to support configuration and operation?

Seidel-Sridhavan: Today, we implement the IO-Link configuration directly in Profinet controllers by integrating the data of the IO-Link configuration in the Profinet GSDML file of the master. This means that users can also configure their components in the same engineering system they use for the controller world. We have also integrated a tool into the web servers of our components that allows access to the IODD Finder, a global database of almost all IO-Link devices on the market. The IO-Link device description is then available in the engineering system or in a configuration system via automated interfaces.

Buda: Our web-based configuration tool has the same interface to automatically load the IODDs from the network. The tool is suitable for configuration, but also for initial commissioning. This also applies, for example, to the RFID read/write devices, for which configuration via IO-Link is very simple. We can also, for example, program web apps that facilitate the calibration of sensors. We have implemented this for our radar sensors, but also for our vibration sensors, and we are continuously expanding the range. IO-Link profiles also define the standardized behavior of individual devices or classes. There are already some profiles, for example for smart sensors. This means that devices of the same type can be treated in the same way in terms of software, irrespective of the manufacturer.

What is the significance of IO-Link for business models such as condition monitoring and predictive maintenance?

Seidel-Sridhavan: The classic automation structure provides for a connection to a PLC. The data goes for example from there to MES systems. Different customer groups, however, are increasingly demanding parallel access directly to the data from the IO-Link masters. This enables the condition monitoring system to thus

be expanded or modified as required over the lifetime of a plant. We have been offering this kind of parallel interface in our masters for many years. It enables condition monitoring to be implemented using our edge gateways as well as suitable cloud services. Our concept of decentralized automation not only includes the components outside the control cabinet in IP67, but also the data pre-processing directly at the machine. We also offer logic functions for our edge controller for this purpose. We are also open for industry standards such as OPC UA and MQTT for communication with the IT layer.

Buda: When the topics IIoT and Industry 4.0 emerged, there was a lot of talk about big data to later start machine learning projects. However, a lot of data generates a lot of traffic and requires a lot of bandwidth and memory. Nowadays, only smart data is normally transmitted. This can be an evaluation of the data or its changes, it can also be a data aggregation or the evaluation of correlations between different sensor values. There is also the aspect of latency. Fast response times are ensured when decisions are made directly on decentralized edge controllers.

»Today, we implement the IO-Link configuration directly in Profinet controllers by integrating the data of the IO-Link configuration in the Profinet GSDML file of the master. This means that users can also configure their components in the same engineering system they use for the controller world.«

Sai Seidel-Sridhavan | Product Marketing Manager

Is IO-Link therefore ideal as a basis for digital services?

Buda: Our edge controllers provide the platform to preprocess the data using logic or to visualize or send it to the cloud via protocols such as OPC UA. We offer ready-to-use function blocks and modules for this purpose. Our global application engineers and sales teams discuss the task with the customer and draw up a proof of concept. This often goes as far as visualization. However, it often also includes docking to MES or cloud systems. We also work with system integrators who program turnkey applications. Our devices can communicate with any system, but we also offer our own cloud in line with the motto 'configuring not programming'. The target group is those machine builders who are not so familiar with the world of digital services. They start with remote access and can visualize, store and analyze all data using our cloud service. The end result is turnkey solutions that can be adapted.

IO-Link+ or IO-Link over Single Pair Ethernet is currently a hot topic. How do you assess the latest developments?

Buda: The origins of Single Pair Ethernet come from the automotive industry to replace the CAN bus. SPE has spawned various standards that define transmission lengths and data rates that are also suitable for use in automation and the process industry. In the IO-Link community, we have also taken a close look at the developments and have specified the technology with 10 Mbit over longer distances as IO-Link+. Although this is a different transmission medium, we want to retain the advantages of IO-Link. We do not want to compete with Profinet, Ethernet IP or other Ethernet protocols. IO-Link+ is rather intended for device classes that we cannot serve today. IO Link is limited to 20 m between master and device. The data rate is also less than 1 Mbit. With the advent of IIoT concepts, increased data flows will often be required. Furthermore, IO-Link cannot be used in process automation today. IO-Link+ lays here the foundation for also being able to transmit data up to zones 0 and 1. However, IO-Link will always remain a point-to-point connection.

SPE and protocols such as Profinet could well become an alternative to IO-Link. What are the differences, where are the limits, and what role does cost play?

Buda: One of the expectations of SPE is that it should enable sensor connections at a comparable cost to IO-Link. However, this is very unlikely according to current estimates. It will also hardly be possible to connect sensors over long distances and unshielded cables. In

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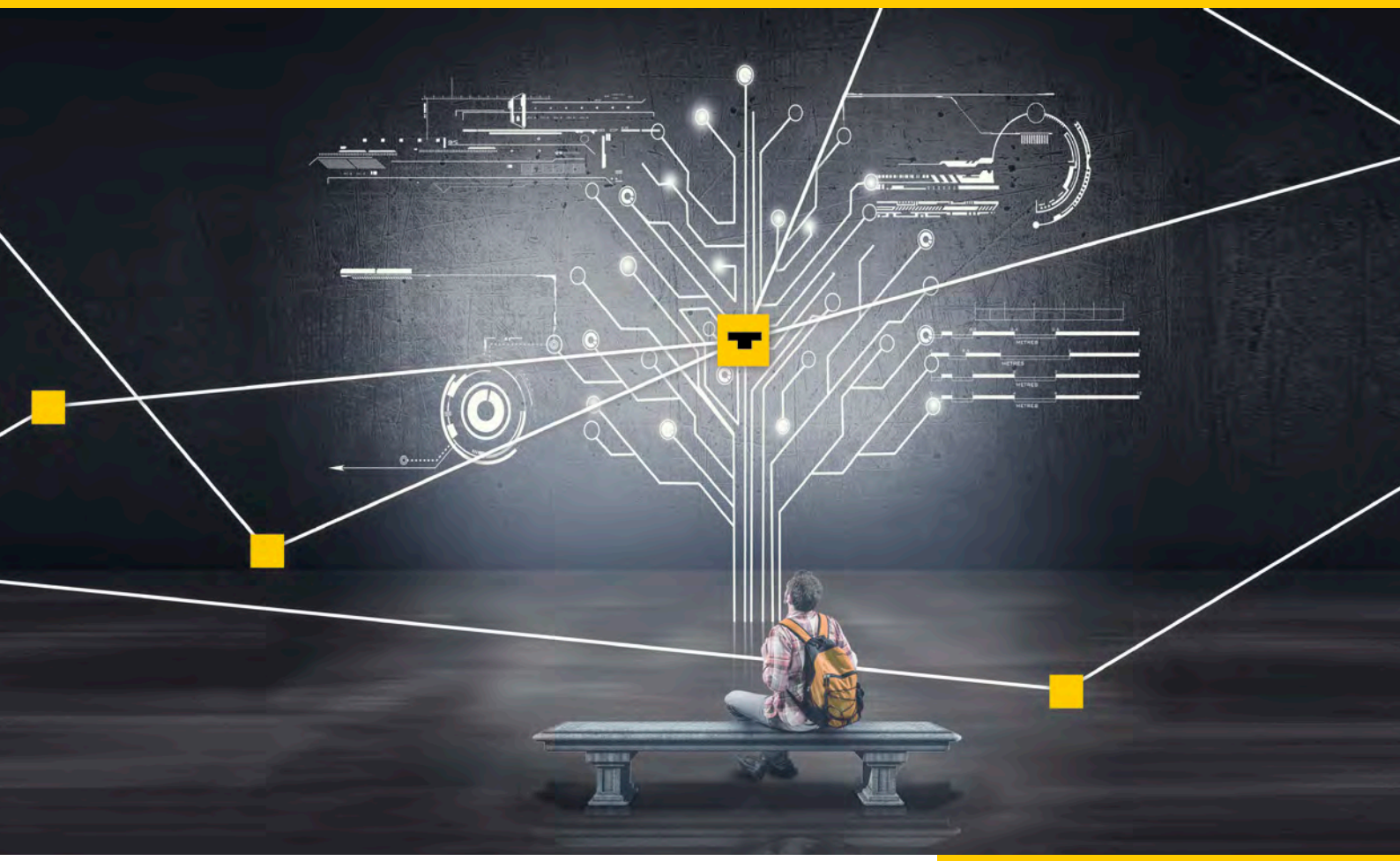

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“SPE will not be a replacement for IO-Link, but a complement to it.” Aurel Buda and Sai Seidel-Sridhavan are convinced that SPE will find its place as a complement to the technologies available today.

the Profinet community, the unshielded two-wire cables in particular are regarded as a cost benefit. SPE is therefore unlikely to provide such robust communication as IO-Link. There is also a difference on the device side. There are complex sensors where the communication interface does not account for a significant portion of the total cost. SPE should come into play more quickly here. For a simple sensor, IO-Link will assert itself as a fieldbus-independent solution.
An IO-Link master today has four or eight IO-Link ports and therefore connects up to eight devices to the controller via a single connection. On the other hand, if I connect eight sensors via SPE, I have to manage eight individual control connections. This takes up bandwidth, also because of the required protocol overhead. Since each communication link must be set up and managed in the controller, this also requires resources in terms of memory and computing power.
SPE will not be a replacement but an addition to IO-Link. It therefore comes down to a coexistence of alternatives. This also applies to today’s widely used Profinet field devices and other Ethernet protocols. We are convinced that SPE will find its place as an addition to the technologies currently available today.
Seidel-Sridhavan: IO-Link as a technology offers considerable potential for opening up new business areas as well, but performance is limited. Devices requiring a higher data rate are not the focus of IO-Link. We are therefore looking very closely in the IO-Link community at where we can use this technology in a useful way, so that the fluid sensor that yesterday still delivered perfect data with IO-Link is not suddenly only developed with IO-Link+ tomorrow. The community is pushing for coexistence in this respect too. The message is clear, IO-Link+ is an extension not the successor of IO-Link.

