Issue 02
2014

more@TURCK

The Magazine for Customers of the Turck Group

Complete program

"Turck is the supplier with the most comprehensive portfolio for IO-Link," says Sai Sridhavan

Solid identification

Witron uses UHF-RFID from Turck to identify pallets in the new COOP Distribution Center

Reliable measuring

Metso has successfully tested Turck's robust QR24 encoder on a mining machine

Ethernet I/O Block

The ultra compact TBEN-S series for Profinet, EtherNet/IP and Modbus TCP eliminates the need for subnets

User 1.0

Dear readers, what are your thoughts when you read about Industry 4.0? Is the vision of the smart factory that controls itself something that you consider in your daily work? Or is it rather a fashionable buzzword, about which you know nothing as to what is actually behind it? Or is the term bandied about in the media so much that you don't even notice it any more?

As interesting as the discussions and visions of the "smart factory" of the future are, in my view, it often means that the present is overlooked. In our focus on Industry 4.0, we automation specialists should also keep "User 1.0" well in view. Automation solutions are naturally getting "smarter" with each new development stage and are thus increasingly able to communicate with each other and pave the way towards the smart factory. However, this autonomous communication is firstly not always useful, and secondly not always financially viable.

While the communication capability of new products is naturally a critical factor in Turck's development roadmap, user and operator friendliness is just as important to us. One example is our multiprotocol technology, which enables the automatic operation of I/O devices in the Ethernet protocols Profinet, EtherNet/IP and Modbus TCP. For two years the technology has been incorporated in increasingly more solutions – now with the third processor generation and still without any competitors.

The ultra compact TBEN-S IO block modules presented on page 8 now even provide you with a solution that brings Ethernet to the I/O level without the need for gateways – at an affordable price and with no additional effort. This is another step towards seamless communication and the simplification of your daily work. This last feature is also offered to you in the form of our new capacitive sensors that can be assigned parameters directly at the sensor via teach buttons. Any tedious setting using potentiometers thus becomes unnecessary.

I can continue to describe any number of examples but it's ultimately up to you to get a picture of how Turck matches up to its claim of being a complete automation partner that simplifies the present and enables the future.

Yours sincerely,

Ulrich Turck, managing partner

more@TURCK

Capacitive sensors that can be paramet erized directly on the device with pushbuttons make the teach operation child's play for the user. **Page 14**

Reimerswaal Dredging has finally found in Turck's QR24 contactless encoder a solution that can constantly withstand the rugged conditions at sea. **Page 25**

For the safe assembly of roller shutter motors, Elero relies on the EZ Screen safety light curtains and a pick-to-light solution from the Turck range. **Page 30**

Turck on Course for Growth

▶ Turck is expecting a consolidated group turnover for the current financial year 2014 of around **470 million euros**. According to Turck managing director Christian Wolf, the family-owned enterprise can achieve an increase in turnover of over five percent by the end of the y ear. In 2014 the number of employees worldwide rose from 3,350 to over 3,500. Exactly half of these ar e employed by the Turck Group at its German sites in Beierfeld, Detmold, Halver and Mülheim an der Ruhr. "With more than ten percent growth we enjoyed above average success in 2014 in the G erman market and likewise in North America," Wolf said. "To maintain continued growth above the mar ket average, Turck is continuously investing in the future. This not only applies t o product development but all cor porate areas. Between 2012 and 2016 the amount invested in buildings, production, logistics and IT solutions will be around 100 million euros.

Ship Approval

▶ The **excom I/O system** has been certified for maritime applications and can now also be used in applica - tions requiring certification from Germanischer Lloyd, Det Norske Veritas, Bureau Veritas or Lloyd's Register. This includes, for example, the mounting in control consoles, housings or cabinets on board seagoing v essels, tankers, and oil platforms. Specialized for the increased requirements of the ship - building sector, Turck has designed its own mechanically reinforced module rack to ensure safe use on board. The excom system can be installed in both Zone 1 and Zone 2.

