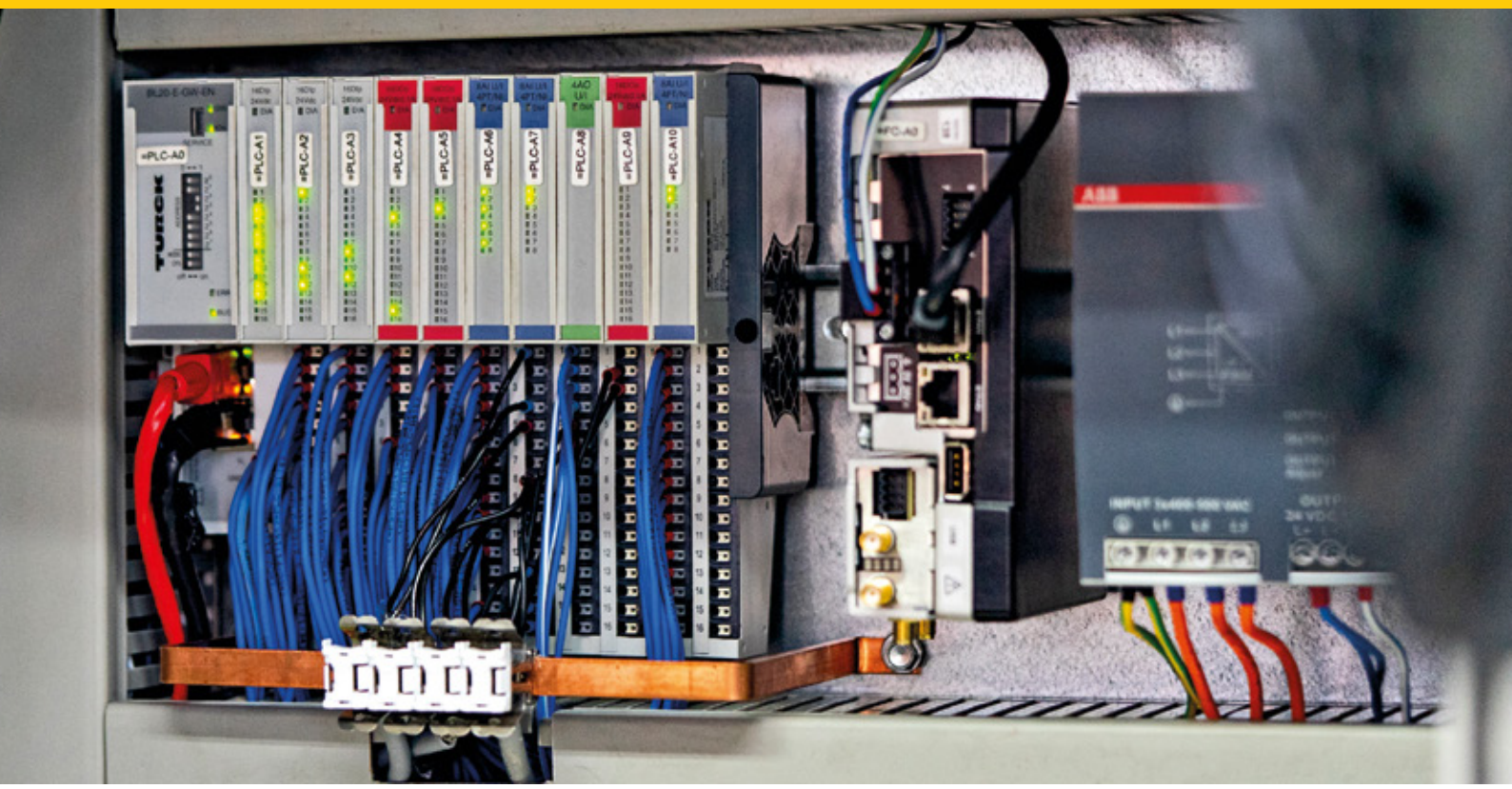
more@TURCK
The Magazine for Turck Customers Issue 2 | 2023

Full Steam Ahead into the Cloud

For its electrical EMX steam generators, Certuss relies on Turck's HMI controllers and condition monitoring via Turck Cloud Solutions



RFID: DTS with Autopilot

KEB Automation expands its DTS automated driverless transport system with RFID technology to fully automated material logistics solution

ATEX: Innovation with High Pressure

In Resato Hydrogen Technology's modular hydrogen refueling stations, IP67 ATEX I/O modules guarantee scalability and fast commissioning

Smart Data Solutions

"Bringing Automation to Life" is the motto of this year's SPS Fair, which is taking place in Nuremberg in the middle of November. After the long break in trade fair activity, the get-together of the automation industry was already a highlight for exhibitors and visitors last year. However, many more exhibitors and hopefully also visitors will be making their way to the Franconian metropolis in 2023. Turck will of course also be there for you to discuss with you how the trade fair motto can be put into practice as efficiently as possible.

Resource conservation, sustainability and the digital transformation of industry are three mega trends that concern machine and plant manufacturers just as much as automation specialists and solution providers like us. In this issue of your **more@TURCK** customer magazine, we also present just how far the digital transformation has already advanced. In a trend article on electric mobility, we look at the challenges that battery manufacturers and car makers must overcome to build efficient and flexible production lines, driven by transparency and smart data.

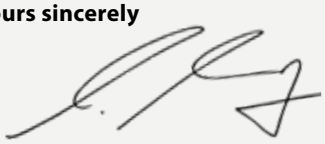
Nowadays, sensor-to-cloud (S2C) is more than just a marketing term. This is demonstrated by two projects presented in this issue. With Turck's support, the customers have successfully taken the path to the cloud. For example, the steam generator specialist Certuss relies on an end-to-end S2C solution from a single source – from the pressure sensor to the I/O system, edge controller and HMI to the cloud connection – to enable its customers to operate their systems smoothly via remote maintenance without unplanned downtimes and expensive service calls. Belgian synthetic fiber specialist Adfil also uses a smart S2C solution from Turck to monitor its storage silos and thus ensure continuous production.

Transparent production and logistics data also play a major role at KEB Automation to ensure the flow of materials in frequency inverter production. The company has enhanced its driverless transport system with RFID technology from Turck to implement a fully automated and error-free material logistics solution.

Smart data is also one of the drivers of innovation in our new products such as our M12Plus: The smart connector detects current, voltage and temperature, and also transmits the data via Bluetooth Low Energy to a controller as required. This means that cables subject to particular stress, for example on drag chains, can be continuously monitored and replaced in good time before an impending failure.

As you can see, there is a lot going on at Turck. If we can also support your digital transformation, we look forward to seeing you in Nuremberg or on the web in the Digital Innovation Park, our digital showcase at **www.turck.com/dip.**

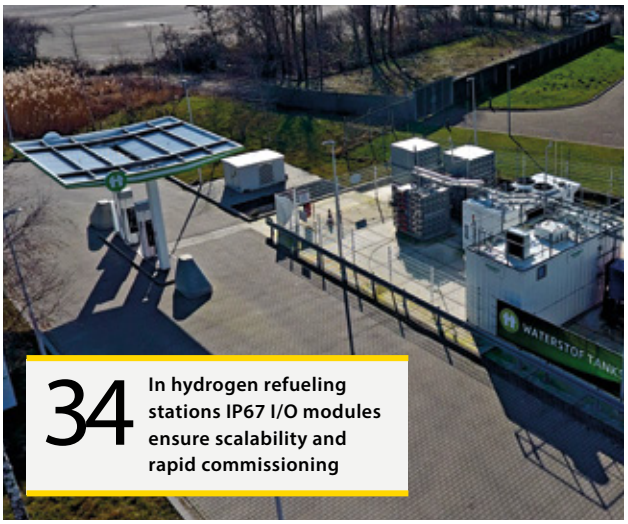
Yours sincerely



Christian Wolf, Managing Director

Content

22 EMX steam generators from Certuss use automation technology from Turck - from sensors to I/O systems and HMI PLCs to cloud connection



34 In hydrogen refueling stations IP67 I/O modules ensure scalability and rapid commissioning

28 RFID technology expands AGV from KEB Automation into fully automated and fail-safe material logistics solution

HF Read/Write Head with S2 Redundancy

Turck's new HF read/write head with an integrated multiprotocol Ethernet inter-face adds an efficient solution with unique features in terms of startup time, communi-cation and safety to the existing RFID portfolio. With a startup time of less than 500 ms, the TNSLR-Q130-EN is ideal for highly dynamic applications such as tool changes in which every second counts. Thanks to its multiprotocol interface the device communicates automatically in Profinet, Ethernet/IP or Modbus TCP networks. The integrated S2 system redundancy enables redundant communi-cation between two controllers.

Miniature RFID Tags and Read/Write Heads

New RFID read/write heads in an M12 hous-ing and in-metal tags in the compact 4 x 3 millimeter format enable the identification of very small metal objects in very restrict-ed spaces. The read/write heads are avail-able for both flush and non-flush installa-tion. In addition, Turck offers variants with RF bus mode that allow multiple read/write devices to be efficiently connected in line topology.

Shock Proof Inductive Coupler Sets

more info on page 14

Turck has updated its inductive coupler sets and now also offers additional functions such as selective pairing in addition to improved performance. With a startup time of 600 ms, the NIC couplers enable shorter production cycles and thus increased productivity. With IO-Link COM3, the NIC couplers support the maximum data transmission rate of 230.4 kbps. The robust couplers resist high shock loads and transfer 18 W of power via a 7 mm air interface. As "non-contact connectors" they are com-pletely wear-free and, thanks to IP68 protection, permanently sealed. A flexible angle offset up to 15° and parallel offset up to 5 mm ensure a high level of installation freedom. The diagnostic function detects the presence of the secondary part as well as any metal objects in the air gap. Bidirectional communication enables actuators to be activated and sensor signals to be collected.

High-Resolution Profinet Absolute Encoders

Turck's encoder portfolio now also offers encoders with a Profinet interface for real-time applications, particularly in the logistics, food & beverage and machine building sectors. The REM (multi-turn) and RES (single-turn) series encoders rely on the latest Profinet encoder profile (version 4.2) and offer 19-bit resolutions for the single-turn devices and resolutions of up to 24 bits for the multiturn devices. All encoders support Profinet features such as the Media Redundancy Protocol (MRP), Link Layer Discovery Pro-tocol (LLDP) and Simple Network Management Protocol (SNMP).

Bluetooth Connectors Monitor Cable Conditions

With its new M12Plus connectors, Turck is shifting the condition monitoring of cables subject to severe stress directly to the connection technology. The connectors, which come with voltage and current monitoring and a Bluetooth chip, enable measured voltage and current values to be sent wirelessly to a controller. Comparing input and output values enables problems such as cable kinks, cable breaks or power outage to be detected early on. The user can identify in advance any cable that is at risk of failure via the individual MAC address of each connector and replace it immediately. The Turck Automation Suite (TAS) visualizes the measured values of the M12Plus via the Cable Monitor app and thus enables condition monitoring and other IIoT applications.
Read more on page 8

IIoT Power Supply for excom

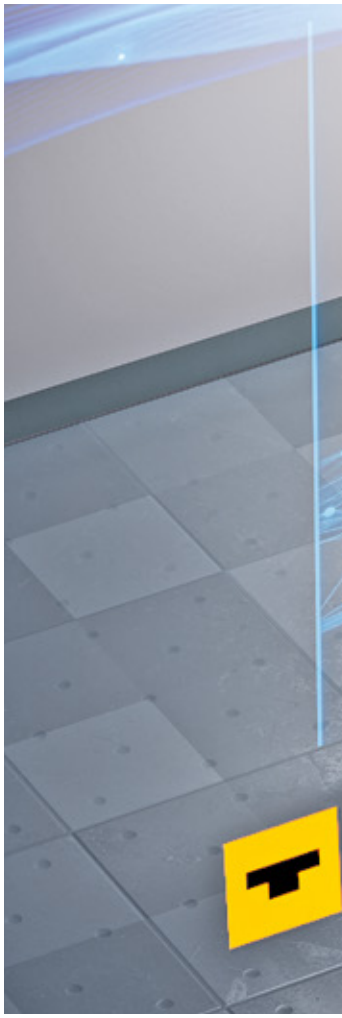
Turck has upgraded the power supply modules of its excom high availability system with two variants for IIoT data. The PSM24-3G.1 supplies power to excom systems in Zone 2/22 while the PSM24-N.1 supplies power to excom systems in the safe area (N system). Compatibility with previous power supply modules is retained. The additional IIoT data of the new modules is also transferred via the Ethernet gateway modules. Turck's new power supply modules ensure the long term operational capability of the I/O system. Compatibility with previous power supply modules and excom systems allows existing excom installations to be upgraded with IIoT functions.

Organizing Codesys Programs with TAS

The latest release 1.9. of the Turck Automation Suite TAS now enables Codesys control programs via network to be downloaded, saved, run, stopped and restored via batch processing. Until now, this had to be done directly in Codesys on each individual device. The HF Tag Actions app can display any possible detuning on HF read/write heads for long range devices (TNSLR), which may be caused by metallic environments. This provides additional transparency and safety when commissioning RFID systems. TAS even offers with the HF Quality app enhanced analysis for the new Q130 HF read/write head with an Ethernet interface. It graphically displays the transmission quality and the RSSI value virtually in real time. Another new feature is the addition of Chinese, French and Spanish to the existing German and English menu languages.

Onsite Configuration

The IM(X) interface device series is now also available with variants that can be parameterized directly on the device via rotary coding switches. The limit values of the OSC variants (onsite configuration) can thus be set easily in the field using a screwdriver. The the IM(X)-FI rotation speed monitors, the IM(X)-TI temperature measuring amplifiers and the IM(X)-AI analog trip amplifiers are particularly useful in stand-alone applications where there is no system infrastructure in place to assign parameters from a central location. Turck is offering both IMX12-OSC variants for Ex areas and IM12-OSC devices for safe areas. The OSC models offer all the benefits of the standard interface devices.