Another topic is IO-Link Safety. What importance does Turck as a safety supplier attach to this technology?

Buda: We are watching the market very closely. Turck offers various safety products, especially in the IP67 area - Profisafe and hybrid devices that combine safety channels and IO-Link, with an integrated shutdown function that can be used to safely switch off actuators. However, this does not comply with the IO-Link safety protocol. The technology as such is interesting and will further advance IO-Link. We are currently watching how the ecosystem is forming up. The first version of the IO-Link Safety standard was already completed in 2017. Alternative approaches such as Profisafe over IO-Link have tended to create uncertainty. After the specification was ready, test concepts were developed as a basis for developing the device. We also consider IO-Link Safety to be an interesting approach because the safety sector in particular is characterized by proprietary sensor and actuator systems. IO-Link Safety is the first harmonized standard at the lower level. This will give us a mixed field of different manufacturers for safety switches and sensors, which can also be connected to masters from different manufacturers.
Seidel-Sridhavan: In recent years, most manufacturers have developed devices for the safety area that link IO-Link with Profisafe. Since these are two concepts, the IO-Link community did not support this. IO-Link Safety, on the other hand, is independent of Profinet, Ethercat or Ethernet IP. Specifications have already been drawn up at the PNO on how IO-Link safety can be integrated into Profinet, and the other organizations are sure to follow. It is important that manufacturers of safety sensors and actuators focus on one standard. A door interlock, for example, has so far required a great deal of effort in terms of wiring. IO-Link Safety with its bidirectional communication would bring considerable advantages here.

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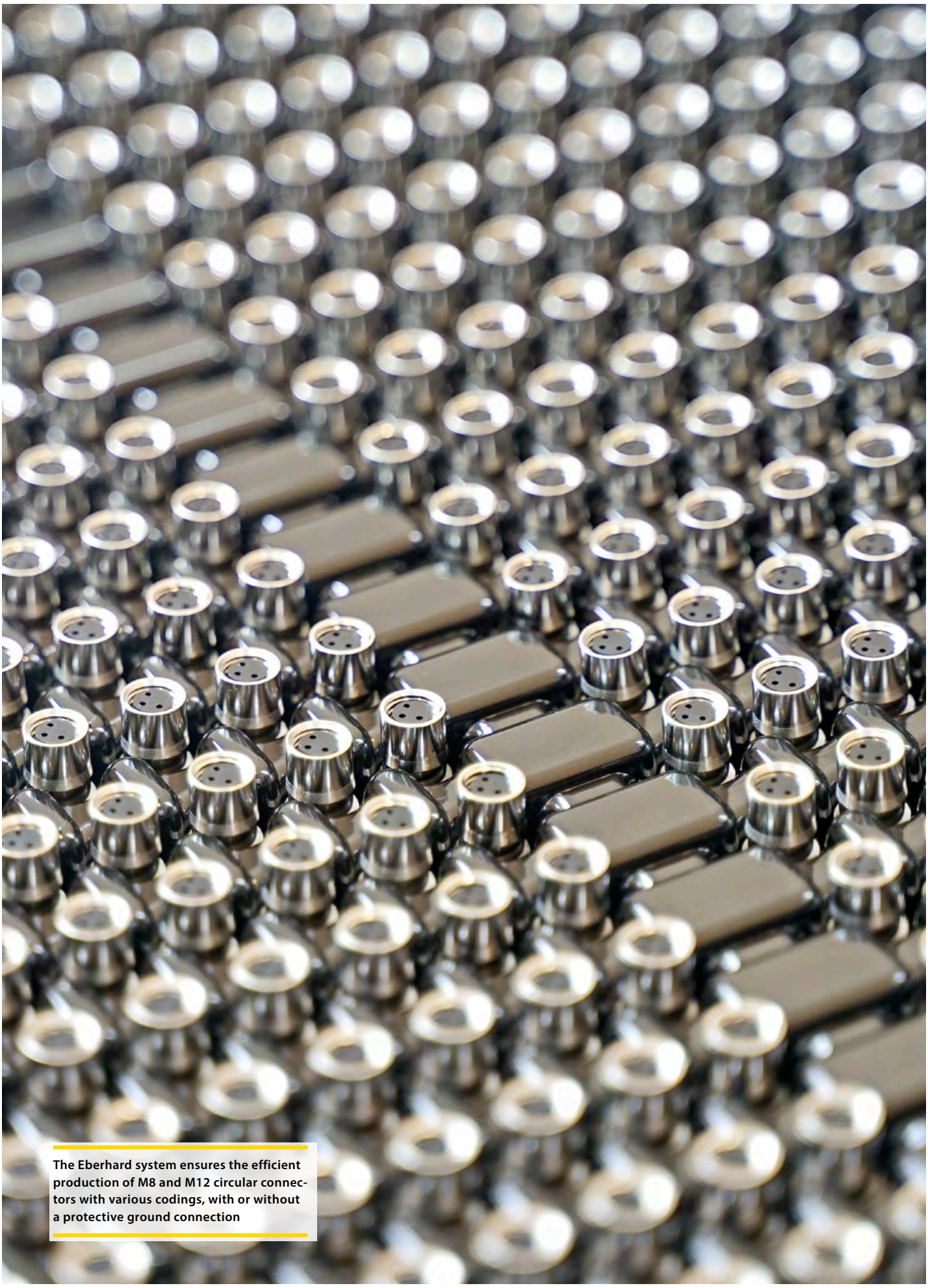


The Eberhard system ensures the efficient production of M8 and M12 circular connectors with various codings, with or without a protective ground connection

Connectors Made Easy

High product variety with minimum setup times: Eberhard AG builds high-performance assembly system for M8 and M12 connectors

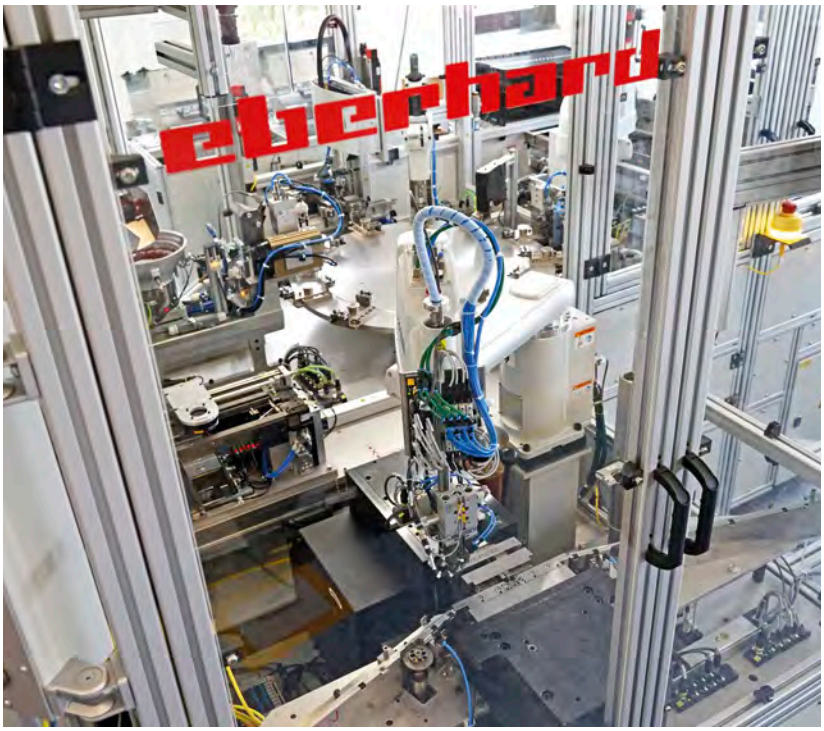
When it comes to cabling industrial plants, machines and devices under demanding operating conditions, circular connectors are one of the most common physical interfaces worldwide. M12 and M8 have become established as the standard sizes for more compact devices. Turck had been looking for an assembly solution that offered fast throughput times, scalable quantities and maximum process reliability for the automated assembly of M8 and M12 circular connectors with different codings. These were to be used in TBEN block I/O modules, with or without a protective earth (PE) connection. The assembly of millions of circular connectors places high demands on automated systems. This is particularly the case when regular retooling for different variants is required. The machine is moreover not only required to handle the actual assembly, but also the visual inspection of the contact insertion and lastly the packaging of the circular connectors in trays.