Webcode more21410e

Ultra-Compact Block I/O for Analog Signals

▶ Turck has added several ultra-compact Ethernet block I/O devices with four analog in- or outputs to its **TBEN-S** series. The analog inputs of the Multiprotocol Ethernet modules can process four different types of input signals: besides voltage and current signals, it also processes PT100 signals from temperature sensors or millivolt signals, which are typically output by thermocouples or measuring bridges. This enables the user t o respond flexibly to the particular input signal requirements in the field. The TBEN-S series enables applications that previously required three different block module types to be implemented with just one. The fully pot- ted IP67 modules ar e slim with a width of only 32 mm and a short length of only 144 mm, and allo w assembly directly on the machine. With their ex tended temperature range from -40 °C to +70 °C degrees, the devices are highly versatile in application. Despite the compact design every TBEN-S module can be operated without additional gateways in each of the thr ee Ethernet systems: Profinet, Modbus TCP or EtherNet/IP. more on page 8 ▶

Compact Tower Lights

▶ A new self-contained, compact version of its industry-recognized TL50 tower light has been presented by Turck's Partner Banner Engineering. The **TL50C** measures only half the height of the standard TL50 models, and the TL50 compact tower lights are ideal for space-restricted applications requiring highly visible operator guidance or indication of equipment status. Designed to replace conventional stack lights, which often require time-consuming assembly and complex wir ing, Banner's TL50 tower lights provide bright, uniform lighting. The new TL50 compact version displays up to five stacked colors in one t ower with universal ac voltage and up to seven stacked colors in one t ower with standard dc voltage, with ten colors to choose from for each segment. Despite its compact dimensions for narrow applications the TL50C offers the same uniform brightness and reliable performance customers have come to expect from the standard TL50 tower light models. Turck's tower lights come preassembled and preconfigured, allowing users to save time and mone y during installation.

Capacitive Sensors with Single-Click Teach

▶ At this year's SPS IPC Drives fair, Turck is presenting the next generation of its capacitive sensors, the **BCT series**, which are primarily used for level measurement. Instead of using a potentiometer as before, the sensors can be taught for the relevant medium via a teach button. The BCT automatically defines the switchpoint so that any deposits on the tank wall or contamination of the sensor cap does not cause any incorrect switching. A logical testing of the selected setting also prevents programming errors with difficult to detect media. Turck offers the BCT series as a universal NO/NC contact in a cylindrical design as an M18 and M30 variant. This not only enables users to effectively reduce the number of device variants that have to be kept in stock but also to implement fail-safe underfill and overfill protection of tanks with a single sensor type. The output behavior can also be set via a pushbutton. All versions are available with a PNP or NPN output. more on page 14 ▶

Resistance and Sensor Modules for excom

▶ An RTD and a 2/3 wire sensor module extend Turck's range of modules for the excom I/O system. The new **TI41 4-channel resistance module** is suitable for connecting PT100, Ni100 and CU100 temperature sensors in 2, 3 or 4-wire circuits. The 16-bit processing of the modules provides a particularly high measuring range resolution. In this way applications in the chemical and pharmaceutical industry can be implemented, which require a measuring accuracy of 1/10 Kelvin. The new **DI40-N digital input module** enables the user to connect 3-wire NPN and PNP sensors. The 3-wire sensors are supplied directly from the excom system, thus eliminating the need for external wiring for an auxiliary supply. The diagnostic features of the module also provide information on faulty periphery when the 3-wire sensors are connected. Besides 3-wire sensors, it is also possible to connect NAMUR (DIN EN 60947-5-6) sensors or mechanical contacts. Wire break or short circuit monitoring is also possible when using mechanical contacts.

Sales Partner in Canada aquired

▶ Turck has acquired a 50% interest in its long term Canadian sales partner Chartwell Automation Inc. The new company name is now **Turck Chartwell Canada Inc.** Furthermore, on October 1, 2017, Turck will acquire the remaining shares and thus be 100% owner of the new subsidiary, Turck Canada Inc. Mark and Steve Boehmer, the two founders of Chartwell, have signed long-term management contracts. They will continue to lead the company as general manager and sales manager. This year, Turck Chartwell Canada expects sales of around 14 million CDN $.