Data-driven Battery Production

Whether RFID, IO-Link, OPC UA or Ethernet, digital automation concepts for battery cell production guarantee flexibility, reliability and fast ROI

Electromobility is one of the most significant trends in the automotive industry worldwide. More and more automakers are turning to electric cars to reduce the CO2 emissions of their vehicle fleets. Of crucial importance for the success of electromobility is the efficient production of battery cells. For this reason, carmakers are increasingly positioning themselves as battery manufacturers alongside major suppliers. It is true that the production of car batteries is currently still concentrated in Asia. In recent years, however, Western companies have also invested in building up their own battery production capacities.

IO-Link fluid sensors monitor roller pressure and temperature for electrode calendering

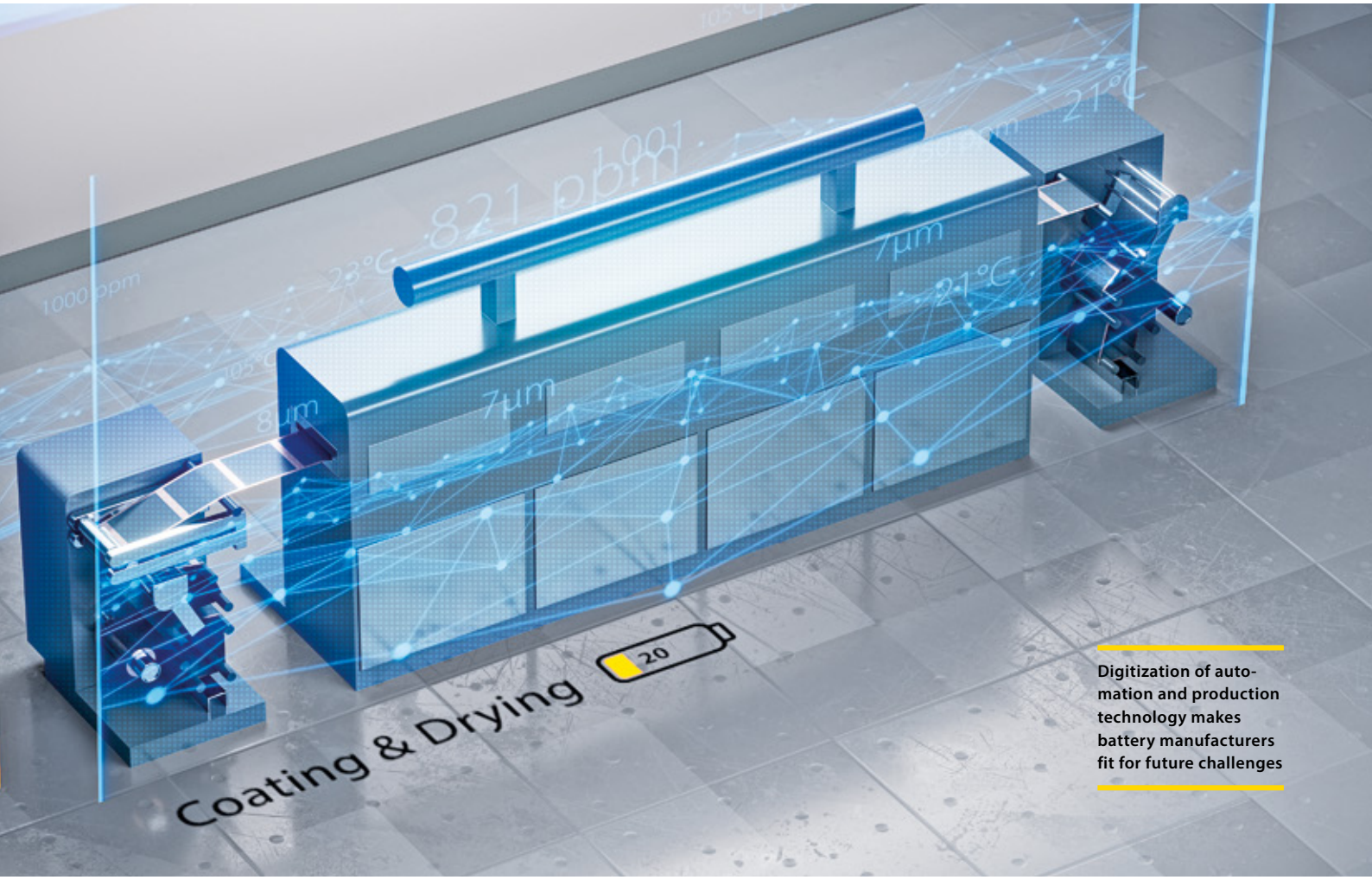
Short innovation cycles

The processes and technologies for the production of battery cells will further develop in the coming years. Whether new raw materials, modified mixing and coating processes, or different processes for calendering and winding, there will always be changes. If battery cell manufacturers want to prepare existing and future production plants for this dynamic phase and significantly shortened innovation cycles, they need powerful automation partners who support the digital transformation with their solutions and thus enable modular, flexible plant concepts.

With its robust portfolio, Turck has been one of the most important automation partners for the automotive industry around the globe for several decades - and today the most successful battery manufacturers also rely on Turck technology and design their production plants to be flexible and future-proof with data-driven process optimization.

Three loading columns for production efficiency

For example, contactless RFID identification technology helps to increase the output of existing plants while



Digitization of automation and production technology makes battery manufacturers fit for future challenges

at the same time improving process reliability and product quality. Condition monitoring solutions reveal problems at an early stage and thus enable predictive maintenance measures, which permanently increases the availability and thus the overall efficiency of a plant (OEE). Above all, decentralized automation technology with robust, IP67 systems without control cabinets facilitates the construction of modular production plants for later regrouping of machines or relocation of capacities.

Traceability: The energy density of batteries can be compared to explosives. Faulty batteries can thus be quite dangerous and risky. Production that tracks and documents, every raw material, every product and every production step guarantees battery cells of the highest quality. Error-free production can be proven by track-and-trace systems in cases of doubt. Turck has almost 20 years of experience with HF and UHF RFID solutions in the production environment. Hardly any other automation supplier can offer such a comprehensive RFID range and unique technologies such as HF bus mode.

Overall equipment effectiveness (OEE): The costs of a product and the profitability of a production process heavily depend on the availability of its production equipment. This is another reason why increasing the overall efficiency of equipment is a key goal in battery manufacturing. The goals are to minimize unplanned machine downtimes and eliminate material bottlenecks. Turck automation technology enables you to master both challenges: You can extensively monitor machine states to plan predictive maintenance, while RFID identification technology improves your database for material procurement.

QUICK READ

The availability of high-performance batteries at moderate prices is one of the most important factors for the success of electromobility. Short innovation cycles and increasing competition are major challenges for battery manufacturers and carmakers, which above all require flexible, digitized production lines - and automation companies that support the digital transformation with their solutions and thus enable modular, variable plant concepts. As a long-standing automation partner to the automotive industry, Turck therefore also supports the major battery manufacturers with its relevant know-how.

The roller pressure during calendering is critical for the quality of the battery cells, Turck's fluid sensors continuously capture the measured values

Flexibility: The number of battery cell types is also increased with the different battery applications. Currently built production equipment should therefore be prepared for future adaptions, both mechanically and in terms of automation. Modular plant concepts are the royal road to greater flexibility. Decentralized I/O and control solutions in IP67, combined with flexible and fast Industrial Ethernet communication, allows plant modules to be quickly re-arranged. Controlled by decentralized PLCs and safety controllers, factory acceptance tests of new plant modules can already be carried out at the manufacturer, thus shortening commissioning in the entire plant at the user's site.

The following application examples show how Turck supports battery manufacturers with its solutions.

IO-Link fluid sensors monitor calendering

Calendering is one of the most critical process steps when manufacturing lithium ion battery cells. In this process, several rotating and heated roller pairs compress the copper foil (anode) and aluminum foil (cathode) coated on both sides. The film is then rolled up again and transferred to the next process step. The hydraulically driven roller pairs generate here a precisely defined pressure that must be maintained at all times. Any deviation from this value leads to a deterioration in the quality and thus the performance of the battery cells. Excessive pressure can even damage the substrate.

A complete IO-Link solution consisting of sensors and suitable infrastructure monitors the interaction of all process components and guarantees optimum calendering. Turck's TBEN-L4-8IOL is used as the IO-Link master. The compact multiprotocol I/O module provides eight IO-Link master channels and is installed in the control cabinet. The robust pressure and temperature sensors of Turck's Fluid+ series are installed inside the hydraulics in the plant and capture and monitor the measured values in battery production. The PS+ pressure sensors ensure optimum and constant pressure so that the substrate is provided with an even surface structure and the required porosity. The TS+ temperature sensor not only monitor the temperature of rollers but also the liquid used to heat the rollers. IO-Link enables easy parameterization and commissioning as well as any device replacement in battery production. Empty rollers have to be detected in time to be replaced in order to prevent an unplanned production stop. This requires a complete measurement of the roller diameter with Turck's RU80D ultrasonic sensors.

HF Bus mode ensures quality of Lithium-Ion batteries

When assembling battery modules from individual cells, the cells are welded to an aluminum strip that connects them together. The quality of the weld spots is vital to ensuring the quality of the finished battery. Therefore, the entire module is tested after welding. The result of the test is written directly in the tag located under the product carrier of the module. In total, the production line comprises about 35 read/write positions, which can be quite expensive with standard RFID systems. RFID via IO-Link would be an alternative, but is usually too slow due to the low bandwidth.

In HF bus mode, up to 32 RFID devices can be connected in series to a single RFID port

Identifying the containers is recommended since battery cell production is a batch process

With Turck's HF bus mode, up to 32 read/write devices can be connected in series to a single port of the RFID interface, significantly reducing the cost per read/write position. The production line can maintain its original speed because bus operations offer a relatively high bandwidth. Another advantage is that every read/write head can read both EPROM and FRAM tags, which are both used on these production lines. Tag reading is triggered by an inductive sensor. If multiple tags are present in the air interface of different read/write heads simultaneously, the PLC creates a buffer to execute the commands at the different read/write heads one after the other. The trigger sensor also helps to detect errors: if the read/write head cannot read a tag after it has been triggered by the sensor, this indicates that the tag is faulty. RFID devices and trigger sensors are connected directly to the TBEN-S2-2RFID-4DXP. The IP67 interface communicates with the PLC via Profinet. However, as a multi-protocol device, it can also be easily used in Ethernet/IP or Modbus TCP networks - without user intervention.

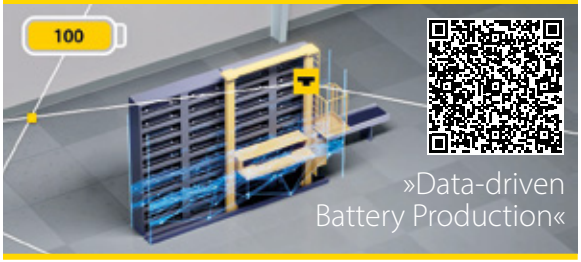
RFID tracking with OPC UA

Since the production steps are not managed by a PLC or a control system in many production plants, but are created directly in the ERP system, identification systems must communicate directly with the ERP system to secure the production process. OPC UA has proven to be the ideal communication interface for this purpose. This standard is both a communication protocol and semantics for processing production-relevant data. OPC UA is "understood" by IT systems as well as by compatible machines and systems of the OT. Via Turck's TBEN-L-4RFID RFID interface, the data from the robust IP67 TNLR-Q80 read/write heads is transferred to the ERP system via OPC UA.

Since RFID communication in metallic environments can be prone to errors due to possible reflections, special data carriers for mounting on metal guarantee reliable identification processes. In this application, only the ID of the tag is read out in order to then assign the correct information via a database. As a full range supplier, Turck offers a seamless system from tags to read/write devices and connection cables to RFID interfaces, right through to qualified support. Communication problems caused by multivendor solutions in the system can thus be reliably prevented.

Author | Chien-Hsun (Josh) Chuang is sales director SEA, STAN & Vertical Sales APAC
Webcode | more22305e

Further info: www.turck.com/bat

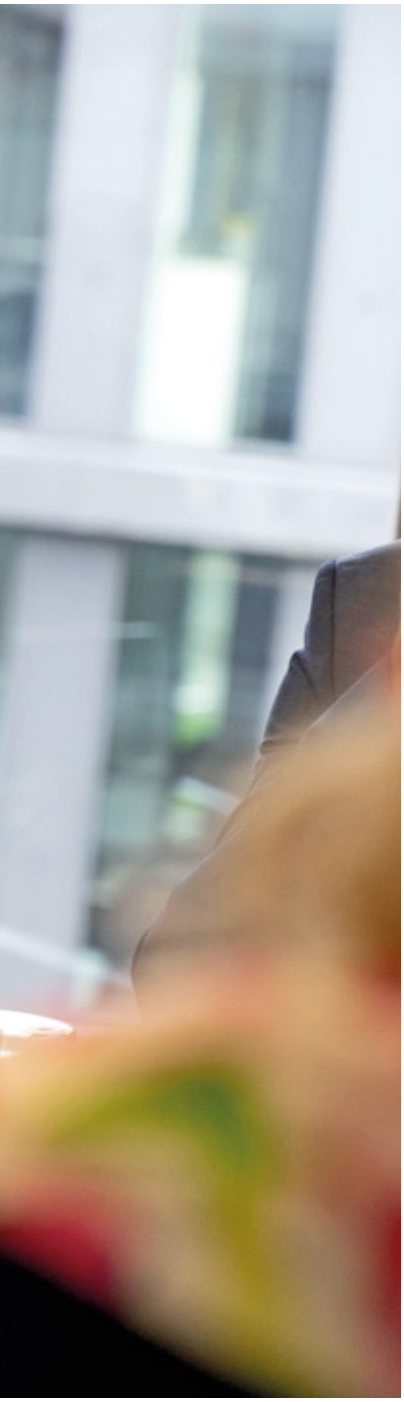


»Reducing energy consumption and operating costs are processes that can ultimately only be solved in a data-based manner through digitization. In this respect, efforts to produce and manage sustainably are significant accelerators for digital transformation in industry.«

Christian Wolf | Managing Director

Mr. Wolf, what challenges did Turck have to overcome in the past three years of crisis?