The production planners at Turck had already experienced good results with the special machines of Eberhard AG used at various production sites. The order was therefore placed with the company based in Schlierbach, Baden-Württemberg. For more than 50 years, the company has supported electronics manufacturers and automotive suppliers worldwide with modular and high-performance solutions for the production of connectors and other electromechanical components. Its core competences include all the standard processes involved in assembly technology, insertion and bending of contacts, testing and packaging, as well as the handling of products according to customer requirements.

The requirements for maximum productivity and efficiency were already clear during the design phase of the application: maximum output, short setup time, as well as high system flexibility and reliability. “Eberhard AG proved to be the most trustworthy and suitable partner for our application,” says Jörg Montowski, from Production Engineering – Process Development at Turck. “We were particularly impressed by the company’s exceptional expertise in the production of plug connectors and insertion of contacts in plastic parts, such as hundred-pin male connectors for the automotive industry.”

Automated insertion

The pin insertion machine inserts the metal contacts into the plastic cores of the subsequent female connector, slips the later metal connector body over the plastic core like a sleeve and also adds a ground connection beforehand. The process control is handled by a Siemens PLC. The remaining automation tasks were implemented with Turck components wherever possible, including sensors, safety light curtains, block I/O modules, HMI operator panels with direct cloud connection and connection technology.



Eberhard was able to utilize the full Turck range, from sensors and I/O modules to HMI and cloud, for the design and implementation of the plant

Like the metal bodies, the plastic cores are fed via a spiral conveyor. A QS18 photoelectric sensor detects the tray on which the finished female connectors are placed. The optical sensor from Banner Engineering

QUICK READ

Eberhard AG is a powerful partner in the field of automation, and develops, produces and distributes customized automation and assembly systems worldwide. Depending on customer requirements, individual stations are individually combined into complex systems and then integrated into the production lines. Eberhard AG developed an assembly machine for the production of M8 and M12 female connectors for use in Turck’s block I/O modules and benefited from these very same block I/O modules during its construction. Turck’s pressure sensors and Banner Engineering’s optical sensor components also impressed Eberhard AG. The standout features of the insertion system are its minimal setup times and high precision.

»We were particularly impressed by the variety and flexibility of the decentralized block I/O modules. Turck's hybrid TBPN-Profinet/Profisafe module in IP67 combines standard and safety inputs/outputs in one device, which can be parameterized flexibly.«

Andreas Wißt | Eberhard AG

A Turck HMI from the TX700 series is used for visualization and cloud connection

thus ensures the orderly feed and outflow of the plastic carriers. Banner Engineering safety light curtains are used in tunnel operation in the palletizer to protect the operators of the system from unintentional access into the danger area of the machine. After feeding the plastic parts, a camera system measures their position based on the guide and hole geometry. The system reports a degree to the controller so that the robot can pick up the plastic parts in the correct position or correct their position. After the actual and target insertion positions have been matched, the robot moves the plastic part to the rotary table, where it is rotated to the appropriate position and inserted. During the insertion operation, a QM30 sensor mounted on the insertion head records vibration data that is visualized via a dashboard and can be used for condition monitoring and predictive maintenance.

Plug and play device replacement with IO-Link

One requirement was the ability for plug and play replacement of the sensors, so that they can be exchanged in the event of a fault and used directly without the need for renewed parameterization. A requirement that was met with smart IO-Link sensors. Parameter sets of IO-Link devices can be stored in the IO-Link master and applied to any replacement device. Other IO-Link components in the plant are valve terminals, including the large main terminal at the insertion head and the Turck pressure sensors. "The PS+ pressure sensors deliver on their promise to offer intuitive commissioning and operation," Andres Wißt, head of software engineering at Eberhard AG, confirms. The PS+ sensors monitor the pressure changes in the pneumatic system of the plant. The user is alerted if the plant delivers values that deviate from the standard.

Flexible I/O and safety modules

Eberhard relied on Turck's TBEN I/O module portfolio to connect the IO-Link signals as well as the conventional digital input and output signals. "We were particularly impressed by the variety and flexibility of the decentralized block I/O modules," Andreas Wißt describes. "Turck's hybrid TBPN-Profinet/Profisafe module in IP67 combines standard and safety inputs/outputs in a single device, which can be parameterized flexibly. I was very surprised at what this device can do."

A TX700 series HMI serves as a fixed panel for visualization and is also used as a cloud gateway. "A major benefit," says Wißt. "One of the requirements was to provide data for the cloud. This was only

possible with the Turck HMI – and without any problems." The HMI accesses the controller data via OPC UA. Relevant data can thus be uploaded to the cloud, where key figures are derived such as the number of parts produced, fault messages or machine downtimes. These are visualized on a central monitor in the plant.

Further possible applications examined

The project members at Eberhard AG are also examining additional scenarios for the use of Turck components in other projects due to their good experience with them. "This applies to the sensors and especially the TBEN modules as a whole," says Wißt. "We will thus benefit from the diversity and their flexibility, especially with the hybrid safety module."

The insertion system is now running successfully at the Lublin production site in Poland. In anticipation of the continuing high demand for M8 and M12 connectors, another machine has already been ordered as a result of the good experience had with the first one. "The cooperation with project management and those responsible was excellent – also on a personal level. Very communicative and relaxed," says Wißt. "This is especially true in light of the fact that this was the first machine of its kind, and everyone involved was able to learn something. I am looking forward to more projects in the future."

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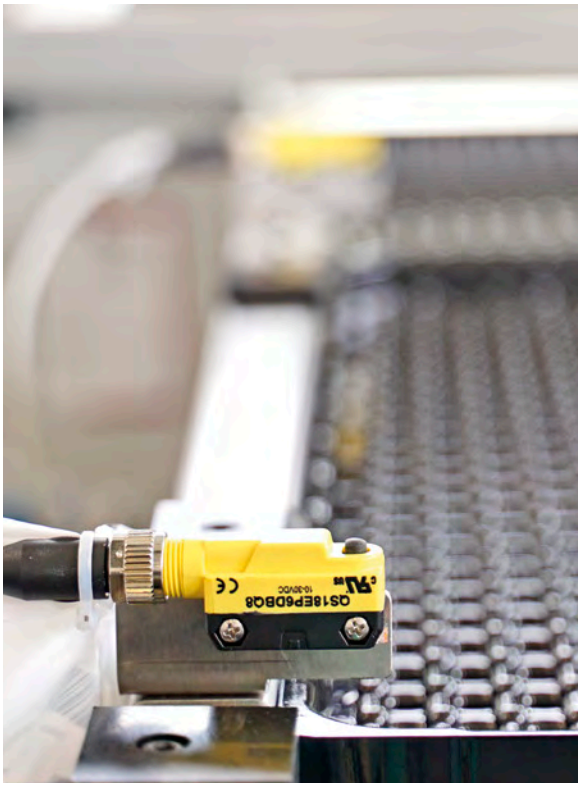
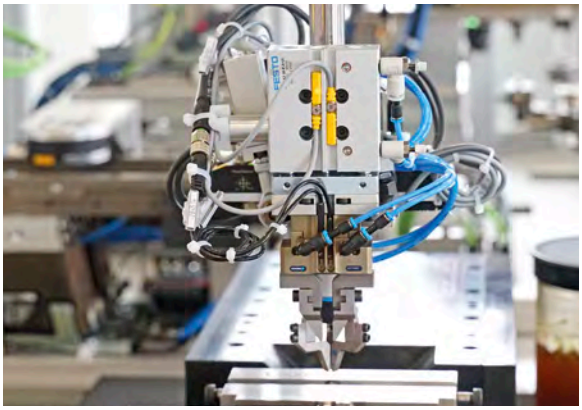