Straight Male Connectors with LED

▶ As first manufacturer Turck offers straight **M12 male connectors** with three LEDs. With straight male connectors, the indication of sensor switching states in the field is always clear – irrespective of the particular mounting position. The 5-pole male connectors are provided with a green Power LED and a yellow one for channel 1 (Pin 4). The third LED for channel 2 (Pin 2) is either red or white. Turck offers connection cables with a female connector at one end in cable lengths of 2, 5 and 10 meters, as well as connection cables with male and female connectors in lengths of 0.3, 0.6 and 1.2 meters. Other lengths are available upon request.

For the Food Industry

▶ Two new connector series extend Turck's portfolio for the food industry. The **hygienic series** for sensitive areas – also with direct contact to foods – is designed without small cr evices to prevent the buildup of contami - nants. The cable materials are Ecolab-certified and FDA-compliant. For less sensitive areas, Turck is also off ering a variant of its **standard** connection technology with cables made fr om FDA- and Ecolab-certified materials. The cable materials are the same as those of the Hygienic series while the male connectors have the conventional design. These features make the cables ideal for peripheral areas in the F&B industry.

Compact Inductive Sensors

▶ Turck is offering inductive proximity sensors in compac t designs with the **BI series** EH03, EG04, EH04K and EG05K, which hav e now been completely updated. With their reduced lengths of 22 to 15 mm, the new models are even better suited for use in restricted mounting conditions. The EH03 and EH04 smooth barrel devices are available with diameters of 3 and 4 millimeters, and the EG04 and EG05 threaded barrel modules in M4 x 0.5 and M5 x 0.5. All de vices are short-circuit and reverse polarity protected and are provided with a yellow LED.

QR24 with User-Definable Pulse Counting

▶ Turck is now offering the **incremental variant** of its **QR24** contactless encoder with pulse rates that can be defined by the customer. The user simply sets the number of pulses per revolution between 1 and 5,000 via the Pactware parameterization software. As before, the encoder can also be taught t o one of the nine most common pr eset pulse rates using the Turck teach adapter. The QR24 can thus be used as a univ ersal incremental encoder, which effectively reduces the number of encoder var iants that have to be kept in stock and allows more standardization. The right number of encoder pulses can be selected for each application so that a vir tually unlimited range of applications is possible. In spite of the large number of incremental encoders on the market, the inductive QR24 offers the possibility to change the position of the Z track, as well as a burst func tion, which enables the user t o output the absolute angle position of the encoder incrementally. As a result, any reference runs after machine shutdowns become unnecessary.

Dual Color LED Strip Lights

▶ The new **WLS28-2** Dual Color LED Strip Lights by Banner Engineering have enhanced the WLS28-2 to offer dual-color operation. This makes the LED light optimal for industrial lighting applications requiring more than one color such as mobile vehicle illumination, where red light is easier on operat ors' eyes in dark areas, and machine status indication, wher e alternating colors are used to identify error conditions. The WLS28-2 Dual Color delivers a versatile lighting solution, featuring rugged aluminum housings, a space-saving, low-profile design and various lengths from 285 mm t o 1130 mm.

For increased flexibility, the WLS28-2 Dual Color is available in four models, allowing operators to select from stand-alone cable, stand-alone push butt on QD, sealed cascadable, and lensed cas - cadable. All models offer enhanced light quality with bright, densely spaced LEDs to ensure even, bright, and highly effi - cient illumination. Consuming very little power at less than 9 watts per f oot, the WLS28-2 Dual Color is designed to last more than 50,000 hours of continuous operation with minimal loss of int ensity. LED strip lights are offered in six different colors, including cool and warm white, red, green, blue, and yellow.

IEN europe Industrial Engineering News

energy efficiency BUSINESS : INDUSTRY

PEI PRODUITS EQUIPEMENTS INDUSTRIELS

TR Technische Revue

IEN italia Industrial Engineering News

PCN Europe processing & control news

icatalogs

endüstri DÜNYASI yeni ürün ve teknoloji haberleri

Manutenzione TECNICA E MANAGEMENT

IL DISTRIBUTORE INDUSTRIALE LO DISTRIBUZIONE, VENDITA & MANAGEMENT

The ultra compact TBEN-S modules are ideal for serial machines and other sectors where limited space is a factor

Webcode more21400e

Author Jörg Kuhlmann is head of fieldbus technology product management at Turck

Ethernet I/O Block

Ultra compact TBEN-S series for Profinet, EtherNet/IP and Modbus TCP eliminates the need for subnets

The core of the newly developed TBEN-S I/O block modules is an ARM chip. The ARM architecture is a special microprocessor design. Already developed in the eighties, the chips are integrated in smartphones, tablets and game consoles on account of their reduced instruction set and their energy efficiency. These features enable ARM chips to also be used in many electronic products in the industrial automation sector.