Wolf: The past three years have definitely been challenging years in terms of the scarcity of resources, the shortage of skilled workers and the uncertain overall situation – caused by Corona and the war. Three years with ups and downs. As an example: in my 25 plus years at Turck and in the industry, I have never experienced such a price and procurement war for components as in 2021 and 2022. Brokers determined many prices for components and raw materials, which we had



»Digitalization and Automation are the Bridges to Sustainability«

Despite the risks and uncertainties of war, the energy crisis and disrupted supply chains, the automation industry can look back on two good years. Christian Wolf, Managing Director of Turck, and Bernd Wieseler, Director Product Management RFID Systems, discuss the boom in automation technology, the path to sustainability and the challenges that the digital transformation poses for large companies and SMEs in an interview with Anja Van Bocxlaer, Editor-in-Chief of the Think WIOT Group.

to process in close cooperation with our customers.

How has the crisis affected business development?
Wolf: In business terms, we have experienced exactly the opposite of a crisis in these years, namely a boom in automation technology. In 2020, sales fell slightly compared to the previous year. In 2021, we recorded growth of 26 percent in automation technology. In 2022, we still had a very good 16 percent in growth. A curious circumstance. The period of the pandemic is actually the most successful period in our company›s history to date. The question of how we can counteract the shortage of employees, the shortage of materials and the lack of manufacturing capacity, especially during the pandemic, arose at the same time as the massive increase in incoming orders.

What do you see as the reasons for the increased demand for automation solutions?
Wolf: There are several reasons. Generally speaking, automation technology offers solutions to many of the problems we face today. Specifically, the four major social and economic challenges of this era are: de- globalization with intensive global trade interdependencies, decarbonization and thus the pursuit of CO2 neutrality and energy efficiency, and the transformation toward electromobility. The automation and digitization of all processes is the basic prerequisite for each of these tasks. And with all these changes, we must also successfully address demographic transformation.

Can you give an example of how digitization and automation relate to the issue of sustainability?

Wolf: Let's take the example of mechanical engineering. Today, due to increased energy prices on the one hand and EU sustainability requirements on the other, a mechanical engineering company is asking itself how it can make production more energy efficient. The answer is: through digitization and automation. The evaluation of sensor data from machines is essential to set up process speeds as well as the maintenance and downtimes of machines in such a way that the energy balance is optimal. The use of energy can also be optimized through the use of automation technology. Reducing energy consumption and operating costs are processes that can ultimately only be solved in a data-based manner through digitization. In this respect, efforts to produce and manage sustainably are significant accelerators for digital transformation in industry.

How has the increase in energy prices affected production at Turck?
Wolf: Not as strongly as in other industries, but the increased costs are also noticeable for us. Turck is not a company with high energy consumption. We only use gas to a small extent, not for machines and plants, but to heat our premises. Our machines and plants are operated electrically. We have therefore launched initiatives and investments to significantly increase the share of photovoltaics in our energy supply in the near future. In doing so, we want to become much more self-sufficient in terms of energy. I generally welcome the fact that an ecological rethinking of energy issues is taking place in industry in order to become less dependent on gas supplies.

Do you see a way to build resilience against the impact of geopolitical crises?
Wolf: If you assume that economic development will remain volatile, you have to position yourself more broadly on the capacity side in order to respond quickly to customer requirements in the event of a sharp rise in demand. After all, high availability will continue to be a decisive criterion for the economic success of companies in the future. Ultimately, this means acting countercyclically. In other words, it will continue to be the case that the economic climate will cool down after three to four years. To nevertheless be able to plan for the longer term, we at Turck are now working on a structured five-year plan. As a company, we have to turn the uncertainties caused by geopolitical tensions back into entrepreneurship and stay on the investment path even in difficult times.

Full steam ahead with sustainability and digitalization – this sounds like a happy ending. Is it?
Wolf: Yes, there are indeed a great many opportunities arising from digitalization and sustainability, but this does not apply to every industry. Energy-intensive companies face major challenges, including economic ones. But transformation also means investing. For example, an automotive supplier that generates 90 percent of its sales today with a transmission line that will be eliminated in five or ten years as part of the e-mobility turnaround must demonstrate a transformation speed that is very difficult to manage.

So what does this mean for providers who are unable to invest sufficiently in this transformation?
Wolf: This is difficult for many SMEs. Large companies sometimes assign entire teams of employees to study all the regulations and develop implementation plans. At the Turck Group, we still manage it – with effort and investment. However, as a smaller energy-intensive company with fifty to a hundred employees, for example, becoming climate-neutral by 2030 and complying with all the EU regulations is a major challenge.

Mr. Wieseler, how did product development 2022 turn out at Turck?
Wieseler: Most of our development capacity has gone into the redesign of existing circuits and layouts in order to remain in a position to deliver despite missing or extremely overpriced components. In addition, we have developed many firmware updates to optimize the IIoT functionalities of our solutions. Take the RFID interfaces in IP67, for example: We have expanded them with OPC UA to include the AutoID Companion Specification V. 1.01 and an HF bus mode. This enables smooth and direct communication with MES, PLC, ERP or cloud systems. Another example is the HF bus mode of our RFID interfaces, which offers great time and cost advantages for applications with many reading points. This allows up to 32 HF read/write devices per channel to be connected in series simply by means of a T-piece. Via OPC UA we connect the devices with simple methods and get easier access even for smaller applications.

Will Turck offer software products more frequently in the future?
Wieseler: We use software to connect systems and to make it as easy as possible for the customer to use our products. However, we are first and foremost a hardware manufacturer and the software is always directly related to our hardware. With TAS, the Turck Automation Suite, for example, we help our customers make as much as possible out of their Turck devices. Although software development plays an extremely important role in our products, it does not mean that we are a system house.

Can you explain the TAS?
Wieseler: With pleasure. TAS is an IIoT platform that simplifies the management and configuration of Turck devices in industrial Ethernet networks. With TAS, the commissioning phase is simpler thanks to visualization, but also faster thanks to batch functions, such as firmware updates or the assignment of IP addresses. We thus generate added value for the customer because they can get an overview of all products with one platform and address them. We had already integrated many examples and usable applications in the first version, including a simple visual representation of proofs of concepts with our products. Being able to easily address RFID applications and devices is a very big topic in the development work of TAS.

Why was the focus on an improvement in the RFID segment necessary?
Wieseler: Setting up an RFID gate involved a lot of effort. The customer first had to align his antennas. Then find out which tag was captured and where it was located. Based on this, initial conclusions could be drawn. However, it was all presented in a relatively rudimentary way. In the new version, we are providing better tools in TAS that capture and display the processes on the individual levels in such a gate. How the data carriers are read in the levels can be represented two-dimensionally or three-dimensionally. This representation helps our customers.

What does the customer learn by gaining insight into different levels?
Wieseler: Via the position of the tags. When I bring a pallet with several products through the gate, for example, the customer sees how many can be read from the front, in the middle or at the back. The customer sees what field strength is needed and then knows where the antenna position should be adjusted.

How does TAS support customers in reading data carriers as energy-efficiently as possible?

Wieseler: We also have a new tool for this. In the past, high performance and low power consumption were often mutually exclusive. The new tool uses a readout cycle, which we call ‹power sweep›, to determine which parameters result in the best read performance and how data carriers are optimally controlled.

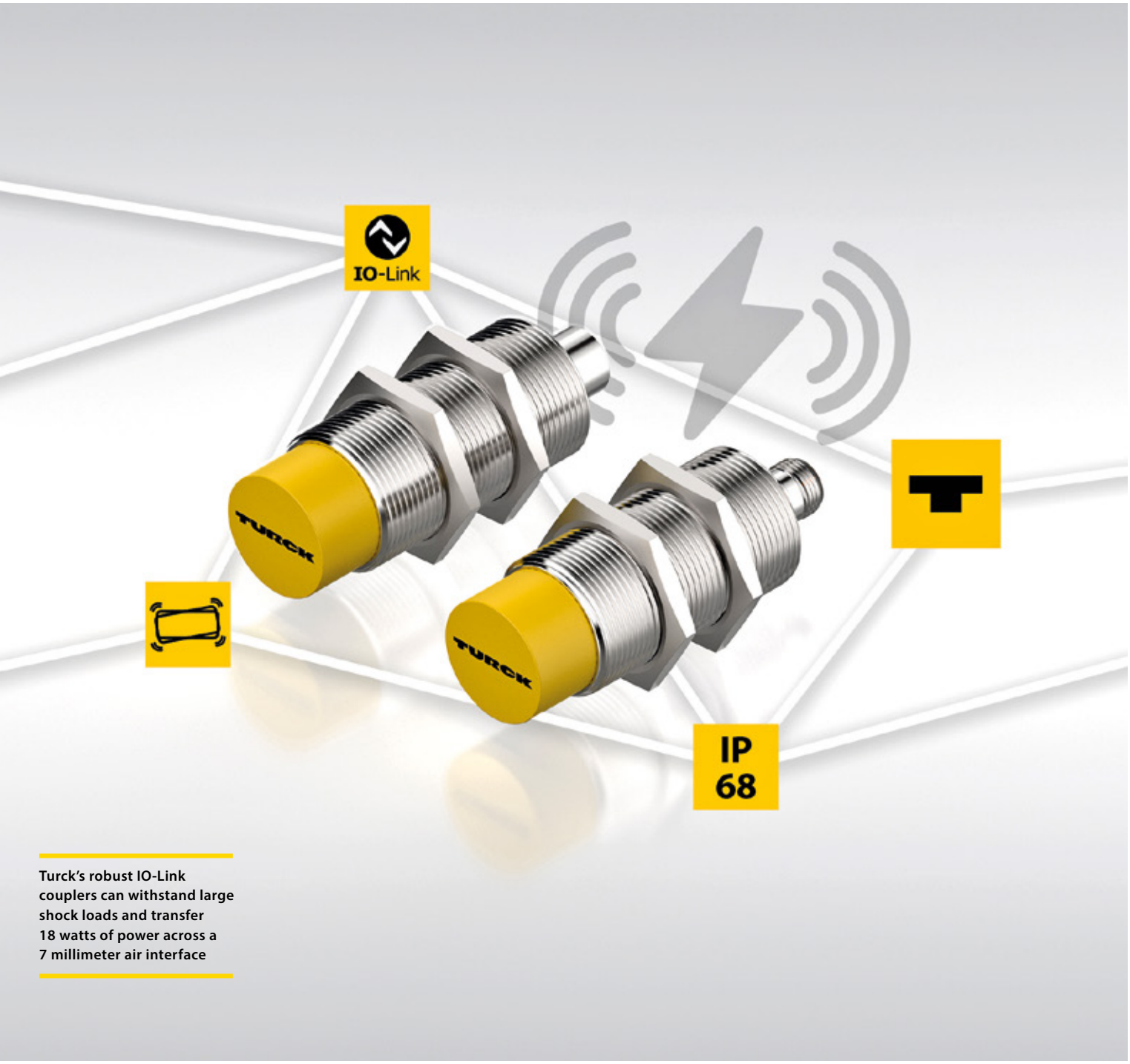
How strong is the RFID segment at Turck at the moment?

Wolf: We are experiencing enormous growth and full order books. On average, we have grown by 25 percent or more in the RFID segment every year, and by almost 75 percent in the last two years. Turck has equipped many new plants with RFID, especially in intralogistics. However, we were unfortunately limited in our capacities and had to turn down orders as a result. In 2022 in particular, RFID products were severely affected by delivery problems and material shortages, especially for chips.

»We have developed many firmware updates to optimize the IIoT functionalities of our solutions and, for example, extended our RFID interfaces with OPC UA to include AutoID Companion Specification V. 1.01 and HF bus mode. This enables smooth and direct communication with MES, PLC, ERP or cloud systems.«

Bernd Wieseler | Director Product Management RFID

Author | The interview was conducted by Anja Van Bocxlaer, Editor-in-Chief of the Think WIOT Group
Web | www.rfid-wiot-search.com
Webcode | more22330e



Turck's robust IO-Link couplers can withstand large shock loads and transfer 18 watts of power across a 7 millimeter air interface

Contactless Coupling

Power and data transfer based on inductive coupling enables Turck to offer a wear-free solution for heavily loaded connections – up to 18 watts of power

Inductive coupling is a technology that supports us in many areas of everyday life and yet remains unnoticed. It enables the transfer of power between two devices without physical contact and is therefore also referred to as a "contactless connection". Known examples of this are wireless charging devices for smartphones or electric toothbrushes that can draw power using inductive coupling. Inductive coupling is used, for example, in medical technology for wireless power and signal transfer in medical implants such as

In this application, Turck's inductive couplers transfer power and switching signals of mobile sterilization containers contactlessly – the ID of the IO-Link sensor is also used for reliable identification of each container

pacemakers. These are just a few examples that show how present and versatile the applications of inductive coupling are.

Wear-free with freedom of movement

The major cost factor of industrial applications using connections subject to severe wear, is not only the result of wear, for example due to vibrations or frequent plugging and unplugging, but also the associated downtime involved. Examples of these kinds of applications include tool changers, workpiece carriers in continuous motion or rotary indexing tables. Another application field are electrified monorail systems which are used in the automotive industry. Inductive couplers not only offer here the benefit of wear-free operation but also help to prevent user errors.

Instead of traditional connections that wear over time and require regular maintenance, the inductive couplers or "contactless connections" enable the effective and reliable transfer of information and power without the need for physical contact between parts. This saves time and money as expensive repairs, or the replacement of worn connectors are unnecessary.

Powerful coupler series with high shock resistance

Inductive coupler sets consist of a primary unit (transmitter) on the controller side and a secondary unit (receiver) on the sensor/actuator side of the connection. Turck's recently upgraded inductive coupler sets of its proven NIC system also offer new functions in addition to improved power. The NIC couplers operate with a high frequency AC field that transfers power in a frequency range from 100 to 148.5 kHz. The data is transferred simultaneously via a separate 2.4 GHz wireless connection.

The NIC couplers can transfer currents of up to 750 mA and up to 18 watts of power across an air interface of up to 7 mm, even when subject to severe shocks. As "wireless IO-Link cables", they are totally wear-free and permanently sealed with protection class IP68. This allows sensors and actuators such as light curtains, position and proximity sensors, or even smaller valve terminals to be operated without the

QUICK READ

Robots with tool changers or rotary indexing tables place demanding requirements on the connection technology. Contacts and plug connectors that are subject to wear must be maintained with short maintenance intervals or can even cause machine downtimes. They therefore present the field of connection technology with particular challenges. Turck's contactless inductive couplers of the NIC series offer a wear-free alternative to slip rings or plug connections that are subject to severe stress, and transfer up to 16 switching signals and up to 18 watts of power via IO-Link.

need for an additional amplifier on the secondary side. An M12 connector is used to connect the primary side. The secondary side is provided with an M12 female connector. With their M30 housings, Turck couplers are among the most compact devices on the market.