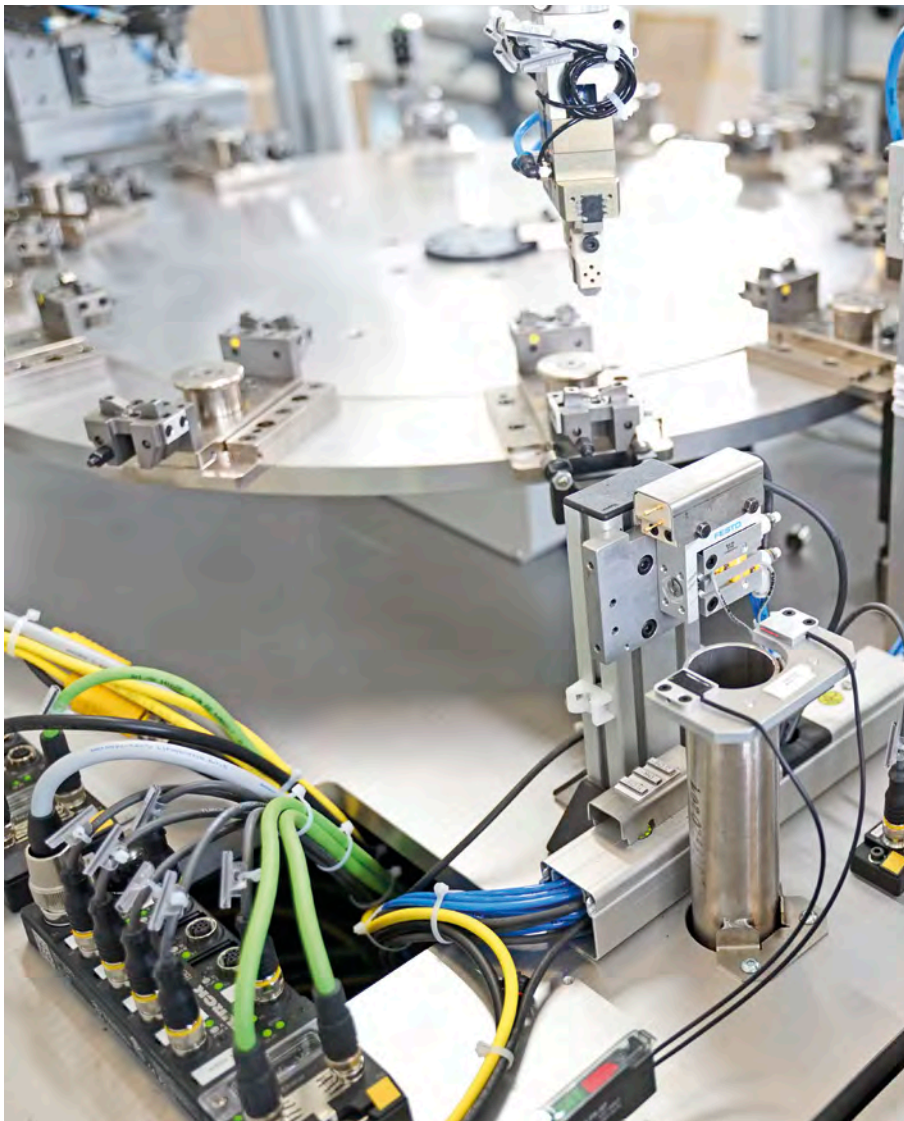
A QS18 photoelectric sensor detects the tray on which the finished connectors are placed



The BIM-UNTK magnetic field sensors detect the piston position and thus the height of the gripper

Illuminated emergency-stop pushbuttons: the space-saving concept of the light integrated in the pushbutton is rarely found

After checking the insertion position, the robot moves the plastic part to the rotary table, rotates it into the correct position and inserts it for insertion with the contacts



Follow the Light

How the digitalization of order picking, assembly and planning processes reduces work for employees and makes it more efficient

Errors occur wherever people work. In production and assembly processes they happen now and again even to the most conscientious and experienced workers. The wrong component or the wrong number of components may for example be taken from a container. They may possibly also be assembled in the wrong order. This results in the need for rework, recall actions or even image loss. Accuracy is therefore especially important for a quality product. To achieve a maximum throughput, assembly must also be performed as quickly as possible. The solution therefore has to ensure fast assembly at optimum quality.

The worker must be able to identify the next parts container quickly and easily if greater efficiency and accuracy in assembly is to be achieved. A customized system for light-guided worker support clearly indicates the container from which the co-worker is to take the next part. The system also logs the removal and indicates immediately the next container.

As individual solutions are normally very expensive due to the high development costs, the CSAE system house developed a pick-to-light software based on the experience, ideas and customer requirements of the past 25 years. This provides functions to cover most typical requirements as well as the needs of new customers. This controller software is the basis for customer applications and is considerably less expensive than the programming of a tailored solution. Only the customer's interface requirements are implemented for each specific project. "The customization work required continues to be our responsibility," says Oliver Gundlach, team leader for automation technology at CSAE. "It's not the customer who has to adapt to our solution but our solution to the customer. Depending on the customer's system, we adapt our solution so that it works in the particular application."

Easy modular expansion

The controller software is the central component in the "Smart Light Touch" modular system. Another element is the shelf, although the system always operates independently of the shelf type and can be adapted both to new shelf systems as well as to existing shelf systems of the customer. Modbus/TCP-capable components from Turck complete the CSAE pick-by-light solution, which

Besides the processing of the controller software, Turck's robust TBEN-L-PLC IP67 PLC offers many possibilities for interface connection and visual indication – entirely cabinet-free

»The TBEN-L-PLC is robust and can be used directly in the production environment. An ultracompact device that can do a lot and offers a lot, particularly in terms of the range of interfaces.«

Oliver Gundlach | CSAE

primarily includes the PTL110 indicator with a 7-segment display, light buttons and optical sensor, the small K30 Pro LED indicator with a light button as well as the WLS LED work light without a button element.

Other components from the Turck portfolio can be added to the system depending on customer requirements. They have to be Modbus/TCP-capable devices as this protocol offers fast, flexible and effective communication in industrial networks. The specialists at CSAE rely on Modbus/TCP for the lights as this protocol offers a high degree of flexibility, and communication is very reliable and fully developed. A panel PC can be integrated at the shelf to ensure even greater safety and for example to indicate assembly steps. This gives workers an accurate overview of the work process.

QUICK READ

Whether during assembly, order picking or logistics – errors can often occur, costing time and money. To achieve the lowest possible error quota, processes have to be optimized and available resources optimally used. The "Smart Light Touch" pick-to-light solution from system house CSAE GmbH based in Wolfsburg supports this approach. This is a modular and automated complete system for the visual support of workers that is based on Turck components. It uses light signals to reliably guide workers through assembly and order picking processes – and thus significantly reduces the error quota.

Turck's pick-to-light devices and brackets of the Banner PTL110 series can be used easily without the need for additional tools or reprogramming

TBEN-L-PLC eliminates the disadvantages of PC-based controllers

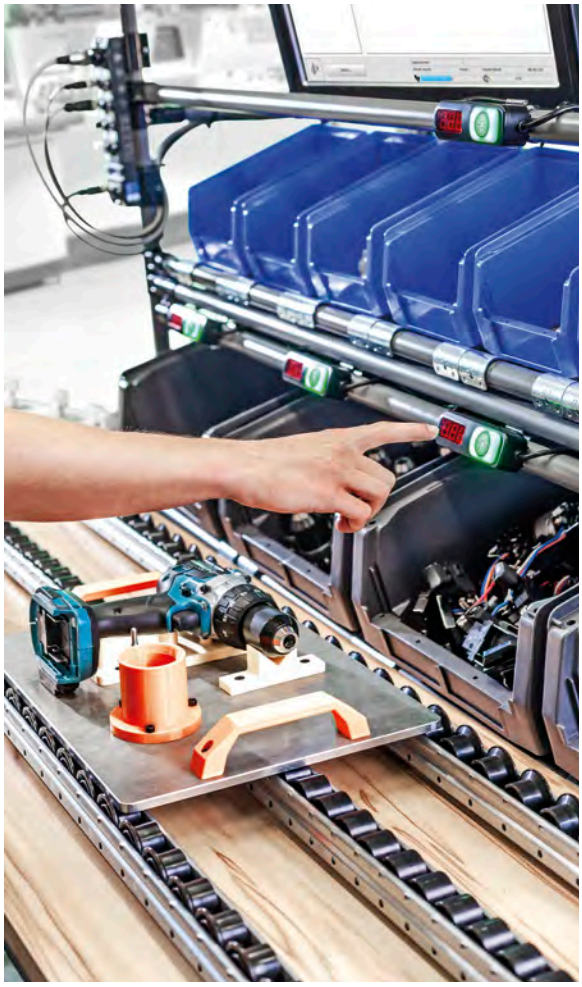
CSAE looked for a PLC for the controller software of Smart Light Touch that has capacity for SAP and other interface connections as well as options for visual indication. The company decided to use Turck's robust TBEN-L-PLC compact PLC. The IP67 controller is designed for industrial use and, as a block IO module, enables the design of cabinet-free modular machine concepts for Industry 4.0 and IIoT. It not only comes with a Codesys PLC on board but also allows a direct cloud connection. Thanks to its multiprotocol technology, it can also communicate via different Ethernet protocols at the same time.

By using the Turck controller, the disadvantages of PC-based controllers can be excluded from the start. These include difficulties with the later implementation of system changes and the frequent absence of long-term support, which depends in PC-based systems on the specific Windows version. "For us it was important to connect to the network. The TBEN-L-PLC is robust and can be used directly in the production environment. An ultracompact device that can do a lot and offers a lot, particularly in terms of the range of interfaces," says Oliver Gundlach. "The straightforward collaboration between Turck support and our programmers also offered an important basis for the implementation of custom interface requirements. Technical modifications such as firmware adaptions are also completed at short notice."

Easy installation and commissioning

The easy installation of the CSAE system is unique on the market – from the setup of the shelf right through to commissioning: "Not even a screwdriver is needed for the setup," says Gundlach. "And the commissioning is simply carried out via a web page – nothing more. A USP that is yet to find its equal."

The system is designed so that any customer can plug together the hardware components of Smart Light Touch on their shelf on their own – without any technical instruction. The individual components are fitted to the shelf with click and screw mechanisms. Commissioning does not require any IT specialists so that each customer can do it themselves. The CSAE customer portal provides here permanent support



The simple installation of the automated and modular "Smart Light Touch" pick-by-light system is unique on the market – not even a screwdriver is required for the setup

User-friendly: the entire system is commissioned easily via a web page

CSAE sales manager Sarah Wedekind wants to particularly support small and medium-sized companies in the digitalization of their logistics: "We therefore offer an intuitive and simple system that customers can configure on their own."

with operating manuals, video tutorials and support contacts. "We also take into account the needs of small to medium-sized businesses that cannot afford a programmer," says sales manager Sarah Wedekind. "We also want to address these companies effectively and support them in the digitalization of their logistics. We therefore offer an intuitive and simple system that customers can configure on their own."