Unlike other suppliers, Turck has decided to develop its own software solution – called Turck Multiprotocol – for Profinet, EtherNet/IP and Modbus TCP based on the ARM family. As the semiconductor market is constantly bringing out new derivatives of ARM processors, this approach enables Turck customers to benefit from falling processor prices while performance features such as memory, size and clock rate improve at the same time.

Multiprotocol allows flexibility

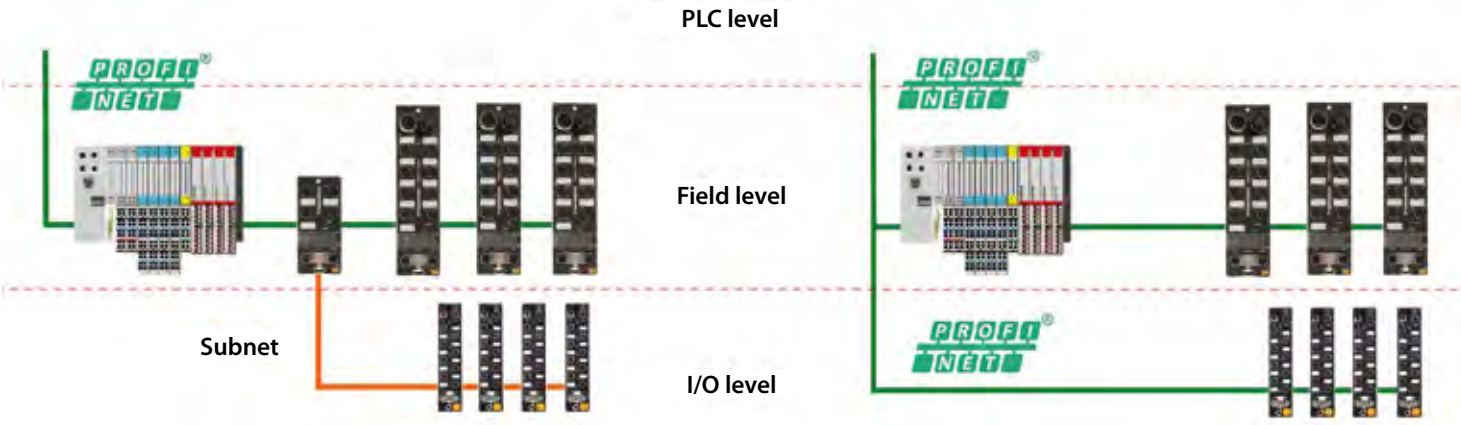
Turck is pursuing a unique approach with its multiprotocol technology. Instead of being fixed over years to a specific chip family (and thus a specific technology supplier) by buying up ready-to-use technology components, a software solution makes it relatively easy to change to a new ARM derivative and thus use the improved features of new chips. The Ethernet technology developed by Turck makes it possible for any improvement in semiconductor technology that results in smaller and more powerful chips to be directly integrated into the products and passed on to the customers. The company always has complete control of the entire technology.

This technological advance now makes it possible for customers to reconsider the use of I/O modules with comparatively few I/O signals and the size of

Big brother: The very compact design TBEN-S modules is shown in comparison to the TBEN-L series in the standard size

Quick read

Small, communicative, unique – that's the best way to sum up Turck's new TBEN-S I/O block module family. With a footprint of only 32 x 144 millimeters, a robust piece of high-tech has been produced that can even be installed in extremely restricted mounting conditions. Fully encapsulated electronics, EMC, shock and vibration resistance, as well as the Turck multiprotocol technology that enables use in Profinet, EtherNet/IP and Modbus TCP networks, make the devices an efficient and reliable solution that brings Ethernet to the I/O level without the need for couplers and subnets.