Flexibility in signal transfer with IO-Link

The inductive couplers can be connected as easily as a cable connection consisting of male and female connector. An IO-Link device, often an IO-Link hub, is connected here to the secondary unit (NICS-EM30-IOL-HK1141) of the coupler system. The primary unit (NICP-EM30-IOL-H1141) is positioned on the opposite side of the secondary unit and connected to an IO-Link master using a standard M12 3-pin connector. This configuration provides the flexibility to transmit up to 16 binary signals and opens up a scalable solution for applications requiring the acquisition and transfer of a large number of signals. It enables bidirectional IO-Link communication, in which functions such as parameterization and diagnostic data can be used.

If an IO-Link connection is not required, a simple VB2 splitter behind the secondary coupler can be used for the contactless transfer of two switching signals. The primary unit is connected in this case to the controller or a fieldbus device via a standard four-pin M12 connector.

Safety through dynamic foreign object detection

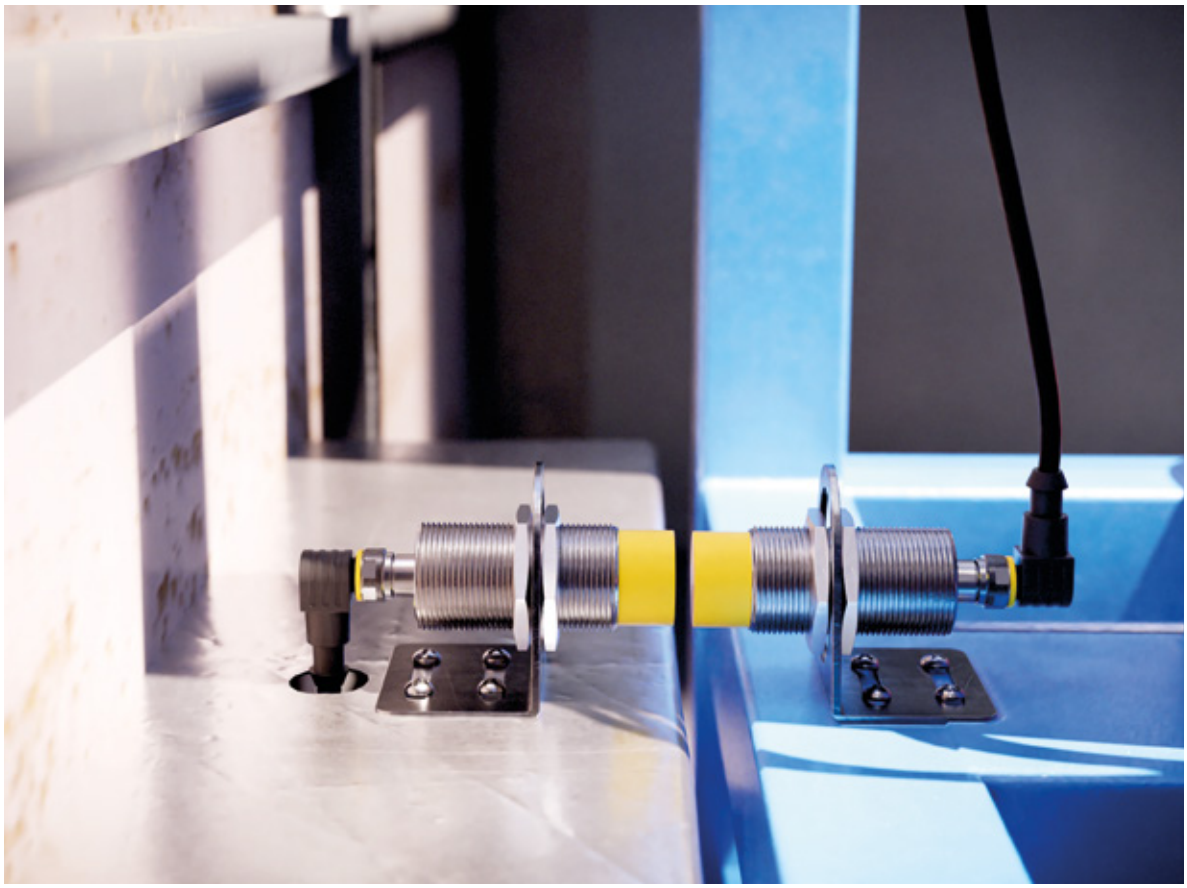
Turck's innovative dynamic foreign object detection enables not only larger but also smaller metallic objects to be identified between the primary and secondary couplers. The system here automatically switches off when such objects are detected in order to avoid possible heating. As soon as the obstacle is removed, the system switches on again automatically. This function ensures the safety and integrity of the system as well as trouble-free operation.

Turck's inductive couplers transfer a full 18 watts of power across an air gap of up to 7 mm. The devices are also insensitive to vibrations and twisting of the primary and secondary units. If the primary and secondary units are positioned directly opposite each other at the nominal distance, they can be laterally offset by up to 5 millimeters. If the two coupler units in the application cannot be mounted in line, the coupler systems can also be mounted at an angle to each other. An angle of up to 30 degrees and a lateral offset of 2 millimeters is possible with a 7-millimeter gap.

Fast startup and selective pairing

In many applications with frequently changing connections, the operational readiness of the secondary unit is also important. With indexing tables in particular, the cycle times that the connection solution allows are a key selection criterion. Fast and stable startup behavior with a response time of 600 milliseconds enables shorter production cycles and thus increased plant productivity.

"Dynamic pairing" enables primary units to be combined with any number of secondary units as required – and vice versa. This even enables tasks



The wear-free NIC couplers on the station and mobile workpiece carrier transfer power and data contactlessly

The couplers transfer data and power between mobile workpiece carriers and static workstation contactlessly. Each workpiece carrier can be identified via the "Application Specific Tag" of the IO-Link device

in more complex applications with multiple primary and secondary units to be implemented without any problem. Depending on the application, the coupler itself can also be addressed via IO-Link. Besides the transfer of diagnostic information, this also enables "selective pairing", which is unique on the market and allows a primary unit to communicate only with selected secondary units. This helps to prevent errors and downtimes that can be caused by unwanted communication between primary and secondary units, for example when a workpiece carrier should only be used at a specific workstation. "Selective pairing" can also be used to increase process reliability, for example by only allowing a tool to be used on a specific holder – or by ensuring other critical assignments.

Tremendous potential

The further development and optimization of inductive couplers holds enormous potential for the future of the industrial automation and promises more efficient, reliable and advanced solutions for a wide range of applications in production. With their robustness and versatility, they could enable significant advances to be made. Despite the increasing relevance and flexibility of contactless data and power transfer, wired connections remain the gold standard in most industrial use cases. With its extensive connection technology offering, Turck has the right connection solution in its program for almost every application, whether contactless or wired, supplemented by fieldbus and control technology, RFID, sensor technology and more.

Author | Dustin Küpper is product manager for position and proximity sensors at Turck
Webcode | more22370e

The M12Plus, with a four-core cable in a flexible polyurethane outer sheath and with A-coded M12 male connectors, complies with the latest standards used in many industrial plants

M12Plus – The Cable Medics

Turck is shifting the condition monitoring of the cabling directly to the plug connector – including wireless measured value transfer via Bluetooth Low Energy

Despite the further development of wireless systems and communication connections, the digital transformation of industry also requires safe cable connection solutions in the future. As the establishment of the Industrial Internet of Things (IIoT) continues to advance, smart and networked devices also will always need a reliable communication connection and power supply. Connectivity thus also plays a critical role in the digital transformation of industry.

Turck has offered a broad range of connectivity products for decades, from the standard M12 connector to splitters and countless variants right through to customized cordsets. Turck's extensive offering, including several connection types and cable variants, creates a range of flexible combination options that cover a large number of applications.

Technology for the early detection of problems

However, time does not stand still, even in the area of connection technology. Turck's M12Plus connector is one of the latest innovations in this area, consisting of an M12 connector with integrated voltage and current monitoring electronics, which was developed in collaboration with IMS Connector Systems and the Fraunhofer EMI. The M12Plus connector moves the condition monitoring of cables subject to severe stress directly to the connection technology level.

Besides the incorporated measurement technology, the M12Plus also features an onboard Bluetooth chip. This enables it to measure voltages and currents and send these measured values to a data interface in the plant, such as Turck's TBEN-PLC. A Bluetooth dongle enables the robust IP67 controller to read a host of Bluetooth-enabled devices, and the scan intervals can be adjusted for the particular application in order to ensure optimum performance. The cable data is transferred to the controller in real time. This information can be used to determine potential issues such as voltage drops in the cable or the plug contact, even before the connection actually fails. If required, the controller can be programmed so that an alarm is triggered as soon as a specific threshold value is reached.

Cables are particularly subject to severe stress in drag chains – constant condition monitoring with the M12Plus enables cables at risk of failure to be replaced in good time

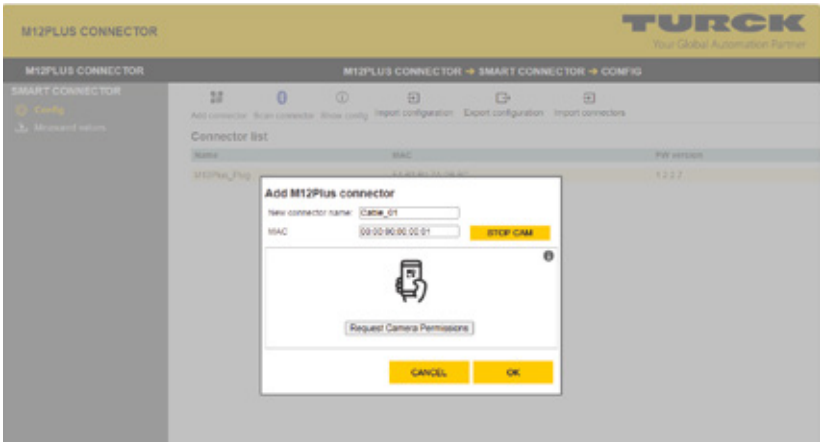
Effective protection from cable failures

The gradual degradation of the copper wire may increasingly occur in applications where cables are frequently bent in drag chains or on robots. The

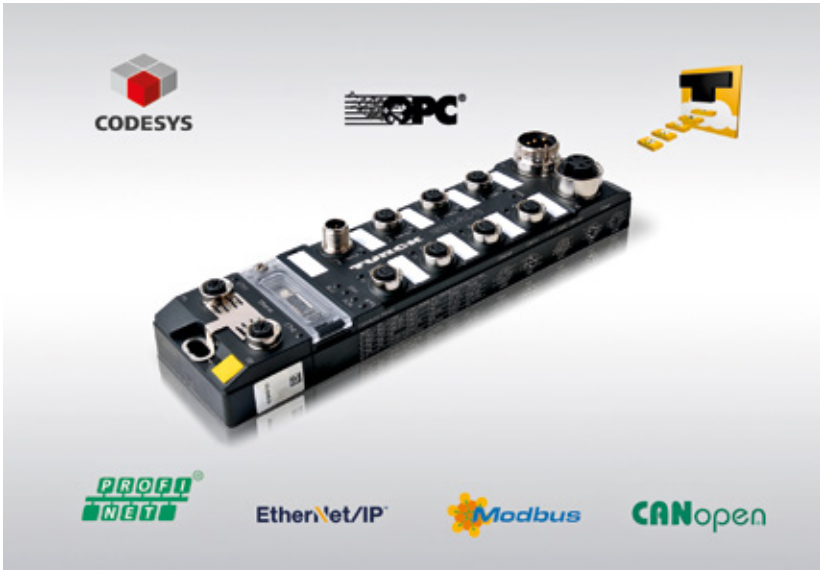
QUICK READ

Defective cabling and contact problems can lead to expensive plant downtimes and unscheduled maintenance work – and are one of the most frequent causes of faults. Turck's smart M12Plus connectors now provide a solution and enable the condition monitoring of cables and contacts by measuring current and voltage. The cable is continuously analyzed thanks to the early voltage drop detection function. Error sources can be identified and localized as each plug connector is assigned a unique address. This ensures trouble-free plant operation and prevents costly downtimes or unscheduled maintenance. The M12Plus connector allows a completely new approach to predictive maintenance.

The Turck Automation Suite graphically displays the measured values of the M12Plus



The M12Plus can be configured conveniently via TAS



Turck's robust TBEN-PLC IP67 controller is able to receive the measured data of the M12Plus wirelessly via a Bluetooth dongle

millions of tension and torsion stresses present in these applications impair the quality of the copper and can cause breaks in the wires or strands.

The smart M12Plus connector with integrated measurement electronics consists of a four-core cable (4 x 0.34 mm²) of the TXL series with a polyurethane outer sheath and is specially designed for use in drag chains. A-coded M12 connectors are fitted to both ends of the sensor/actuator cable. This design complies with the latest standard used in many industrial plants.

The sensor integrated in the M12Plus connectors enables precise voltage and current measurement at the male and female connector. Comparing input and output values thus enables problems such as cable kinks, cable breaks or an inadequate power supply to be detected early on. The highly accurate measured values enable the precise monitoring of contact quality for lasting and reliable connectivity. Factors such as contact corrosion or wear by repeated mating are taken into consideration here.

Optimized plant availability thanks to precise cable location

A plant with thousands of connections presents a significant problem: in the event of a fault in a cable connection, an engineer has to first of all locate the fault in the field and of course do this as quickly as possible to minimize any financial losses caused by plant downtime. With IP67 connectors this requires far more effort than with the wiring in a control cabinet.

Turck's smart M12Plus connector provides a solution here and offers a critical benefit for localization: the unique MAC address of each M12Plus connector makes it possible to identify the cable at risk of failure directly via the documentation. Without wasting valuable time in fault localization, an engineer can now replace the affected cable with the appropriate replacement at the time of his choosing so that the plant can continue operating without any unscheduled downtimes.