Personalization through individual color settings

Smart Light Touch detects at any time via a higher-level system or a transponder which worker is currently working. After logging into the system, workers can set the colors to their individual preferences or needs. A worker with red-green color blindness, for example, can select alternative colors to red and green in order to carry out the work without any difficulty. Corporate colors can also be set or the favorite colors with the worker. The colors can naturally also be set to indicate to workers immediately the tool they are to use with the currently taken part. This enables each worker to design their workstation as they like.

High worker satisfaction

Smart Light Touch supports assembly workers and significantly reduces their error quota, thus keeping rework and recall actions to a minimum. A major benefit of light-guided worker support at the shelf, as well as the visualization of the work steps is a considerably faster assembly speed and the resulting increase in worker productivity. Time is not lost by workers having to think about what the next work step is or which is the right tool for the currently taken part.

New workers or vacation cover can already work on their own and reach full output after a short training period. As work with the pick-by-light system is based on light signals, workers could also be employed who were previously excluded from working life for example due to a lack of language skills or minor disabilities.

Conclusion

The easy installation of the automatic and modular Smart Light Touch pick-by-light solution from CSAE is unique on the market. Customers are able to assemble and commission the system on their own – without the need for a programmer or any technical instruction. A direct cost benefit for the customer is the proven controller software, which was developed on the basis of customer requirements of the past decades and covers a majority of market requirements. Custom interface requirements are implemented individually. The technical possibilities of Turck's TBEN-L-PLC compact controller as well as the close collaboration between Turck and CSAE experts enable these to be implemented very quickly.

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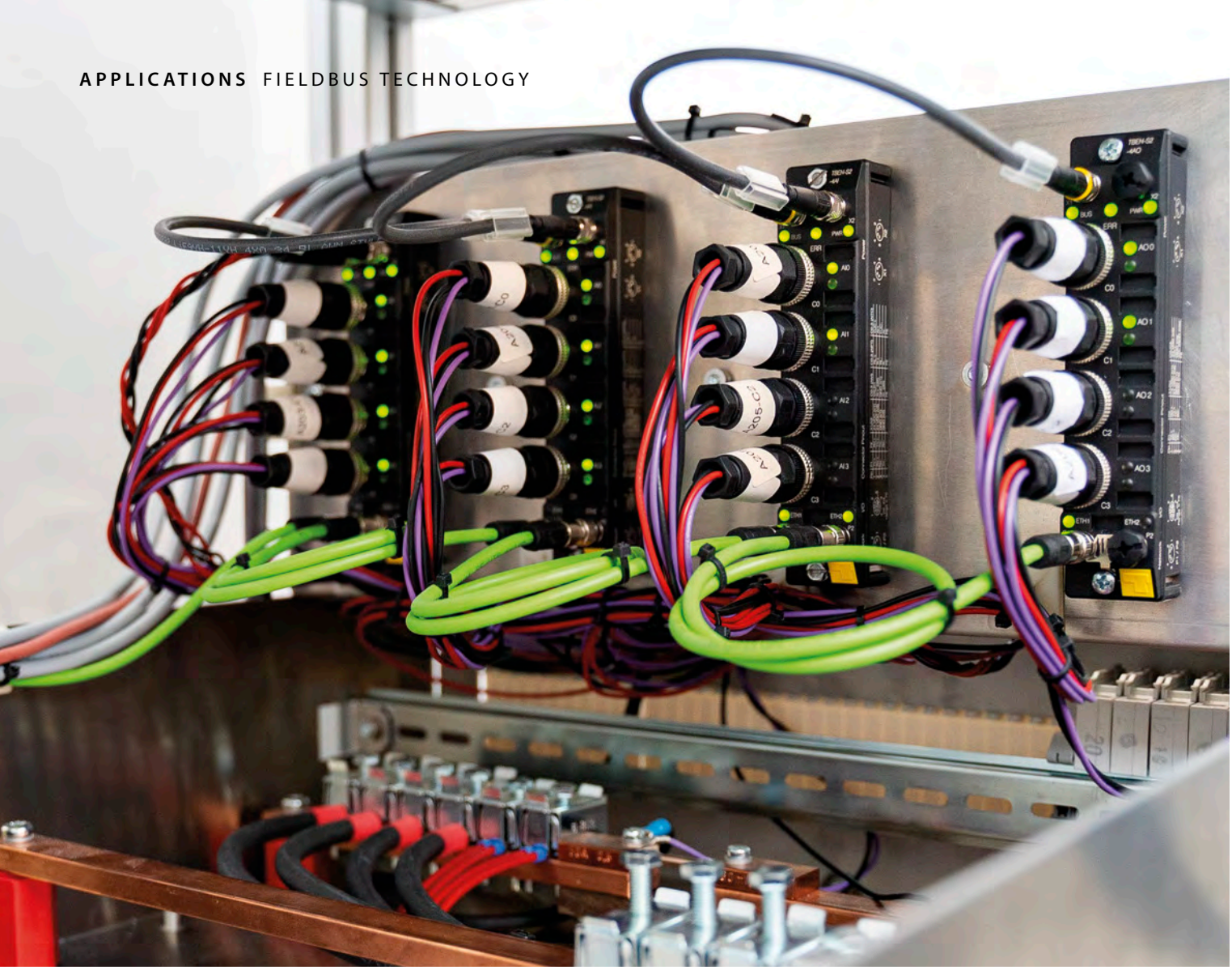


Cell Block

Turck's TBEN block I/O modules with their own LabVIEW driver improve system flexibility and mobility in test stands for fuel cells at FutureE

Instead of an external control cabinet and long cable routes: Turck's IP67 block modules with integrated LabVIEW driver considerably simplify the creation and expansion of test stands

"Battery storage alone will not be enough," Siegfried Limmer says of the energy transition. "We will need both technologies in future, hydrogen and battery storage technology." He is already noticing daily the growing demand for fuel cells as part of this trend. As managing director of the development consultants FutureE in Nürtingen, Siegfried Limmer works on the development of fuel cell systems together with his employees and partners. His customers come from the materials handling, automotive and commercial vehicle industries, but also from the energy or building sectors.

Optimization potential: fuel cell system

"The subject of fuel cells will increasingly become a major topic for discussion and I expect that we will grow with this," the managing director says with confidence. He has good reason to do so since the use of hydrogen in a fuel cell still offers tremendous optimization potential. This electrochemical process involves the oxidation of hydrogen gas at the anode with water formed at the cathode through the supply of oxygen. The electrons released in this process can be used to drive electrical loads. However, like the combustion engine, which has undergone constant improvement since its invention, there is still also considerable optimization potential in fuel cell technology. It is also possible for example to fine-tune the electrolyte or the catalyst of the reactions in addition to improvements made with regard to temperature, pressure and other reactant conditions.

Test stand for the technology

To test its own fuel cell systems, FutureE developed a test stand similar to the one that could also be used in a laboratory environment. Testing in this case involves

more than just a quality check after production. It is a major part of the development work since the efficiency of a fuel cell depends on several parameters which are run through in multiple iterations to determine the ideal operating parameters for different load scenarios of a fuel cell system. This ensures that the system is always run with the optimum operating parameters in different ambient conditions – both at zero degrees and five percent air humidity as well as at a tropical 40 degrees and 80 relative humidity.

LabVIEW: virtual standard for test stands

LabVIEW from National Instruments is virtually the standard software for extensive test procedures in R&D. However, LabVIEW is also used to run test stands in product development and increasingly also in parallel with production. "The programming required with a PLC is considerably greater, particularly when making calculations with array functions. LabVIEW also offers considerably more options than a PLC when it comes to designing the graphical user interface," Albert Wais explains. He has known Siegfried Limmer for years, also from their time together at Ballard, the fuel cell manufacturers. Wais has specialized in LabVIEW programming and supports FutureE here with the ongoing projects. For Wais, LabVIEW was virtually set as the software for operating the test stand. The program makes it possible to automate entire test series and run them automatically.

Signal connection in the control cabinet: undesired and established

Test stands in R&D are normally set up in a control cabinet which houses the instrumentation and control technology as well as the controller, IT and communication technology. The control cabinet is usually located outside of the test area since climatic conditions simulated inside it are challenging. This therefore requires the cables to the sensors and actuators on the test stand and test object to be routed individually from the test area to the control cabinet.

Problems often arise during testing that were unforeseeable during the planning phase. "Additional signals are then also required for this. Even though spare channels are planned in, more channels are needed in the end," Wais explains the dilemma from his experience. "This then requires us to once more route several cables in the control cabinet to the test and laboratory area, and this often involves considerable mechanical effort and in some cases, new approvals."