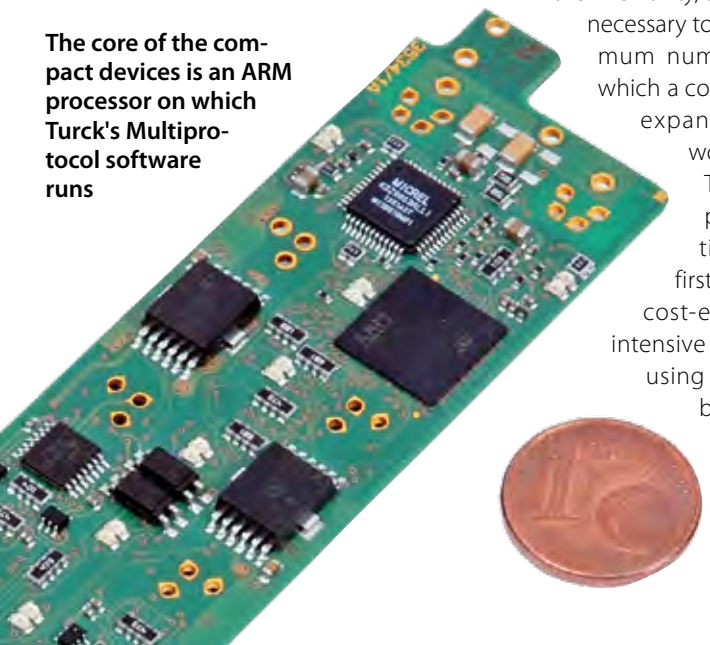
New freedom: Unlike the solutions available to date (left), the TBEN-S modules bring Ethernet right into the I/O level – without any additional expense for couplers

a candy bar, for which a direct connection to Profinet seemed inconceivable a few years ago.

Independence from other technology suppliers has enabled Turck to create the ultra compact TBEN-S block I/O series. Turck provides M8 female connectors on an area of only 32 x 144 millimeters. The fully encapsulated IP67 devices are ideal for all applications in which signals have to be brought to the controller in a restricted space, such as in machine building or serial machinery building applications. In spite of its compact design, each TBEN-S module can be operated without any additional gateways in any of the three Ethernet systems Profinet, Modbus TCP or EtherNet/IP. Thanks to Multiprotocol, the devices detect the protocol used automatically. Their integrated switch also allows use in a linear topology.

Flexibility benefit

Alternative I/O modules in this design, if any, are only offered on the market in conjunction with gateways which connect several small I/O blocks via a subnets. The direct connection of the Turck modules, such as to Profinet, eliminates the need for any gateways, which would otherwise be required, with the resulting positive effect on the overall price. However, the user not only saves costs for the coupler but also considerably increases their flexibility, since it is no longer necessary to consider the minimum number of I/Os from which a coupler with subnets expansion modules is worthwhile. With the TBEN-S as an inexpensive I/O solution from the very first module, even the cost-efficient but labor intensive signal connection using passive junctions becomes less attractive.



The core of the compact devices is an ARM processor on which Turck's Multiprotocol software runs

If a particularly large number of I/Os are required, using the TBEN-S also has its benefits. With conventional compact modules with gateways, the maximum number of modules connected to one coupler can be reached, making another coupler necessary. In contrast to this, each TBEN-S module is connected separately to the Ethernet. Whether the planner only uses a single TBEN-S module or 16, the costs per I/O stays the same. The number of modules is only limited by the maximum number of Ethernet stations on the controller.

This shows clearly that TBEN-S is more than just a block I/O module in a highly compact design. Turck has produced a highly slimline solution that enables the creation of flat communication architectures.

FSU, QC, MRP, DLR and web server on board

The implementation of all three protocols has no disadvantage compared to individual protocol devices. On the contrary: the modules support Fast startup mode (FSU) in Profinet and Quick connect (QC) in EtherNet/IP mode, as well as the MRP and DLR bus redundancy protocols.