Configuration via Turck Automation Suite

The configuration of the M12Plus connectors and the visualization of measured values can be conveniently carried out via Turck's IIoT and service tool TAS (Turck Automation Suite). The browser-based toolkit has been extended with the necessary functionalities in the latest release. For example, each M12Plus can be given an individual designation via TAS. If you are looking for a specific connector in your plant, you can make it flash specifically by clicking on it. The visualization of the applied current and voltage values can also be called up via TAS at the click of a mouse.

Outlook

The M12Plus showcased is the first model of a new generation of smart connectors that can be designed in a large number of other variants and can be specially tailored to individual requirements. This includes further developments such as application specific designs, cables with different cross sections, different numbers of cores as well as a wide selection of voltage ranges.

Author | Andreas Ix is director product management connectivity at Turck
Webcode | more22371e

TURCK
Your Global Automation Partner

Sustainable Automation

Efficient production, effective energy management and transparent supply chains. Digital automation solutions guarantee profitability and sustainability at the same time!

LEARN MORE

www.turck.com/wes

If more steam is needed for the process, the EMX steam generators can be expanded with additional modules as required

Full Steam Ahead into the Cloud

For its electrical EMX steam generators, Certuss uses Turck's TX series HMI controllers – including condition monitoring and remote maintenance via Turck Cloud Solutions

»As a niche manufacturer with limited resources, we rely on partners who can offer us a complete package. This is what we have with Turck. Turck has proved to be a reliable partner who supplies us both with the required switching devices and components as well as enabling an integrated cloud connection.«

Thomas Hamacher | Certuss

Whether in the health sector, chemical, pharmaceutical, automotive or food and beverage industry, the steam generators of Certuss Dampfautomaten GmbH & Co. KG supply steam and process heat worldwide. Steam and heat are indispensable in many industrial processes such as cooking, sterilizing or drying. A failure in steam generation can therefore lead in many sectors to the shutdown of entire processes and have serious consequences. "Steam provides the basis for the entire process of each of our customers," explains Thomas Hamacher, managing partner and technical manager at Certuss.

Electrically driven steam generators increasingly more important

The highly compact steam generators of the family-owned company based in Krefeld were for a long time mainly driven with gas and oil. However, Certuss and its customers have recently been increasingly using electrically driven steam generators, which can also operate more sustainably. Customers have also been requiring steam generators that are compact and easy to maintain. Certuss has met the demands of all three trends with its new EMX product series. Considerable importance is placed here on the availability of spares and the fast accessibility of service personnel. "For the customer, the supply of steam must be as convenient and reliable as the supply of electricity from a power outlet," explains Thomas Hamacher. "Ideally, the customer is hardly aware of the location or function of the steam generator."

Modularity, space saving and remote monitoring

The electric steam boilers of the EMX series can be expanded in modules. Thanks to their upright design, they can be combined into space saving assemblies. The main module can be expanded with additional units if the requirements increase. Certuss has also equipped the systems with an online connection for monitoring system status remotely. "The implementation of these automation features was critically important for us," says Thomas Hamacher. "Our customers increasingly do not have access to specialist personnel on site, and so everything has to be simple. This is where we show our strengths."

Systems that can be maintained online bring the benefit of early notifications, even before a fault actually occurs. This makes it possible to contact the

QUICK READ

Steam generators made by Certuss GmbH & Co. KG supply customers worldwide with process heat and process steam in over 100 sectors. Certuss relies on Turck automation technology for the development of its compact and modular EMX series – from pressure transmitters to BL20 I/O systems and TX series HMI controllers, right through to the cloud connection for remote maintenance using Turck Cloud Solutions. Turck's extensive consulting support, service, development service and, not least, the functionality of its products as well as the scope of its portfolio have impressed the company.

The compact PT pressure sensors accurately measure the pressure in the system

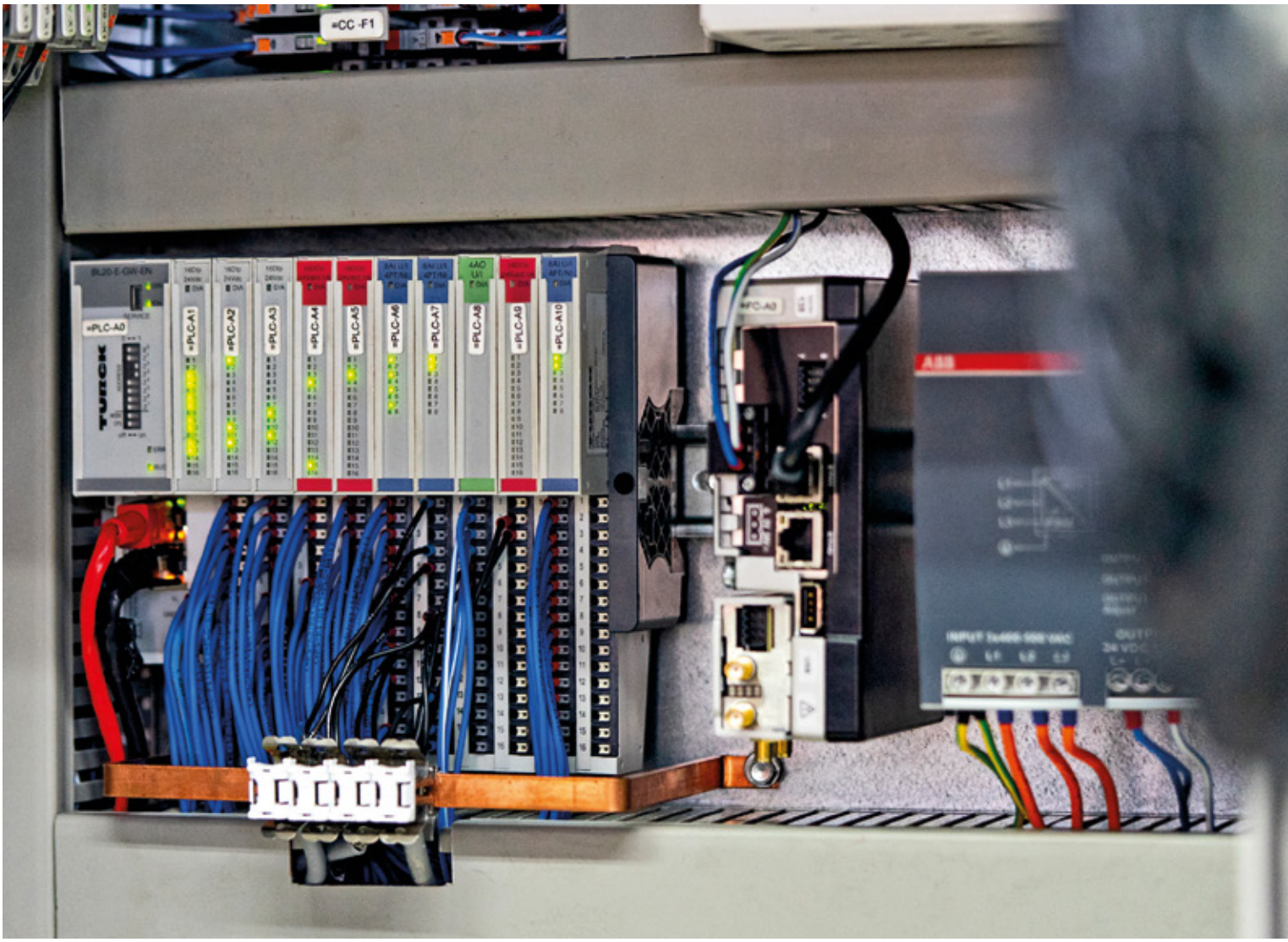
The GUI on the TX705 HMI was thoroughly upgraded in close collaboration with Turck to provide the exact user experience specified by Certuss

customer in good time in order to determine whether a service technician is required or whether the customer can undertake actions on their own in order to prevent possible faults. Coworkers are shown step-by-step the tasks to be completed. Once the performed steps are acknowledged, the plant manager obtains a clear overview of the measures completed and can thus ensure that all the necessary tasks were fulfilled. When major challenges present themselves on site, Certuss specialists can then intervene in order to restore plant operation. "We know exactly when the next plant service is due and which spares have to be available in the near future in order to maintain the smooth operation of the entire production chain," Hamacher explains.

Sensors, I/O technology, visualization and cloud connection from a single source

When the EMX series was developed, Turck was able to support Certuss with an integrated solution, from the sensors to the I/O technology, controller with visualization, right through to the cloud connection. The compact Turck PT pressure transmitters precisely measure the pressure in the system and send the values to the modular BL20 I/O system and from there on to the TX700 edge controller. This monitors and controls the input and output signals as well as the connection to the cloud. The TX705-HMI is then used as the operator panel and visualizes the processes. "As a niche manufacturer with limited resources, we rely on partners who can offer us a complete package. This is what we have with Turck," says Hamacher. "Turck has proved to be a reliable partner who supplies us both with the required switching devices and components as well as enabling an integrated cloud connection."

The graphical user interface of the HMI was therefore designed with the TX VisuPro development environment in close collaboration with Turck to provide the exact Certuss user experience. "The result is an outstanding product that is impressive both in terms of its technology and its looks," Hamacher notes.



The measured data provided by the pressure transmitters is routed to the BL20 I/O system

Cloud connection: proactive operation and continuous optimization

The cloud connectivity provides Certuss customers with important functions. As the data is transferred from the EMX steam generator in real time, the plant can report service issues to the Certuss maintenance personnel directly. Certuss can view all sensor values and follow how the plant is operating, even over long periods – providing that the customer has allowed access. This enables the manufacturer to operate proactively instead of only responding to inquiries. The integrated status monitoring regularly checks whether threshold values are exceeded. This enables the maintenance personnel to detect immediately if something is not working properly and respond immediately – thus reducing downtimes to virtually zero.

Steam is not the same in all the many applications and sectors in which it is used. Understanding quickly how the customer uses his plant is therefore critical. The information that is acquired from the cloud connection is also fed back into the further development of steam generators – in order to further increase the efficiency of the resources for the steam generators without losing out on performance.

Higher pressures and greater availability

The EMX steam generator offers users a critical added value: they generate steam at a pressure of up to 16 bar. This was previously only possible with steam generators driven by fossil fuel. However, these will increasingly be replaced since Certuss customers are endeavoring to minimize their CO2 footprint. Customers are well prepared for the future with the EMX generation. "We hope to enjoy other benefits from the cloud solution in the future, such as predictive maintenance with anomaly detection," Thomas Hamacher explains further plans. "We also intend to build steam generators that run on hydrogen with the latest control technology. We firmly intend a close collaboration with Turck in this project."

Author | Andreas Herrmann is director of sales Germany West at Turck
Customer | www.certuss.com
Webcode | more22350e

Smart Silos

Adfil's smart level detection system from Turck, which optimizes procurement and production at the same time, demonstrates how sensor-2-cloud solutions don't have to be expensive and complex

The robust LTF12 laser sensor with an IO-Link output has a range of up to 12 meter with a resolution of 0.3 to 3 millimeter

With more than three decades of experience, Adfil is a proven specialist in the development and manufacture of synthetic fibers for concrete reinforcement. The company, headquartered in Zele, Belgium, produces the synthetic fibers in different variants for ready-mix, precast or sprayed concrete. Adfil specialists in the company's planning office determine the exact amount of fiber for the particular concrete, which is used in a wide range of applications, from concrete floors and paving, tunnel linings, right through to precast concrete for walls or fences.

The use of synthetic fibers in concrete has several benefits. It firstly saves time since the fiber reinforcement already in the concrete eliminates the need for steel mesh.The user also saves money since the price of steel mesh reinforcement is considerably higher than for synthetic fiber reinforcement. It also saves a considerable number of man-hours on the construction site.

Reducing the ecological footprint

Choosing synthetically reinforced concrete is also a good move in terms of sustainability and reducing the carbon footprint. Independent studies prove that 90% of the carbon can be saved in the reinforcement through the use of this fiber. Besides the fact that no steel is required, the considerable reduction in vehicle movements – by eliminating the need to transport steel mesh – has a positive effect on the carbon footprint.

Electromechanical sensors were used previously to measure the granulate level in the storage silos. However, these did not provide the possibility for continuous measurement. The operators in the production halls had to manually call up the level in each silo by pressing a button on a panel. The measured values corresponded to a specific volume that was represented in a table on an A4 sheet next to the board. Although this process worked, it wasn't ideal, also because the measured values were not always accurate and the system was often mechanically jammed.

With smaller loads, it was thus very likely that the level of certain granulates was not measured frequently enough and there was a risk of production stops due to raw material shortage. For this reason, Guy De Vuyst, maintenance engineer at Adfil, decided to automate the level measurements. The search for accurate and inexpensive sensors was a challenge at first. Although special solutions were available, they were more expensive than the planned budget.

Continuous level measurement using laser sensors

Not so with the solution from Turck Multiprox. Turck's Belgian subsidiary could offer a solution that was not only attractive in terms of price: the LTF12 laser sensor from Turck's optical sensor partner Banner Engineering. This laser sensor with an IO-Link output has a range of up to 12 m with a resolution of 0.3 to 3 mm. The sensor's measurements remain accurate and reliable over long periods of time. Unlike with other sensors, the lenses of the LTF12 make it ideal for this application as they do not require high pressure cleaning to ensure correct measurements.

»We are very pleased with the solution from Turck Multiprox. This very reasonably priced solution allows our coworkers in purchasing and production to monitor the granulate levels in our silos so that supply is always exactly matched to our needs.«

Guy De Vuyst | Adfil

However, the actual added value of the offer from Turck Multiprox was the fact that they developed a flexible complete solution. They therefore not only provided support in selecting the most suitable hardware, but also in configuring the components and programming certain parts of the code. The IO-Link sensors were connected to Turck's FEN20-4IOL, one of the most compact IO-Link masters on the market. This multiprotocol I/O station with four IO-Link master channels also offers optimum flexibility as it can be used as an EtherNet/IP slave, Modbus TCP slave and c slave. The IO-Link masters are connected to a Siemens PLC via Profinet. From there, the data is visualized locally on the HMIs in WinCC. The data is also forwarded to the Ignition SCADA via OPC UA.