Learning from industry: decentralized signal connection

Decentralized signal connections are now well established in industry as an alternative to point-to-point connection. I/O modules with IP67 protection are installed directly at the machine, capturing signals and transferring them to the controller via a single Ethernet cable. IP67 I/O solutions were previously rarely used for communicating with test stands, partly because the I/O modules designed for Industrial Ethernet can hardly communicate with LabVIEW. "Although NI offers a driver for Ethernet/IP, it is so basic that you can't really work with it properly," Albert Wais explains the situation. The fact that National Instruments does not consider Ethernet/IP as a priority for LabVIEW is understandable, especially since the software has only in recent years been increasingly used for parallel testing in production.

»The TBEN-S modules are ideal for climatic tests. We fit them directly in the climate chamber and only have to route out a single cable. We can then add additional modules in the climate chamber flexibly – without having to route new cables. This flexibility is a major benefit for us.«

Siegfried Limmer | FutureE

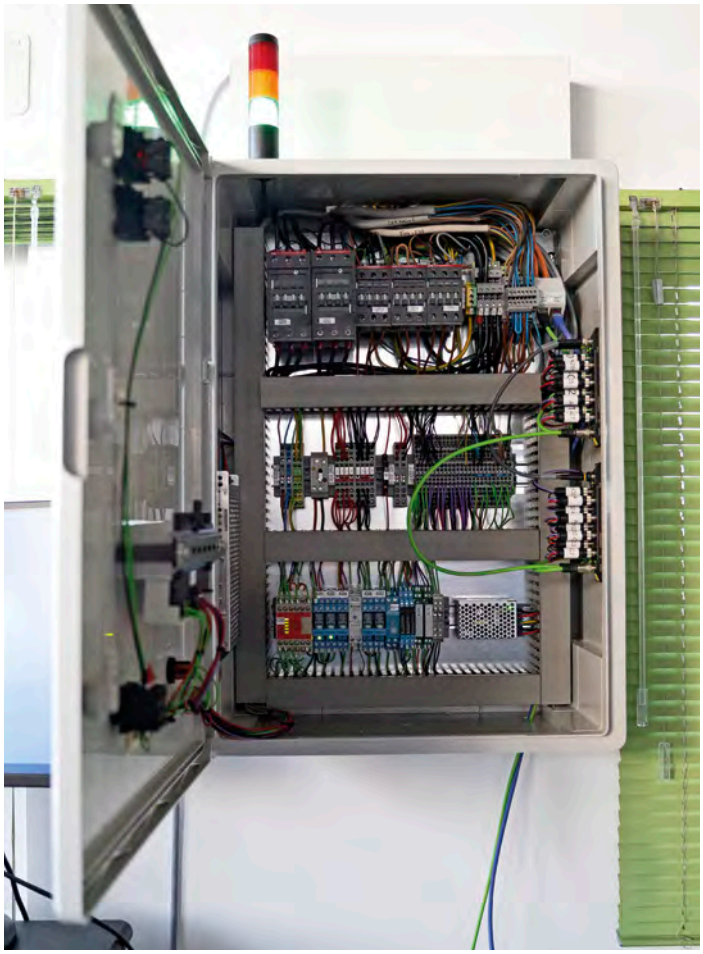
Unique: IP67 I/O modules with LabVIEW driver

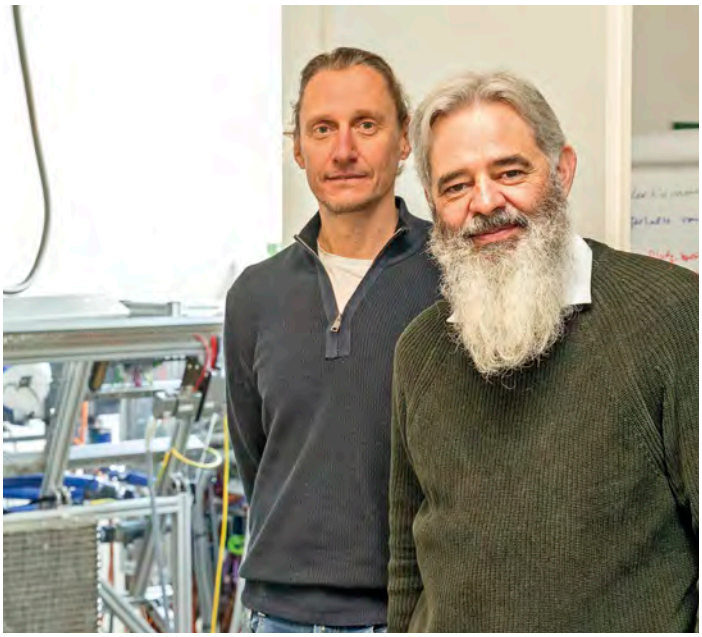
Albert Wais himself was involved in the work to close this gap. Wais and co-workers from special machine builders Kirschenhofer wrote a LabVIEW driver for Turck's TBEN-S decentralized I/O modules for a project for Kirschenhofer and Britax Römer. "This was a enormous task because we had selected for the RFID module in this project the most complex RFID module

QUICK READ

Hydrogen could be one of the central enablers of a CO2-free energy supply. For this to be successful, companies like FutureE based in Nürtingen are constantly working on the optimization of their fuel cell technology. The company uses Turck's decentralized TBEN-S IP67 block I/O modules on a fuel cell test stand. The integrated LabVIEW driver of the modules enables direct signal connection in the test area. This considerably reduces the time required for setting up the test stand and simplifies expansions and their mobile use.

The control cabinet of the test area is located close to the operator PC and can be made considerably smaller than usual thanks to the decentralized signal connection





Albert Wais (l.) and Siegfried Limmer in front of the test stand, which can be customized and expanded thanks to Turck's TBEN modules with integrated LabVIEW driver

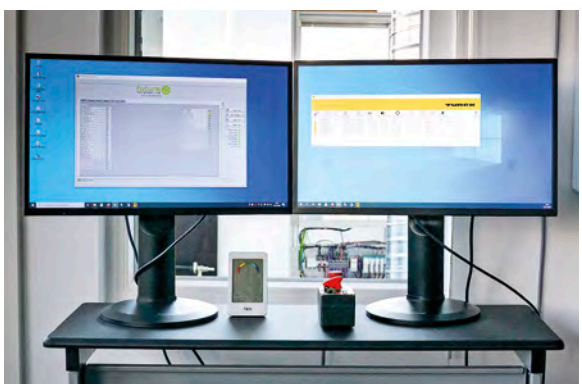
of the TBEN-S series." The work, however, was worth it: Users can now find drivers for most of Turck's IP67 I/O modules in the NI LabVIEW driver database. Wais consequently recommended Turck's TBEN-S modules for the LabVIEW signal connection also for the test stand of FutureE. "The TBEN-S modules are ideal for climatic tests. We fit them directly in the climate chamber and only have to route out a single cable. We can then add additional modules in the climate chamber flexibly – without having to route new cables. This flexibility is a major benefit for us," Siegfried Limmer confirms

End customer benefits from flexibility

Actuators such as for the cooling water controller and the cooling fan also have to be connected in addition to the signals for the sensors on the test stand. Flexibility is also ensured here thanks to the modules themselves. The DXP channels of the TBEN-S for example can be used as inputs or outputs without any configuration required. The use of the modular I/O system on the test stand also brings benefits for the FutureE customer. "Our customers mostly get involved in the development as well after we have handed over a system. They then also benefit from the ability to add functions easily at a later time or expand the system." The system is handed over in such a way that customers can later run through their own test scenarios via the LabVIEW user interface, and these routines can be defined by the customer.

Conclusion

Managing director Limmer is just as pleased with the test stand project as he is with the I/O modules. "With every customer, requirements are different. One time we are developing systems for a forklift truck and another time for a heating system or a portable generator. These always involve different requirements, which we can nevertheless fulfill with the I/O modules. We therefore greatly appreciate the modules. They make our work easier."



A conventional Windows PC can be used to run the test stand thanks to the Ethernet/IP LabVIEW interface of the TBEN-S modules