Turck has also provided a web server on the processor. This enables each module to be addressed separately for diagnostic and parameterization tasks. The web server provides these diagnostic messages in plain text. The diagnostic buffer allows the user to also call up diagnostic messages with a time delay. Both Ethernet ports are provided with an error counter that can be monitored by the web server. Users of EtherNet/IP and Modbus TCP in particular will appreciate this function since, unlike Profinet, these networks normally do not provide these kinds of in-depth diagnostic tools.

For smartphone and tablet users, Turck has implemented the web server in a responsive design so that even mobile terminal devices can be used to call up diagnostic and configuration functions if a suitable wireless access is provided in the system. The fact that a powerful web server could also be implemented in the multiprotocol platform as well as the three protocols mentioned, is made possible by the economical and exceptionally slim architecture of the operating system.

Flexible signal types

Turck is initially offering five TBEN-S variants in the range: devices with four digital inputs and outputs each, with eight digital inputs including module and channel diagnostics, with eight digital outputs, as well as with eight universal digital inputs/outputs (TBEN-S1-8DXP). This last device automatically sets itself to the configuration required. Some of the outputs of the modules switch a current of up to 2 amps.

Analog devices and an IO-Link master will also follow the five digital modules over the course of 2015. The key feature of the version with four analog inputs (TBEN-S2-4AI) is the fact that each input can not only be configured as a voltage or current input but can also be used to connect PT100 sensors or thermocouples. The customer can thus use one device to replace up to four alternative modules. Up to now it was necessary use several modules in applications with different AI signals. With the typical four-channel granularity available, many channels were therefore often unused. With the universal analog input of the TBEN-S, the same application can be implemented in future with considerably fewer modules and also at less cost. A variant with four IO-Link ports completes the range of devices on offer.

Reducing complexity

The conventional multiprotocol benefits that Turck has already been providing for two years in increasingly more I/O solutions are now provided in the TBEN-S family. Customers using different Ethernet protocols can effectively reduce the number of device variants that have to be kept in stock by using multiprotocol devices. Machine builders that offer their machines both with Rockwell controllers (EtherNet/IP) as well as Siemens controllers (Profinet) can use multiprotocol I/O devices to implement a standard electrical planning for two different machine versions. With the devices of the TBEN-S series this is the case down to the lowest I/O level. There are also customers that use the multiprotocol modules in conventional automation technology on controllers with Profinet or EtherNet/IP. However, their measuring and testing technology in quality assurance uses PC-based systems. Thanks to Modbus TCP the same modules can be used here as in production.

Outlook

The life cycle time in the semiconductor industry is short. New chip generations are appearing on the market every few months. Since Turck presented the first multiprotocol generation in 2012, more powerful chips have already been integrated into the devices twice. With the strategy described, it won't be too long before Turck can integrate the next chip generation in its devices. In view of the dynamic development in semiconductor technology, the chips should also be cheaper in future and suitable for use in other product groups at Turck. ■

The new analog modules are particularly flexible in terms of input signal types

Sai Sridhavan coordinates at Turck all activities related to the subject of IO-Link

"We Supply Complete IO-Link Solutions"

In an interview with Frank Nolte, editor of the trade magazine „etz", Sai Sridhavan explains the importance of the IO-Link technology for Turck and its benefits for the customer

Turck has been working with IO-Link since 2008. Why are you coordinating all activities now?

It's true that Turck has supported IO-Link since the very beginning. As many users in our industry now wish to integrate IO-Link components in their machines and implement them in their processes, we are getting more and more inquiries on

the subject from many different specialist departments. My task is to bundle Turck's IO-Link know-how from different departments and coordinate our further development in this field so that we can achieve the best possible synergies. This will allow us in time to bring precisely the right solutions that the customer requires and expand our product portfolio faster and more effectively.

What sensors do you offer with the IO-Link interface?

Our aim is to fit all analog sensors, such as the rotary position sensors, so that all analog output values can be processed with IO-Link. In terms of measuring variables, we have sensors in the range with an IO-Link interface for pressure, temperature, flow, position, angle and distance. We have also integrated in the system I/O hubs with digital inputs and outputs for data collection. For the contactless transfer of data and power, we also offer an inductive coupler which enables bidirectional communication between IO-Link master and device.