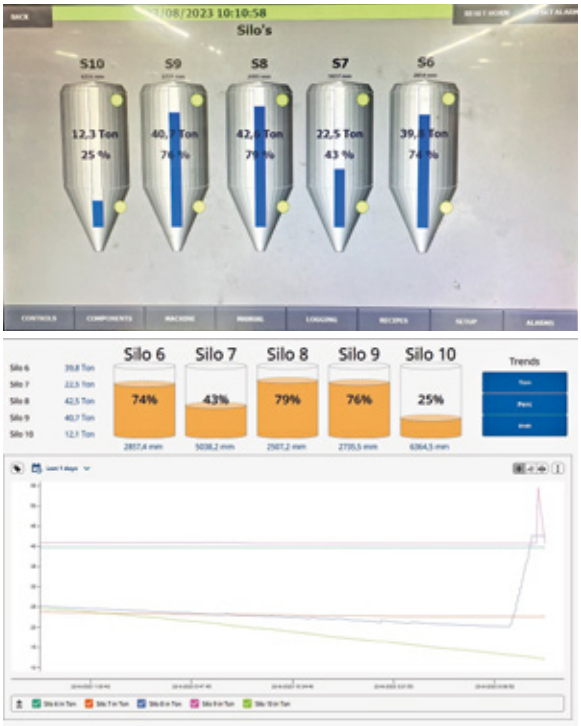
Sensor-2-cloud solution supports procurement

It was also important for Adfil's purchasing department to be able to act quickly and correctly based on the measurement data, even if they were not on site. Deliveries to the production plant that are too fast can lead to overfilling in one of the silos. Too slow a supply may lead to material shortage and even a production stoppage in the worst case. For this, Turck Multiprox has developed a cloud solution that gives both the coworkers in the purchasing department as well as those in production an overview of the correct level of each silo at any time.

The Turck TX700 dual-core IoT gateway with the Codesys V3 controller is used here to read the IO-Link islands simultaneously via Modbus/TCP. The TX700 is a genuine 'Swiss Army knife' piece of equipment that offers a host of communication, visualization and programming options. The device is future-proof and fits perfectly in the Industry 4.0 strategy of modern companies.

Conclusion

As the example shows, even the digitalization of a relatively simple task can bring enormous gains in efficiency. With this clearly manageable and attractively priced IIoT application, Adfil now benefits from measurement data that can be accessed continuously from anywhere, thus enabling optimized procurement and production processes. As Guy De Vuyst also confirms: "We are very pleased with the solution from Turck Multiprox. This very reasonably priced solution allows our coworkers in purchasing and production to monitor the granulate levels in our silos so that supply is always exactly matched to our needs."



Everything in view: the silo levels are displayed from the cloud on the monitor in real time

The purchasing department can also view the levels in the Scada system at any time and can order in good time

Author | Hans De Craemer is marketing manager at Turck Mutliprox in Belgium
Kunde | adfil.com
Webcode | more22351e

QUICK READ

In many production sites, the correct supply of materials is critical in order to ensure optimum production processes. This is also the case for Belgian plastics specialists Adfil, for which Turck Multiprox implemented a smart sensor-2-cloud solution that enables procurement and production to access real-time data on silo levels at any time. This ensures that the right quantity of raw materials is always available.

»By using this RFID solution, we can intentionally allow a certain amount of chaos at this point to enable efficient work. As soon as a pallet leaves the area, the pallet and its destination are automatically recognized.«

Phillip Hannesen | KEB Automation

Autopilot

KEB Automation is expanding its automated driverless transport system with RFID technology into a fully automated and fail-safe material logistics solution

Efficient material logistics requires much more than simply managing material flows related to production. The primary objective is to optimize processes, reduce costs and ensure smooth operations. Transparency plays a crucial role in managing and controlling transport movements efficiently and flexibly. This calls for a solution that seamlessly combines as many aspects of material logistics as possible. The flows of information accompanying material must be ensured to achieve the maximum possible productivity and efficiency and prevent bottlenecks. KEB Automation faced this challenge with the intralogistics in the electronics plant.

QUICK READ

To optimize material logistics for assembly, drive and automation technology, specialist KEB Automation relies on RFID technology on conveyor lines and driverless transport systems. Turck's RFID solution supports the automation of logistics processes and enables full transparency in the material flow of frequency inverter production – without any time-consuming manual effort. The solution also helps to optimize the use of resources and the efficient utilization of warehouse capacity by ensuring fast and reliable assignment to destinations through automated pallet tracking.

As specialists for drive and control technology, KEB Automation develops, produces and sells drives as well as engines, gearboxes, brakes, clutches and IIoT solutions worldwide. At the production plant in Barntrup, the company wanted to automate all non-value-added warehouse processes as much as possible. The specific occasion to do this came with the move into a new production hall, in which it was possible to carry out detailed planning right down to the production areas. From the start, the aim was to replace the use of forklifts in the production area with a driverless transport system.

Warehouse control and pallet tracking using RFID technology

"We wanted to fully automate the identification and tracking of all pallets on the routes in the production area using RFID tags," Viktor Derksen, head of industrial engineering at KEB, describes the main requirement of the application. The labels have a unique handling unit number (HU), which gives the load carriers their identity in SAP EWM. The additional labeling of the number as a barcode and plain text makes who identified a pallet, and where and how it was identified unimportant. A transport order always therefore refers to an HU, also between cross-system warehouse locations, whether executed by the DTS or by conventional industrial trucks. The information exchange between

After the transport order is generated, the DTS picks up the pallet at the warehouse location

the different systems and SAP is coordinated via middleware. At the automated warehouse, the picked pallets are prepared for the DTS using a conveyor system. From this start point, the pallets are transported to all electronics production halls. The route includes several individual sections and intermediate buffers, depending on the destination. The individual transport orders are carried out not only by the DTS, but also by manually operated industrial trucks and stationary materials handling equipment. In this mixed operation of different intralogistics systems, the accurate tracking of pallets and precise control of their movements present challenges that RFID technology is designed to overcome.

Optical ID solution unsuitable

The DTS always requires instructions or position information to determine the route. "For a simple pallet transport from one workstation to another, this is quite straightforward," explains Phillip Hannesen, digital transformation manager for production at KEB in Barntrup. "It becomes problematic in zones in which multiple pallets are temporarily stored to be picked up later by another vehicle and taken to another location. When there is a mixing of load carriers, consistent HU-to-location assignment is no longer assured, so vehicles must always be able to identify the loaded pallet."

In order to ensure reliable identification of the load, the possibility to do this is important regardless of the orientation and positioning of the pallet. Turck's UHF RFID technology provides a solution for all installation situations of the application and achieves a read rate of almost 100 percent. The versatility and flexibility of the system is demonstrated by a look at the various use cases at KEB.

Pallet identification at the transfer point

The presence of the pallets at defined storage locations is checked at a transfer point for forklifts and DTS. The Q5X laser distance sensor from Turck's optical partner Banner Engineering is used for this. 20 Q5X sensors with a range of 5 meters are used to detect 20 pallets. The Q5X sensors, mounted at a height of 3 meters, determine whether there are pallets at the transfer point that can be transported. As soon as the distance sensor has detected the presence of a pallet, a transport order is generated for the DTS. This picks up the pallet, passes through the RFID gate and finally receives the HU information from SAP EWM.

The system checks whether the destination may already be occupied before a transport order is generated. Before Q5X sensors were used, the DTS first had to move to the destination to determine this. In this case, the DTS waited in front of the blocked storage location until an employee cleared it. Today,

the vehicle receives information in advance about whether the destination is occupied and only starts the journey if it is free – this prevents empty runs and wait times and ultimately improves performance.

A sensor initiates standardized communication between the controller and DTS by sending a 24-volt signal to the controller when it detects the transport system. The PLC in turn transmits the information to the DTS via the TCP/IP network.

Pallet identification at full speed

External antennas are mounted on each side of a hall door and connected to the UHF RFID reader. The external antennas ensure reliable detection of the RFID labels on the pallets, regardless of the orientation of the respective pallet on the DTS. As the DTS approaches the door, it sends a signal to the Q300 via the network to start the recording.

A store order, i.e. the order to transport the load carrier from A to B, is present in SAP EWM for the HU that the Q300 detects. Once the DTS has passed the gate, it sends a request to the middleware. This retrieves the pallet information from the antenna and then asks the SAP system for the destination of the pallet. The data captured is then transferred to the DTS.

Efficient identification even in the near field

Two production halls are connected via a bridge with stationary pallet conveyor technology, which was also equipped with RFID technology. Unlike the application at the hall door, where RFID labels have to be detected over long distances, the challenge in this application is to only read RFID labels in the immediate vicinity, i.e. at a distance of up to about 10 cm. This is achieved with near-field antennas positioned to the left and right of the pallet conveyor. These near-field antennas only detect the RFID label of the pallet that is directly in front of them.

At the transfer points, the conveyor system communicates with the DTS to ensure a smooth transfer process. When the pallet is placed, the DTS sends a request to the middleware to identify the pallet via the near-field antennas of the Q300 reader. This information is returned to the middleware, which determines the warehouse tasks for this pallet from the SAP EWM data. After the pallet has been placed at the transfer point, the conveyor system transports the pallet to the next hall, where it is again detected using RFID.

Full transparency

The RFID solution offers KEB the key advantage of end-to-end transparency. The location of a pallet can be seen at any time – whether it is still on the conveyor system, has been picked up by the industrial truck or has already arrived at its destination. In some situations, it is possible to automate the acknowledgment of EWM warehouse tasks using RFID. This is supplemented by the manual operation of mobile devices. "Turck's solution gives us the transparency we wanted without any time-consuming manual effort," Derksen said. "The capture of the RFID tags is fully automated, allowing warehouse tasks from the SAP Extended Warehouse Management system to be completed or processed at the same time."

Agile warehouse management allows controlled chaos

Another benefit of the RFID solution is that it allows mixed traffic in the production hall. This means that both DTS and employees with lift trucks or forklifts could load and unload simultaneously in the staging area. Separate storage space management is not required, as each pallet can be identified at each fork. "By using this RFID solution, we can intentionally allow a certain amount of chaos at this point to enable efficient work. As soon as a pallet leaves the area,

External RFID near-field antennas on the conveyor system only detect the pallet directly in front of them

»Turck's solution gives us the transparency we wanted without any time-consuming manual effort. The capture of the RFID tags is fully automated, allowing warehouse tasks from the SAP Extended Warehouse Management system to be completed or processed at the same time.«

Viktor Derksen | KEB Automation

the pallet and its destination are automatically recognized," explains Hannesen, who also emphasizes the good cooperation with Turck: "Turck's service and short communication channels enable efficient cooperation, and we are happy to rely on this trusting and well-established partnership."

Outlook

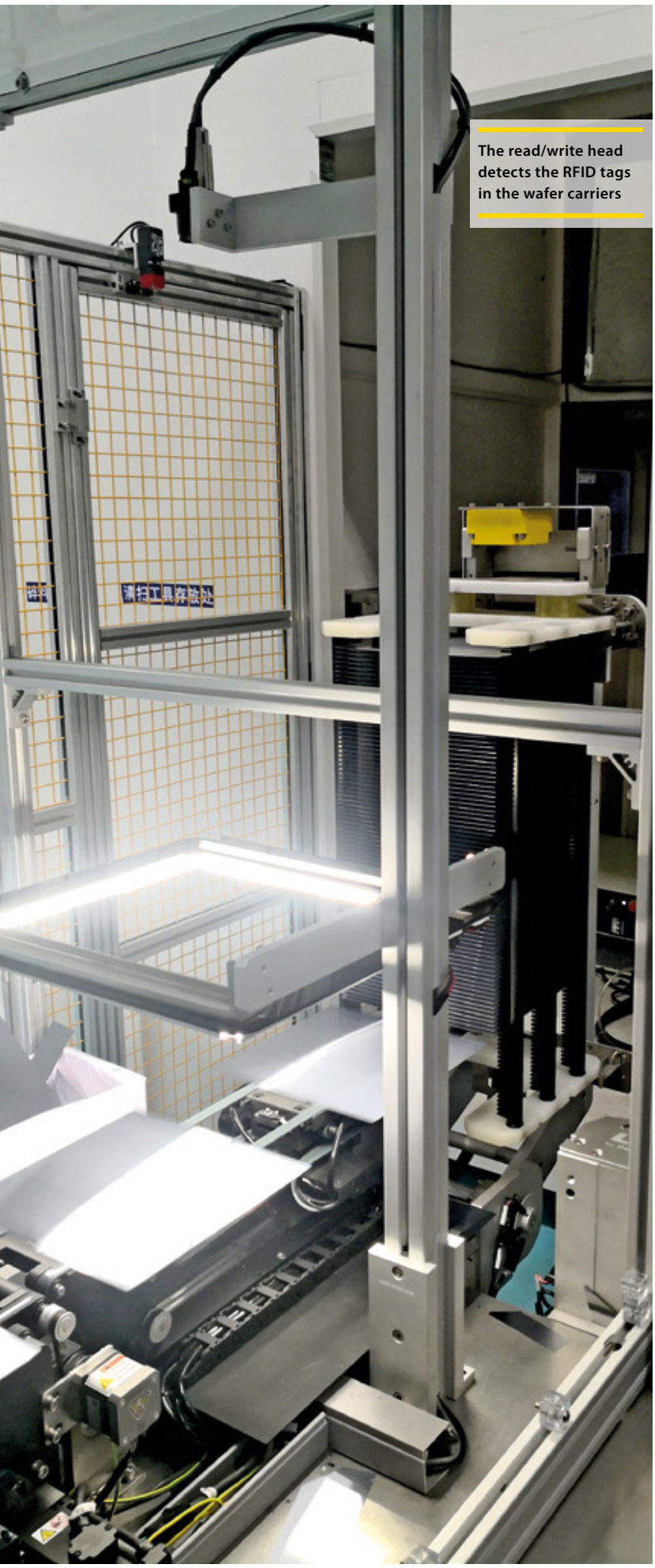
The successful use of the DTS with Turck's RFID technology has led to the planning of further expansions. Waste disposal was also successfully integrated into the system: Containers in which used cardboard is collected are picked up by the DTS. It is planned for these containers to be transferred directly to a new waste compactor, which would mean fully automated disposal.