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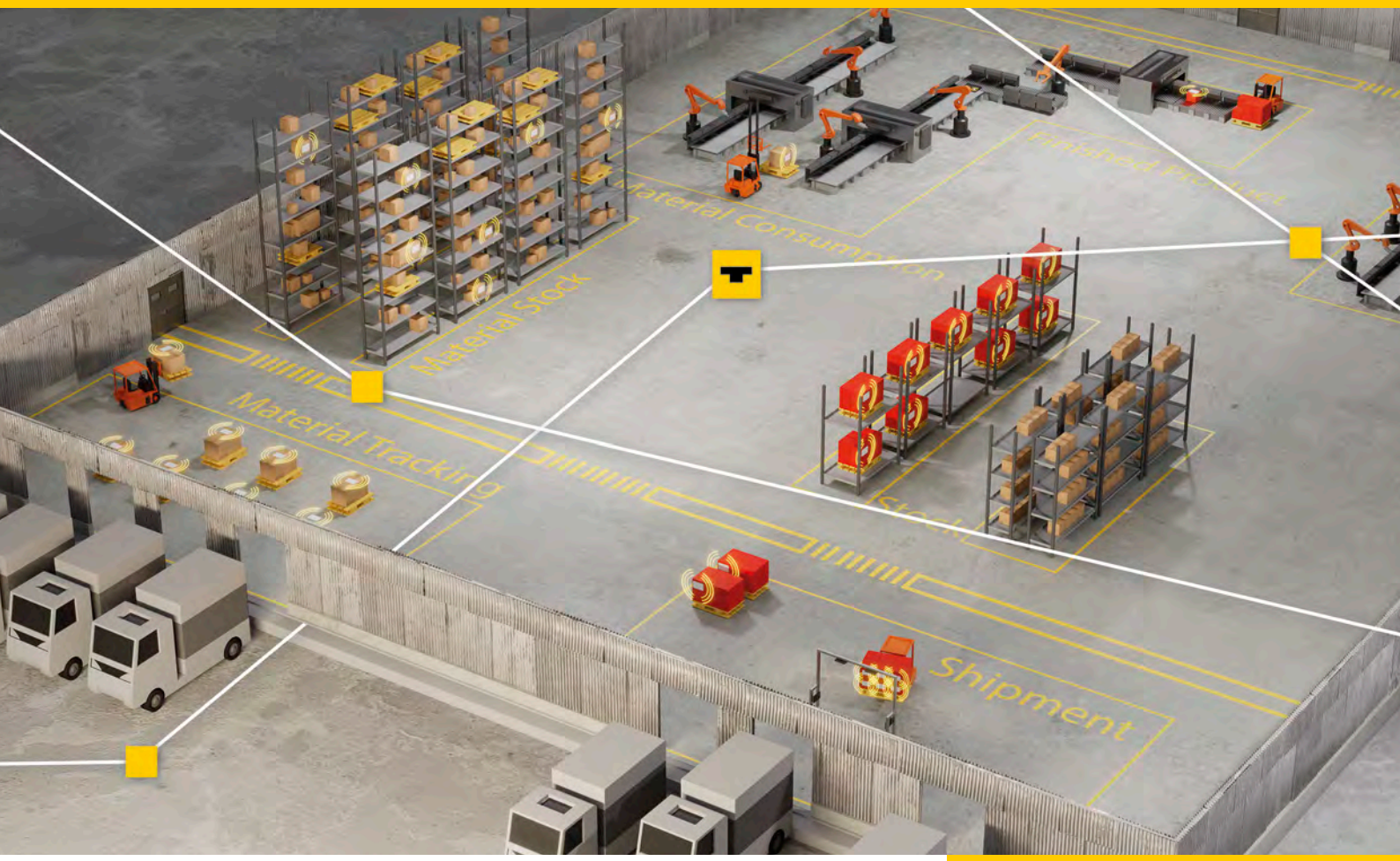

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The adaption of the product range to the particular requirements on site is fundamental to the success of the EasyMart Store

Screws "To Go"

Using an RFID system solution from Turck Vilant Systems, wholesaler chain ProMart developed the "EasyMart" shop concept – self-service containers or store rooms that make fixing materials and tools available at any time and on any site

A great deal of valuable time is lost in the procurement of materials, regardless of whether this is due to long wait times or unnecessary journeys to wholesalers or warehouses. The problem in a nutshell is this: if the right equipment isn't available, a worker has to drive off to replenish supplies, thus having an immediate negative impact on employee productivity, building progress and overall project costs. These kinds of downtimes are even greater in shipyards or in large industrial areas outside of cities if the wholesaler is

»Turck Vilant Systems not only had the experience and a broad offering, but also a solution that we were able to jointly refine and develop in order to adapt it perfectly to ProMart's requirements.«

Hannu Pajula | ProMart

particularly far away. Avoiding these unfavorable effects requires the efficient management of material logistics and the building site has to have a continuous supply of tools and accessories. Different building sites also require different products, since the construction of a ship, for example, uses different equipment than required for the building of a street or hospital. ProMart, specialists in innovative service concepts in the technical wholesale sector, took up this challenge and looked for a solution that supplied customers with tools and accessories round the clock directly on major construction sites – without the need for personnel for complex billing processes.

ProMart developed the idea of the EasyMart store as a logical expansion of its multichannel strategy. EasyMart is designed to increase the range and thus the opportunity to open new sales markets in addition to channels such as static trade, e-business as well as telephone or in-person sales. The EasyMart store is an automated self-service shop that can be set up directly on the building site – for example, in a small store room or a standard container that can be transported easily to building sites. Users are able to serve themselves easily in the store. The stores provide a limited but sufficient range of products that can be adapted to each site, such as on shipyards or building sites.

RFID-based self-service concept

To implement this idea, ProMart looked for a system that could identify on site all the items taken as well as the several hundreds of users employed by subcontractors in a shipyard. This makes it possible to bill the consumed items without the deployment of personnel. RFID technology is particularly suitable for automated inventory management. With over ten years of experience in the design of self-service stores Turck Vilant Systems (TVS) was the ideal partner for this project. ProMart decided to make some adaptions to the standard package for self-service stores supplied by TVS.

Turck Vilant Systems is the specialist in the Turck Group for turnkey RFID solutions, particularly for the areas of production logistics and goods tracking. The company advised ProMart on all aspects of the

Housed in conventional ISO containers, the EasyMart Store can be set up easily anywhere – and transported on after construction

installation, operation and optimization of the EasyMart store and besides hardware, could also supply the software and IT infrastructure together with the server landscape for the permanent operation of the systems.

TVS's ready-to-business approach makes it possible to optimize the standard software to ProMart's require-

QUICK READ

ProMart is a wholesaler for tools, fixing accessories, protective equipment and chemicals, particularly for customers in the shipbuilding, manufacturing and construction industry. In order to save its customers from downtimes on building sites and trips to building suppliers, the Finnish company developed the "EasyMart" concept based on the turnkey RFID store solution from Turck Vilant Systems. The concept consists of automated self-service shops that are set up on building sites, in shipyards or extensive production plants and do not require any personnel. This provides the particular building site with a permanent supply of tools and materials without having to interrupt work processes.

The Turck Vilant Client logs and manages the store user's entry, purchase and exit

On accessing the store, employees identify themselves with their RFID card

ments with only a few adaptions and thus considerably reduce the time required for commissioning. The software is designed to cover the most important requirements of automated warehouse management. This includes the management of multiple users as well as different user roles such as purchaser, borrower, storekeeper etc. with different access rights.

RTID real-time system replaces laborious stocktaking

The key to a fully transparent goods flow in this application is the fact that RFID read devices only log the relevant goods movements and send this data in real-time to ProMart headquarters for further processing. This real-time inventory keeping provides up-to-date stock level information for the store at any time without employees having to pick up items in stock, count them and enter them in lists. The system automatically creates fill lists and invoices based on the scans. This also eliminates shutdowns or cost-intensive overtime outside of opening times to fully complete an inventory.

In a first step, ProMart customers are given the chance – in this particular application; subcontractors in a shipyard – to put together an EasyMart store and agree on the optimum product range. Employees of the subcontractors are then entered as users in the system. The Turck Vilant RFID platform offers the option of managing user access rights and roles for each individual EasyMart store. This makes it possible to set up user roles that also provide the option of borrowing as well as buying items. Reservations can also be processed by the system.

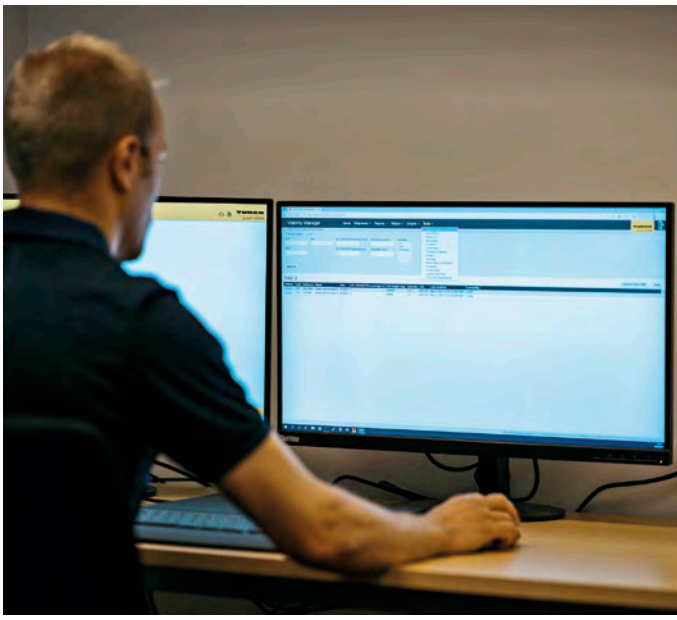
Recording of users and goods flow

During commissioning, each user is instructed in the system and is provided with a personal RFID card to enable access. When users enter the store, they log in with their card for identification purposes. The Turck Vilant Client only allows one user to enter the read area at a time in order for goods movements to be assigned uniquely. After entering the store, the user takes the required products from the shelves just like in a supermarket. The user then enters the checkout area where the goods are automatically scanned without visual contact and shown to the user on a display. After checking the list, the user confirms the taken items.

All products are fitted with RFID tags so that they can be logged automatically at the checkout. A major benefit of RFID identification is its ability to record at distance several products simultaneously. The user does not therefore have to enter any product codes individually.