You presented new IO-Link master modules at the Hannover Messe 2014. Are there any expansions planned in this area?

The master modules for our IP20 and IP67 I/O systems enable the user to use IO-Link in a large number of fieldbus and ethernet networks. The BL67 system now also provides a modular IO-Link master in IP67 with an operating temperature range from -40 to +70 °C for harsh industrial environments. The 4-channel master modules can be used for Profibus as well the ethernet protocols Profinet, ethernet/IP and Modbus TCP. Other modules are currently in development.

Are there any modules for monitoring and visualization that are suitable, for example, for condition monitoring?

status information such as limit and measured value violations are output with IO-Link anyway, so there is no problem in establishing a suitable monitoring solution. Our visual PLC systems, such as the Codesys programmable VT250 HMI, enable the customer to create visualizations tailored for the particular application. naturally we also offer our support here if required.

With increasing numbers of machine and plant builders interested in IO-Link: What is missing in the powerful point-to-point communication to make the final breakthrough?

Firstly, there is a lack of suitable controllers. so far only a few suppliers have fully integrated IO-Link. IO-Link also has to get better known outside of europe. Added to this is the fact that there are so far hardly any vendor independent tools that allow a simple integration, and only some of the controller manufacturers enable the use of IOdd files. There are admittedly some manufacturers that offer a software that enables the relatively simple parameterization of their products, but when it comes to the complete integration in the controller, the situation is different. Only some of the controller manufacturers already have tools in their portfolio that allow IOdd files to be integrated in the system at the push of a button so that a device can be detected as a station. Turck already offers its customers a special function block for Codesys that simplifies integration for the user.

What is the difference between Turck and other suppliers and what are you currently working on?

Turck is probably the supplier with the largest and most comprehensive portfolio for IO-Link. We can supply complete IO-Link solutions, from the sensor which can identify the tool or device behind it, right through to the controller connection or our own Codesys programmable systems. We also have a large range of connectivity products so that all the wiring from the sensor right up to the controller can be implemented with Turck products. We are also currently working on a large number of different IO-Link masters and devices.

Regarding fieldbus protocols: Which protocols have been implemented and which ones are planned?

Besides Profibus we now already support the standard ethernet protocols. We are currently using our multiprotocol technology, which enables our I/O modules to be detected automatically in Profinet, ethernet/IP and Modbus TCP networks. Other protocols such as CANopen, devicenet and Modbus RTU are planned. In the next twelve months Turck will be fitting all the latest fieldbus families with IO-Link. ■

> "This will allow us in time to bring precisely the right solutions that the customer requires and expand our product portfolio faster and more effectively."
>
> **Sai Sridhavan**

> "Besides Profibus we now already support the standard ethernet protocols. We are currently using our multiprotocol technology, which enables our I/O modules to be detected automatically in Profinet, ethernet/IP and Modbus TCP networks."
>
> **Sai Sridhavan**

Author Frank nolte is an editor of the technical journal "etz"
Web www.etz.de

Webcode more21430e

Turck offers the new capacitive sensors with teach buttons or teach cable in M18 and M30

Webcode more21470e
Author Peter Arnold is a product manager for fluid sensors at Turck

Quick Taught Sensors

Turck's new capacitive sensors of the BCT series offer maximum user-friendliness with teach buttons and LED indication

When it comes to the monitoring of tank levels, there seems almost no limit to the sensor technologies available. Ultrasonic sensors, photoelectric sensors, radar or microwave technology, as well as various mechanical level measuring systems that operate with floats, paddle switches or vibration sensors can be selected. It is also possible to use systems that control levels by measuring pressure differences, conductivity or electrical capacitance. Some of these measuring processes can provide information on the actual fill level in a tank. Other techniques are used as limit switches and protect tanks from fill levels that are too low or too high. Capacitive sensor technology can perform both tasks.