The laser distance sensors will also be equipped with Turck IO-Link modules in the future, which will independently perform control tasks through the use of Turck's ARGEE logic software. This includes, for example, the acquisition and evaluation of sensor values. They will also autonomously and efficiently manage the required communication with middleware or DTS, resulting in an extremely lean overall solution.

The Q5X laser distance sensors mounted at a height of three meters determine whether pallets are present at the transfer point

Autor | Phil Whorton is responsible for customer-specific system solutions in the Application Service Center at Turck
Customer | www.keb-automation.com
Webcode | more22352e

After the transport order is generated, the DTS picks up the pallet at the warehouse location



The read/write head detects the RFID tags in the wafer carriers

Clear as Daylight

Chinese solar cell manufacturer uses Turck's RFID system to increase the quality and efficiency of its production

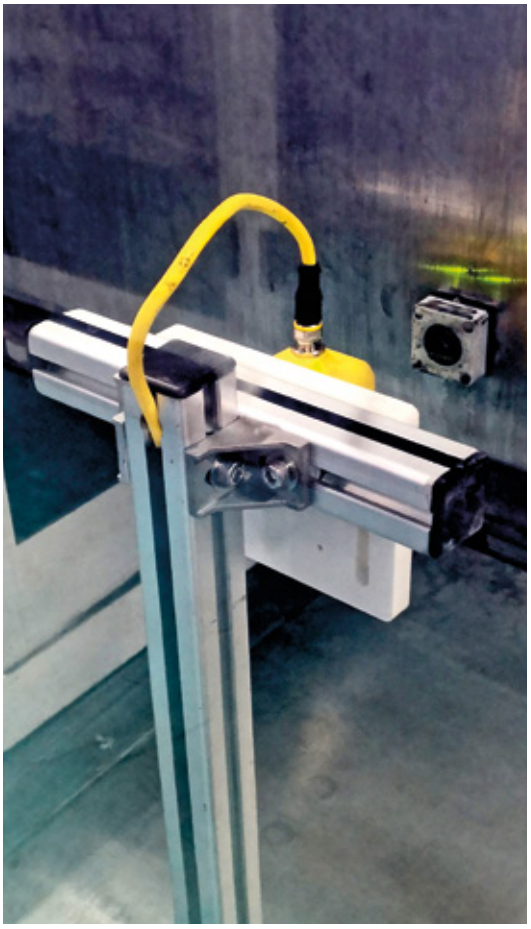
The photovoltaic industry is playing a key role worldwide as part of the energy transition. Solar cell manufacturers are faced with the challenge of consistently producing good quality and increasing their production output – while maintaining or reducing costs. But where do the errors mostly occur in the production process? At which points is an adaption worthwhile? In order to find well-founded answers to these questions, manufacturers need a full and seamless collection of production data.

A Chinese system integrator was therefore commissioned by a manufacturer to collect this data for its solar cell production in order to provide a basis to make well-founded production decisions. An automated solution was required to guarantee smooth production and quality control. The customer decided as a result to use RFID to implement data acquisition and processing as efficiently as possible throughout the entire production process. The contactless RFID technology allows products to be tracked and anomalies to be identified in real time, so that sound data-driven decisions could be made in good time.

Production tracking by wafer carrier detection

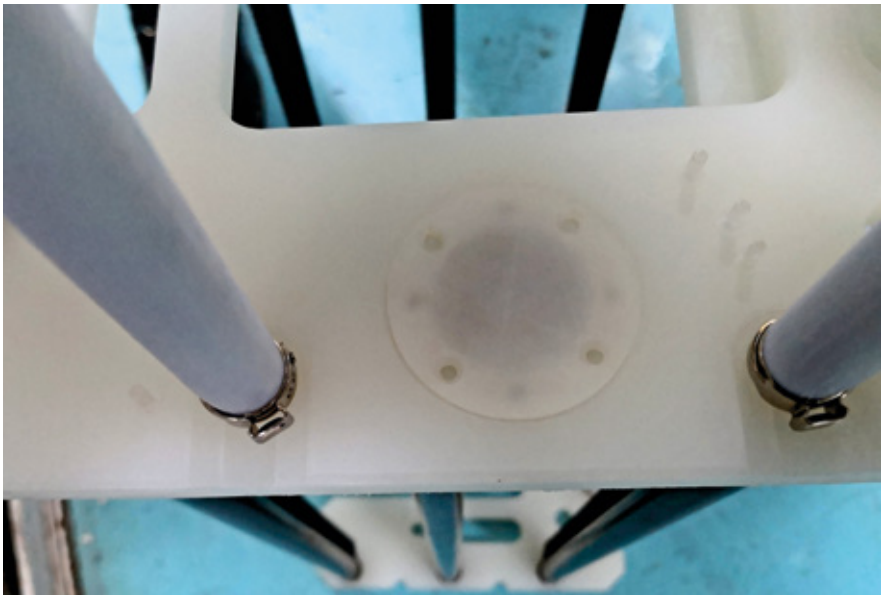
Quality assurance and control play an essential role in the production of solar cells. The complex manufacturing requires the precise allocation of production batches right down to the individual silicon wafer. The solar cell wafers are transported between the production steps and stored in special wafer cassettes. These wafer carriers are designed so that the solar wafer is protected from external factors such as dust, humidity and mechanical stresses. The installation of RFID tags provides each wafer carrier with a unique identification code to which a production order is assigned.

Read/write heads are installed at the stations of each process step in order to capture the information of the tags as soon as they enter their read range. An RFID data acquisition system was set up based on the collected data, which feeds the information automatically to the system and interacts with it in real time. In this way, real time information about the wafers can be called up and analyzed on each production line, thus enabling accurate production monitoring in the field and decision making in real time.



HF read/write heads at each process station ensure reliable data acquisition

With its 16 kilobyte data buffer, Turck's TBEN S RFID module offers impressive performance



The integrated RFID tag allows each wafer carrier to be identified uniquely and assigned to a production order

RFID solution impresses integrator

Its modular and versatile structure enables Turck's BL ident RFID solution to be adapted easily to any application and integrated in existing plants. Standard software modules are available for easy system integration and commissioning. The system could thus be easily integrated in the complex solar cell manufacturing process.

Turck's TBEN RFID modules offer three Ethernet protocols with Profinet, Ethernet/IP and Modbus TCP, which are compatible with the controllers of many manufacturers. In this way, the user is able to reduce the number of different variants in the warehouse and thus also reduce the product inventories to be kept on hand for each project, thus saving considerable costs. When it comes to maintenance and servicing, the system integrator appreciates the possibility of being able to replace the components of the RFID system during operation, thus minimizing downtime for his customers.

The tags were robust enough for solar cell production and impressed in the specific project. The tags with protection to IP68 can be stored for up to 100 hours at temperatures up to 140 degrees. Thanks to the 16 kilobyte data buffer of the TBEN RFID interface, the wafer carriers no longer have to wait in front of the read/write devices until all read/write operations have been completed. This means that the manufacturer can achieve a higher production speed – without any loss in quality. The TBEN module also offers an integrated switch that enables a line or ring topology to be set up and thus simplifies network cabling.

All these features impressed the customer and gave him a significant improvement in the efficiency of his production. "By using Turck's RFID solution, the company is now able to track all production processes fully and ensure a high level of process quality. The RFID system not only improves the flow of information but also provides a reliable basis for making well-founded decisions for future optimizations," the system integrator concludes

Author | Qiang (Richard) Lin, marketing & product management department, Turck (Tianjin) Sensors Co.
Webcode | more22354e

QUICK READ

A Chinese system integrator is automating the quality assurance and traceability of solar cell production for its customers with RFID technology. The company chose Turck's BL ident RFID system, which can be integrated smoothly into existing plants. This solution enables real time control and monitoring of the individual production steps, supplies reliable data for the production management and allows comprehensive, timely and precise monitoring on site.

Innovation with High Pressure

In Resato Hydrogen Technology's modular hydrogen refueling stations, Turck's IP67 ATEX I/O modules guarantee scalability and fast commissioning

Hydrogen will play an important role as an energy carrier in the future. Buses and trucks in particular will increasingly run on hydrogen. And hydrogen also seems to be establishing itself as an energy carrier for passenger cars in the long term. One of the companies profiting from this trend with its hydrogen filling stations is Resato Hydrogen Technology B.V. from Assen in the Netherlands. The core of the company's innovation lies in high-pressure technology. In the niche market of waterjet cutting, Resato had made a name for itself since the early 1990s. Since 2018, the engineers have also been applying this know-how to the development and construction of hydrogen refueling stations. The company has already produced and commissioned more than 45 hydrogen refueling stations in Europe, nine of them in the Netherlands.

If this hydrogen filling station is to be extended by additional dispensers, further buffer storage tanks can be added relatively easily

Two pressure levels for trucks and cars

Hydrogen refueling stations can obtain their fuel in two ways, either through an electrolyzer, which uses electric current to cause a chemical reaction that separates water into hydrogen and oxygen, or through

»Resato's ambition is to be the global technology leader in the field of hydrogen refueling stations. For this, we need partners like Turck.«

Niels de Jong | Resato Hydrogen Technology

hydrogen tankers called tube trailers. The hydrogen from the tube trailer is compressed to 350 bar in three stages and cooled down. It is then stored in buffer tanks for refueling trucks or, in a fourth compression stage, compressed to 700 bar and stored in a separate buffer. Due to the precooling of hydrogen cars can be refueled much more quickly via 700-bar pumps.

A hydrogen filling station is therefore much more complex than a filling station for carbon-based fuels. The system must bring the hydrogen to the necessary pressure in a series of cooling and compression steps. Since greater pressure leads to increased temperatures, the hydrogen must also be repeatedly cooled down.

Hydrogen requires explosion protection concept

The complexity of the refueling systems lies in the control system. Resato developed a patented algorithm that realizes the fastest possible refueling depending on temperature and pressure. At the I/O level, explosive hydrogen poses a challenge to the automation concept. It requires an explosion protection concept and products with the appropriate approvals. In addition, the system must be low-maintenance to the maximum extent possible, since no personnel are on site to make any adjustments. The signals to be processed are mainly temperature and pressure signals as well as switching signals from control valves. In addition, there are safety-related signals from valves, emergency stop buttons and other safety sensors.

In the first version, the manufacturer still wired its refueling systems with passive I/O technology. The sensor and actuator signals were routed to passive distributors at the buffer tank and from there to the controller via multicore lines. Although this solution

QUICK READ

Companies investing in hydrogen infrastructure today place a lot of importance on the scalability of a system in order to be able to respond flexibly to future market requirements. This is precisely why the Dutch hydrogen filling station manufacturer Resato Hydrogen Technology B.V. relies on Turck's decentralized IP67 I/O module concept. It is the only one on the market that offers a comprehensive solution for modular systems, even in hazardous areas - and for all signal types including safety.

The buffer storage tanks hold the hydrogen ready for refueling at 350 bar (truck) or 700 bar (car)

worked reliably, it was not very flexible if the system was to be expanded to include additional buffer storage tanks. "Electrotechnically, it was very complex to add a unit. We also had to completely rework the software. So we decided to divide the whole system into modules so that we could control each module individually," says Remco Lagendijk, Electrical and Instrumentation Engineer at Resato, explaining the start of the modular filling station concept.

Modularization for more flexibility

The second generation of Resato hydrogen filling stations is modular. Buffer storage, compressors and cooling units can thus be added and combined flexibly. To make it easier to add aggregates, all signals on each aggregate must converge in one data line. The buffer storage units therefore require an I/O solution with Industrial Ethernet, or more precisely Profinet. Since Resato wanted to save on protective housings and the mechanical effort involved, the experts looked for I/O modules with IP67 protection, which are temperature-resistant and suitable for outdoor use. Up to that point, the requirements profile would not make any automation engineer sweat. However, the modules should also have approval for ATEX zone 2 and also be suitable for connecting intrinsically safe signals from zones 1 and 0.

The search for an automation partner who could also support this decentralized concept in the Ex area also led the Resato team to the Hannover Messe. The engineers were presented with many IP67 IO solutions at the booths. But when asked about IP67 with ATEX approval, many suppliers had to pass. "Except for Turck. They were able to offer us different solutions for IP67 in ATEX zones. We understood that Turck is familiar with this and also already has corresponding components on the market," Lagendijk reports about the search for a decentralized I/O solution.

»Turck was able to offer us different solutions for IP67 in ATEX zones. At the customer's site, we then only have to connect the power and data lines. This saves a couple of days of the commissioning time for the electrical work.«

Remco Lagendijk | Resato Hydrogen Technology

Intensive consulting during concept development

As a result, Resato worked with Turck experts to develop a decentralized I/O concept for its buffer storage units. "The support was really good. We weren't handed a few products and told 'Good luck with that,' but we had an intensive exchange about the products and thought through different possibilities. Turck even recommended the exact cable types with the right lengths for us," explains Niels de Jong, research and development engineer. "Resato's ambition is to be

the global technology leader in the field of hydrogen refueling stations. For this, we need partners like Turck.". The I/O concept was implemented completely decentralized - including the intrinsically safe sensor signals from ATEX zones 0 and 1. With the devices of the IMC family, Turck offers special interface modules in IP67. They are connected between the Ex sensor (or actuator) and the I/O device, safely isolate the circuits and transform the signal currents. Even the safety-related signals are decentralized to the IP67 I/O module TBPN, which communicates with the safety controller via Profisafe protocol.

Modular concept facilitates offline testing and shortens commissioning time

"One of the advantages why we chose the Turck solution is the possibilities for offline testing" explains Lagendijk. "Previously, we had to test at our production site, then we dismantled everything and rewired everything again on site at the customer. Then, of course, we had to test again whether all inputs and outputs were connected correctly. Today, we test the systems on our premises and leave all the connectors connected to the remote I/O modules. At the customer's site, we then only have to connect the power and data lines. This saves a couple of days of the commissioning time for the electrical work and can be done with fewer electrical engineers."

Remco Lagendijk emphasizes this advantage of the modular concept: "Commissioning is a very critical phase. If errors occur here, it usually takes much longer to fix them than in production. This is because all the experts, the right tools and even necessary spare parts are at hand in the company's own production, but not at the customer's site."