The required technical infrastructure can be integrated compactly and inconspicuously in a store room or container. "In the beginning we had a concept about what EasyMart should be like," says Hannu Pajula, development director at ProMart. "Turck Vilant Systems not only had the experience and a broad

All products are fitted with RFID tags so that they can be logged automatically at the checkout



The system automatically creates fill lists and invoices based on the scans. ProMart thus controls its stock levels in real time.

offering, but also a solution that we were able to jointly refine and develop in order to adapt it perfectly to ProMart's requirements."

Optimized range for every site

Planning the ideal product range for the particular place of use that is tailored to the requirements of each user is fundamental to the success of the EasyMart Store. The turnaround data for the individual products and categories of goods provided by the TVS servers enables precise optimization of the product ranges and, for example, the creation of automated fill lists. The restocking process is initiated on the basis of this data. ProMart thus has continuous control of its inventory levels and can ensure that all products are always in stock in any store in sufficient quantities.

Easy to operate and multilingual

Compared to optical identification technologies such as barcode scanners, the solution is the simple RFID based operating concept of the 24-hour self-service shop: the system is fully automated, and operation can be learned quickly. Users do not have to understand a user interface since they do not scan anything. Anyone can thus use the store easily in places where people often do not speak the same language, such as major building sites or shipyards. The use of RFID technology thus ensures the availability of all tools and accessories in a time saving and cost-effective way. "EasyMart Stores are located wherever a large number of people work," says Hannu Pajula. "The operation of our EasyMart Stores can be learnt quickly by anyone, and product selection is configured individually on site so that the solution is ideal for the professional user."

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Properly Loaded!

RFID solution with smart forklifts and IT integration via middleware from Turck Vilant Systems ensures reliable and fast goods flows in Chinese automotive plant

The Chinese plant of a leading Japanese car manufacturer needed to optimize its processes in order to meet the increased requirements. Many processes in the production and logistics of vehicle parts were still managed with paper kanban cards, and the movements of finished parts at nodes in the transport chain were recorded manually – a process that was very prone to errors. Moreover, production and logistics data could not be synchronized in real time with information management systems such as WMS, MES or ERP. Result: time-consuming and inaccurate inventory management often makes on-time parts deliveries impossible.

The customer now relies on RFID technology to achieve error-free and transparent logistics management. With the digitalization of information on containers and stamped parts, it was possible to implement the automatic inspection of finished parts in real time – across the entire process chain. The transparency achieved by this reduces errors and ensures more efficient operating processes.

Marriage of containers and finished parts

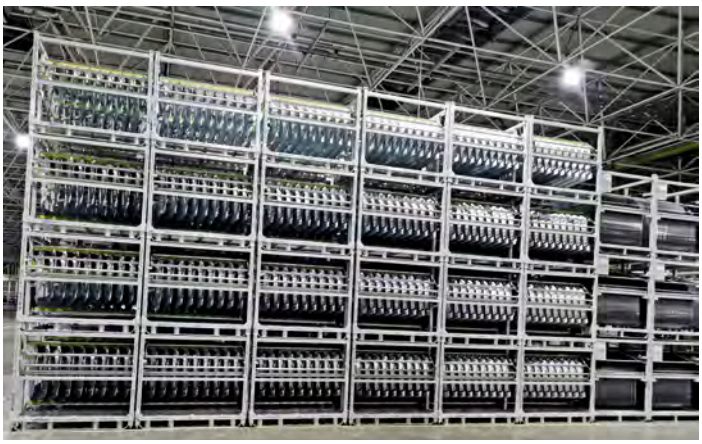
Turck China developed the tailored Turck Vilant Systems UHF RFID solution for the customer. This system uses a passive UHF RFID tag with a unique PC code for storing features like the article number and the quantity of finished parts in order to mark the finished parts containers. The containers thus act as goods carriers when tracking the logistics process of the finished parts.

After production, the finished parts are placed in the container, both with the help of robots and manually. A Q300-LNX RFID reader identifies here the container IDs. The Turck Vilant Engine on the reader is used to assign containers and the contained finished parts to each other in the WMS. This enables the objects to be identified quickly and reliably at any time. The containers are then transported to the warehouse using a smart forklift equipped with RFID reader, monitor and Turck Vilant Client. The UHF antenna on the forklift automatically identifies here the container ID and updates the container and product location in the WMS as "stored".

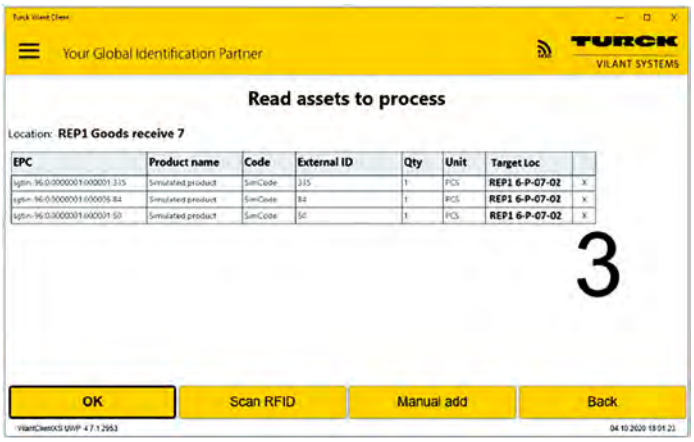
The smart forklift is used to bring containers with finished parts into the warehouse, to store finished parts, and to transport finished parts and containers from station to station. The reliability and accuracy of the forklift is the basis of the system functionality. The benefits of the Turck Vilant system on the forklift

The smart forklift truck detects the transport containers fitted with UHF RFID tags and transports them to the designated storage location

The UHF antenna on the truck identifies the container ID and updates the location in the WMS; the transport jobs are displayed directly on the monitor



The targeted detection of the right parts are a major challenge for UHF RFID applications in confined storage conditions



The driver can check his load directly on the monitor of the forklift truck and avoid incorrect deliveries

are indispensable here. These include standard data interfaces for easy connection to backend systems, landmark detection function for detecting the direction of movement, and the stray read removal function.

For example, when a delivery order is received from the body shop according to the production schedule, the RFID forklift truck drives to the appropriate storage location and picks up the container with the desired finished part. The Turck Vilant client on the forklift identifies the container and displays the current material information of the finished part on the monitor of the forklift. This enables the driver to easily check whether the order matches the request and avoid incorrect deliveries. Orders that were verified to be correct are then distributed to the requesting stations according to the on-screen instructions.

Landmarks to detect the direction of movement

The forklifts with landmark recognition deliver the requested materials to the corresponding stations in the body shop via multiple lanes. Ground location marks are located at the exit/entry points of the lanes so that they detect the finished part exit and the empty container entry. The entire RFID system bridges the gap between the shop floor and IT information systems, providing transparent information across the entire process chain. It not only improves efficiency and accuracy at the operational level, but also enables real-time tracking and planning.

Precision through stray read removal function

The UHF RFID technology used also allows multiple tags to be read simultaneously over large distances. However, the smart RFID forklifts are used in storage areas where finished parts are stored close together and so read errors must be reliably ruled out. "Accurately detecting objects that are in the read range is a major challenge for UHF RFID system applications," explains Turck project manager Sun Zhenjun. "This is because the magnetic field range of UHF RFID is very extensive and irregular. In extreme cases, several dozen tags appear simultaneously in the magnetic field of the smart RFID forklift. If the forklift is not able to locate the correct target items, this results in incorrect information and a large number of error events in receiving and shipping, as well as incorrect inventory data."

Bridge between OT and IT

"By introducing the UHF RFID system, we have created the information-based monitoring of the entire process for the user and automated the flow of goods," says Sun Zhenjun. "The RFID forklifts equipped with the Turck Vilant client in particular are the key to success. The landmark detection function allows them to automatically identify the correct direction of the transported goods. As a result, the system does not require RFID gates, which significantly reduces the cost to set up the system." If required, additional forklifts, RFID gates, E-KANBAN and other devices can be connected to the Turck Vilant Visibility Manager IIoT platform, which connects the logistics site to the enterprise management system. As a bridge between OT and IT, it thus creates the basis for transparency and availability of logistics data in real time and enables increased efficiency at the operational level.

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QUICK READ

The operator at the Chinese plant of a leading Japanese car manufacturer is now automating the tracking of logistics processes for finished parts with RFID. The new system ensures end-to-end transparency and thus smoother processes as well as more efficient operating procedures. Turck developed the RFID system solution based on the Turck Vilant solution for smart forklifts to provide better transparency and real-time availability of logistics data.

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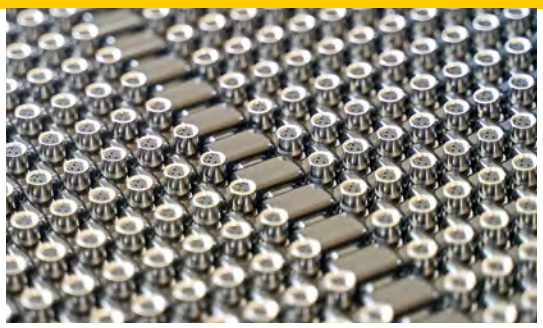


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