Consistently modular - optimally scalable

Resato has thought the modular concept through to the end. Remco Lagendijk and his colleagues from software development have also made the control software modular. This means that a module can be added to the control software without having to rewrite the entire code. "It's almost like copy-and-paste," says Lagendijk. Thanks to the consistently modular concept, Resato's hydrogen fueling stations are now conceivably easy to scale. "If the customer wants to expand their storage and needs more buffer storage, that's not a problem for us - especially from the electrotechnical and control side, it's very easy," adds Niels de Jong.

Next stop: series production

Demand for the hydrogen filling stations is rising continuously. It can be assumed that Resato will successively switch its production from project organization to series production in the near future - at least partially. With the modular filling station concept and the modular I/O architecture, Resato is optimally prepared for this. The concept enables series production. The individual modules, such as compressors or buffer storage units, can be pre-produced in stock and then assembled to meet specific customer requirements. These economies of scale will also reduce the costs and time-to-market of hydrogen filling stations.

Author | Herjan Grootens is project manager automation at Turck B.V. in the Netherlands
Customer | resato-hydrogen.com
Webcode | more22355e

With the TB-SG stainless steel protective housings, almost all TBEN I/O modules are also approved for use in ATEX zone 2

Missing link: Thanks to the IMC interface devices in IP67, Ex sensors can also be connected safely to the I/O modules in zone 2 without the need for a control cabinet

Web and Social Media

Turck promises exciting trends and innovations for Industry 4.0 and IIoT with the Digital Innovation Park - from IO-Link to condition monitoring or track and trace. Turck's digital showcase provides a quick overview of current automation topics and links to webinars, white papers and more. Want to stay up to date? Then subscribe to our newsletter or follow us on our social media channels.

www.turck.com/dip

Trade Fairs

Turck presents current product innovations and proven solutions for factory, process and logistics automation at numerous international and national trade fairs. Be our guest and talk to our experts about your challenges. You will find a current overview at www.turck.com/events.

www.turck.com/events

Sites

With over 30 subsidiaries and more than 60 agencies, Turck is always nearby, anywhere in the world. This guarantees fast contact to your Turck partners and direct support on site.

GERMANY
Headquarters Hans Turck GmbH & Co. KG | Witzlebenstraße 7 | Mülheim an der Ruhr | +49 208 4952-0 | more@turck.com

ARGENTINA | **Aumecon S.A.**
(+54) (11) 47561251 | ventas@aumecon.com.ar
AUSTRALIA | **Turck Australia Pty. Ltd.**
(+61) 1300132566 | australia@turck.com
AUSTRIA | **Turck GmbH**
(+43) (1) 4861587 | austria@turck.com
BAHRAIN | **Al Bakali General Trading**
(+973) 17 55 11 89 | albakali@albakali.net
BELGIUM | **Turck Multiprox N. V.**
(+32) (53) 766566 | mail@multiprox.be
BOLIVIA | **Centralmatic**
(+591) 7 7457805 | contacto@centralmatic.net
BOSNIA AND HERZEGOVINA | **Tipteh d.o.o.**
(+387) 33 452427 | info@tipteh.ba
BRAZIL | **Turck do Brasil Ltda.**
(+55) (11) 26769600 | brazil@turck.com
BRUNEI | **Turck Banner Singapore Pte Ltd**
(+65) 65628716 | singapore@turckbanner.com
BULGARIA | **Sensomat Ltd.**
(+359) (58) 603023 | info@sensomat.info
CANADA | **Turck Canada Inc.**
(+1) (905) 5137100 | salescanada@turck.com
CHILE | **Egaflow S.P.A.**
(+56) (2) 2887 0199 | info@egaflow.com
CHINA | **Turck (Tianjin) Sensor Co. Ltd.**
(+86) (22) 83988188 | china@turck.com
COLOMBIA | **Dakora S.A.S.**
(+57) (1) 883-7047 | ventas@dakora.com.co
COSTA RICA | **Tecnologia Interactiva**
(+506) 2572-1102 | info@tecnologiainteractiva.com
CROATIA | **Tipteh Zagreb d.o.o.**
(+385) (1) 80 53 628 | tipteh@tipteh.hr
CYPRUS | **AGF Trading & Engineering Ltd.**
(+357) (22) 313900 | agf@agfelect.com
CZECH REPUBLIC | **Turck s.r.o.**
(+420) 495 518 766 | turck-cz@turck.com
DENMARK | **Hans Følsgaard A/S**
(+45) 4320 8600 | denmark@folsgaard.com
DOMINICAN REPUBLIC | **Suplitek SRL**
(+809) 682-1573 | aortiz@suplitek.com.do
DOMINICAN REPUBLIC | **VZ Controles Industriales, CXA**
(+809) 530 5635 | vz.controles@codetel.net.do
ECUADOR | **Bracero & Bracero Ingenieros**
(+593) (2) 264 1598 | bracero@bracero-ingenieros.com
EGYPT | **Electric Technology**
(+20) 3 4248224 | electech@electech.com.eg
EL SALVADOR | **Elektro S.A. de C.V.**
(+503) 2243-8542 | info@elektroelsalvador.com
ESTONIA | **Osauhing "System Test"**
(+37) (2) 6405423 | systemtest@systemtest.eem
FINLAND | **Sarlin Oy Ab**
(+358) (10) 5504000 | info@sarlin.com
FRANCE | **Turck Banner S.A.S.**
(+33) (0)160436070 | info@turckbanner.fr
GEORGIA | **Formila Company LLC**
(+995) 555 554088 | formila.company@gmail.com
GREAT BRITAIN | **Turck Banner Ltd.**
(+44) (1268) 578888 | enquiries@turckbanner.co.uk
GREECE | **Athanassios Greg. Manias**
(+30) (210) 9349903 | info@manias.gr
GUATEMALA | **Prysa**
(+502) 2268-2899 | alvaro.monzon@prysaguatemala.com
HONDURAS | **Partes Industriales**
(+504) 2237-4564 | orlando@part-ind.com
HONG KONG | **Hilford Trading Ltd.**
(+852) 26245956 | hilford@netvigator.com
HUNGARY | **Turck Hungary Kft.**
(+36) (1) 4770740 | hungary@turck.com
ICELAND | **KM stál ehf**
(+354) 5678939 | kalli@kmstal.is
INDIA | **Turck India Automation Pvt. Ltd.**
(+91) 7768933005 | india@turck.com
INDONESIA | **Turck Banner Singapore Pte. Ltd**
(+65) 6206 5095 | singapore@turckbanner.com
IRELAND | **Tektron Electrical**
(+353) (21) 4313331 | webenquiry@tektron.ie
ISRAEL | **RDT**
(+972) 3 645 0780 | info@rdt.co.il
ITALY | **Turck Banner S.R.L.**
(+39) 2 90364291 | info@turckbanner.it
JAPAN | **Turck Japan Corporation**
(+81) (3) 52982128 | japan@turck.com
JORDAN | **Technology Integration**
(+962) 6 464 4571 | info@ti.jo
KENYA | **Westlink Limited**
(+254) (53) 2062372 | sales@westlinkltd.co.ke
KOREA | **Turck Korea Co. Ltd.**
(+82) (2) 69595490 | korea@turck.com
KUWAIT | **Warba National Contracting**
(+965) 24763981 | sales.wncc@warbagroup.com
LATVIA | **Will Sensors**
(+37) (1) 67718678 | info@willsensors.lv
LEBANON | **Industrial Technologies (ITEC)**
(+961) 1 491161 | info@iteclive.com
LITHUANIA | **Hidroteka**
(+370) (37) 352195 | hidroteka@hidroteka.lt
LUXEMBOURG | **Turck Multiprox N. V.**
(+32) (53) 766566 | mail@multiprox.be
MALAYSIA | **Turck Banner Malaysia Sdn Bhd**
(+60) 3 5569 7939 | malaysia@turckbanner.com
MEXICO | **Turck Comercial, S. de RL de CV**
(+52) 844 4116650 | mexico@turck.com
MYANMAR | **RobAioTric Co. Ltd.**
(+95) 1 572028 | zawta@robaiotric.com
NEW ZEALAND | **Turck New Zealand Ltd.**
(+64) (9) 300 6048 | newzealand@turck.com
NETHERLANDS | **Turck B. V.**
(+31) (38) 4227750 | netherlands@turck.com
NICARAGUA | **Iprocen S.A.**
(+505) 22442214 | ventas@iprocen.com
NIGERIA | **Milat Nigeria Ltd.**
(+234) (84) 485382 | commercial@milat.net
NORTH MACEDONIA | **Tipteh d.o.o. Skopje**
(+389) 231 74197 | tipteh@on.net.mk
NORWAY | **Hans Følsgaard A/S**
(+47) 37 090 940 | norway@folsgaard.com
OMAN | **Oman Oil Industry Supplies & Services Co. LLC**
(+968) 24117600 | info@ooiss.com
PAKISTAN | **Route One Engineering**
(+92) 051-5735181 | Info@route1.com.pk
PANAMA | **Accesorios Industriales, S.A.**
(+507) 230 0333 | accindsa@cableonda.net
PERU | **NPI Peru S.A.C.**
(+51) 1 2454501 | npiperu@npiperu.com
PERU | **Segaflow**
(+51) 966 850 490 | douglas.santamaria@segaflow.com
PHILIPPINES | **Turck Banner Singapore Pte Ltd**
(+65) 6206 5095 | singapore@turckbanner.com
POLAND | **Turck sp.z o.o.**
(+48) (77) 4434800 | poland@turck.com
PORTUGAL | **Bresimar Automação S.A.**
(+351) 234303320 | bresimar@bresimar.pt
PUERTO RICO | **Inseco Inc.**
(+1) (787) 781-2655 | sales@insecopr.com
PUERTO RICO | **Stateside Industrial Solutions**
(+1) (305) 301-4052 | sales@statesideindustrial.com
QATAR | **Doha Motors & Trading Company WLL**
(+974) 44651441 | dohamotor@qatar.net.qa
ROMANIA | **Turck Automation Romania SRL**
(+40) (21) 2300594 | romania@turck.com
SAUDI-ARABIA | **Codcon**
(+966) 13 38904510 | codconest@gmail.comom
SAUDI-ARABIA | **Salim M. Al Joaib & Partners Co.**
(+966) 3 8175065 | salim@aljoaibgroup.com
SERBIA | **Tipteh d.o.o. Beograd**
(+381) (11) 8053 628 | damir.office@tipteh.rs
SINGAPORE | **Turck Banner Singapore Pte. Ltd.**
(+65) 6206 5095 | singapore@turckbanner.com
SLOVAKIA | **Marpex s.r.o.**
(+421) (42) 4440010 | infox@marpex.sk
SLOVENIA | **Tipteh d.o.o.**
(+386) (1) 2005150 | info@tipteh.si
SPAIN | **Elion S.A.**
(+34) 932982000 | elion@elion.es
SOUTH AFRICA | **Turck Banner (Pty) Ltd.**
(+27) (11) 4532468 | sales@turckbanner.co.za
SWEDEN | **Turck AB**
(+46) 10 4471600 | sweden@turck.com
SWITZERLAND | **Bachofen AG**
(+41) (44) 9441111 | info@bachofen.ch
TAIWAN | **E-Sensors & Automation Int'l Corp.**
(+886) 7 7323606 | ez-corp@umail.hinet.net
TAIWAN | **Jach Yi International Co. Ltd.**
(+886) 2 27312820 | james.yuan@jachyi.com
THAILAND | **Turck Banner Trading (Thailand) co., Ltd.**
(+66) 2 116 5699 | thailand@turckbanner.com
TRINIDAD AND TOBAGO | **Control Technologies Ltd.**
(+1) (868) 658 5011 | sales@ctltech.com
TUNISIA | **Codaprint**
(+216) 95 66 6647 | info@codaprint.com.tn
TURKEY | **Turck Otomasyon Tic. Ltd. Şti.**
(+90) (216) 5722177 | turkey@turck.com
UKRAINE | **SKIF Control Ltd.**
(+380) 611 8619 | d.startsew@skifcontrol.com.ua
UNITED ARAB EMIRATES | **Experts e&i**
(+971) 2 5525101 | sales@experts-ei.com
UNITED ARAB EMIRATES | **Indulge Oil and Gas**
(+971) 2 4957050 | sales@indulgeglobal.com
URUGUAY | **Fidemar S.A.**
(+598) 2 402 1717 | info@fidemar.com.uy
USA | **Turck Inc.**
(+1) (763) 553-7300 | usa@turck.com
VENEZUELA | **Turck Inc.**
(+1) (763) 553-7300 | usa@turck.com
VIETNAM | **Viet Duc Automation co., Ltd.**
(+84) 8 3997 6678 | sales@vietducautomation.com.vn

TURNKEY
TRACK & TRACE SOLUTIONS

Headquarters Turck Vilant Systems Oy
Sinimäentie 6C | 02630 Espoo | Finland
(+358) 10 2350 150 | info-finland@turckvilant.com

Your contact people in the Turck subsidiaries and agencies worldwide are available to support your inquiries for turnkey track and trace solutions.

IMPRINT

Publisher
Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr, Germany
more@turck.com

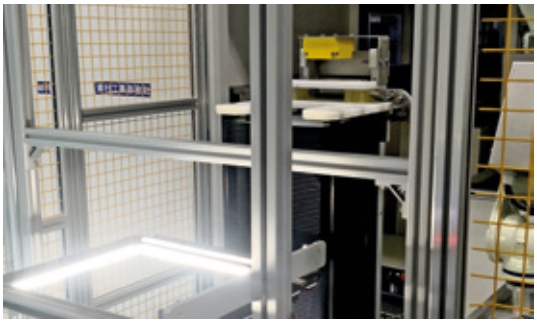
Editorial Staff
Klaus Albers (klaus.albers@turck.com)
Simon Dames, Ilias Grigoriadis

Contributors to this Issue
Anja Van Bocxlaer, Chien-Hsun (Josh) Chuang, Hans De Craemer, Herjan Grootens, Andreas Herrmann, Andreas Ix, Dustin Küpper, Qiang (Richard) Lin, Phil Whorton

Art Direction/Graphic Design
Arno Krämer, Britta Fehr

TURCK

Your Global Automation Partner



D900901 2311

www.turck.com