Operation of capacitive sensors

A capacitive sensor is similar in design to a capacitor: two plates (electrodes), between which an electric charge can be stored. The charge level or capacitance of the "capacitor" changes according to the medium between the two plates. This change is interpreted as a

Foto: © Dusan Kostic – Fotolia.com

The robust capacitive sensors are also suitable for use in mobile building and agricultural machinery

signal. This principle can be implemented so that both electrodes are submerged into the measured medium and fill levels can also be determined precisely. Capacitive sensors are normally in fully enclosed housings. They are fitted on the outside of the tank t o be measured and detect whether there is a medium behind the tank wall or not.

Fill level measuring from outside

The major benefit of capacitive level measuring is the simple mounting on the outside wall . The tanks, however, must not be made of metal . The medium must have a higher dielec tric constant than air in or der to be able to detect a difference between full and empty, which is always the case – apart from gases.

All capacitive sensors that det ect levels in this way must be taught for the medium to be measured. For this the sensor is fitt ed to the tank and "taught" for the medium present or the medium not pr esent level. Many sensors are provided with a potentiometer at the sensor end for carrying out the setting. However, this requires some experience or at least precise instruction. The sensor must be taught the swit ch threshold but with an amount of reserve. Otherwise it could misinterpret deposits stuck to the sensor cap or the inside of the tank as a full tank.

Capacitive sensors have to be reset if the fill medium has changed. Previously, technicians had to reset the sensor in the field with a screwdriver. This was a particularly laborious task if it involved the removal of covers, or if for other reasons the sensor was very difficult to access.

Single-click teach: experience built in

Instead of using a scr ewdriver as before, Turck's new BCT series can be taught easily with a single pr ess of the button. The sensor version with an integrated teach function is provided with two buttons: one for setting the full level and one for setting the medium not pr esent level. The user can teach the sensor at any time regardless of whether the tank is empty or full. The BCT automatically sets a buffer area around the actual switch threshold. The experience of the technician and Turck Support is therefore built into the sensor. With alternative products both states have to be taught. If the sensor is already fitted, the tank would have to be drained or the sensor at least removed just to set it to a new medium.

The BCT sensors can be set as NC and NO contacts and detect the states "medium present," "medium not present" as well as "general teach"

LED visible from all sides

With the BC T, both "medium present" and "medium not present" states only have to be taught if the medium is par ticularly difficult to detect. The fast flashing of the LED indicates to the user when teaching was not successful. The sensor also checks whether the log ic of the selected

Quick read

In factory automation, level control is largely implemented with capacitive sensors. The benefit: You can measure tank levels through plastic and glass walls . The new device generation requires just one press of a button to teach the sensors for the particular medium. In order to reliably protect sensors from manipulation, Turck also offers a variant that can only be taught via a cable.

Foto: © Aleksey Stemmer – Fotolia.com

Capacitive sensors are not only suitable for level measuring on plastic containers but also for "flow detection" on plastic pipes

setting is correct. If, for example, the "medium not present" state of a tank is taught as medium pr esent or the "medium present" state as medium not present, the sensor does not accept the t each operation and indicat es this via the LED display.

Another benefit: The on-board teach on the rear of the sensor has a dar k plexiglass cover. If the LEDs ar e lit, the entire back end of the sensor lights up . This visibility can be very useful, particularly if the area directly behind the sensor is blocked with covers or mounting brackets.

Remote teach version

Turck is also putting a v ersion on the mar ket without pushbuttons, for teaching via a cable . Switch points can be defined with the teach adapter from Turck. The adapter can also be fitt ed in the contr ol center or on the control console away from the sensor. A manufacturer of ag ricultural machinery, for example, can use this BC T version to fit the pipes of its combine harvester so that the t eaching of new media can be carried out with a single click fr om the dr iver cabin. If the type of grain changes, the driver can set a ne w switch threshold with a single push of the butt on. The programming logic of the remote teach variant is the same as the on-board teach. This is also useful for other purposes: Programming via a cable is useful if the BC T is mounted in hard to access locations. This variant also offers reliable protection from unauthorized manipulations in the field.

▶ Overfill protection made easy

If a tank also has to be protected from overfilling even in the event of a pot ential cable break, the upper full level sensor has t o be programmed as an NC contac t. For this the user just has t o press pushbutton 1 for ten seconds. The sensor is factory set as an NO contact.

The Teach buttons and LEDs makes teaching the sensor in the field child's play

Sensor variants

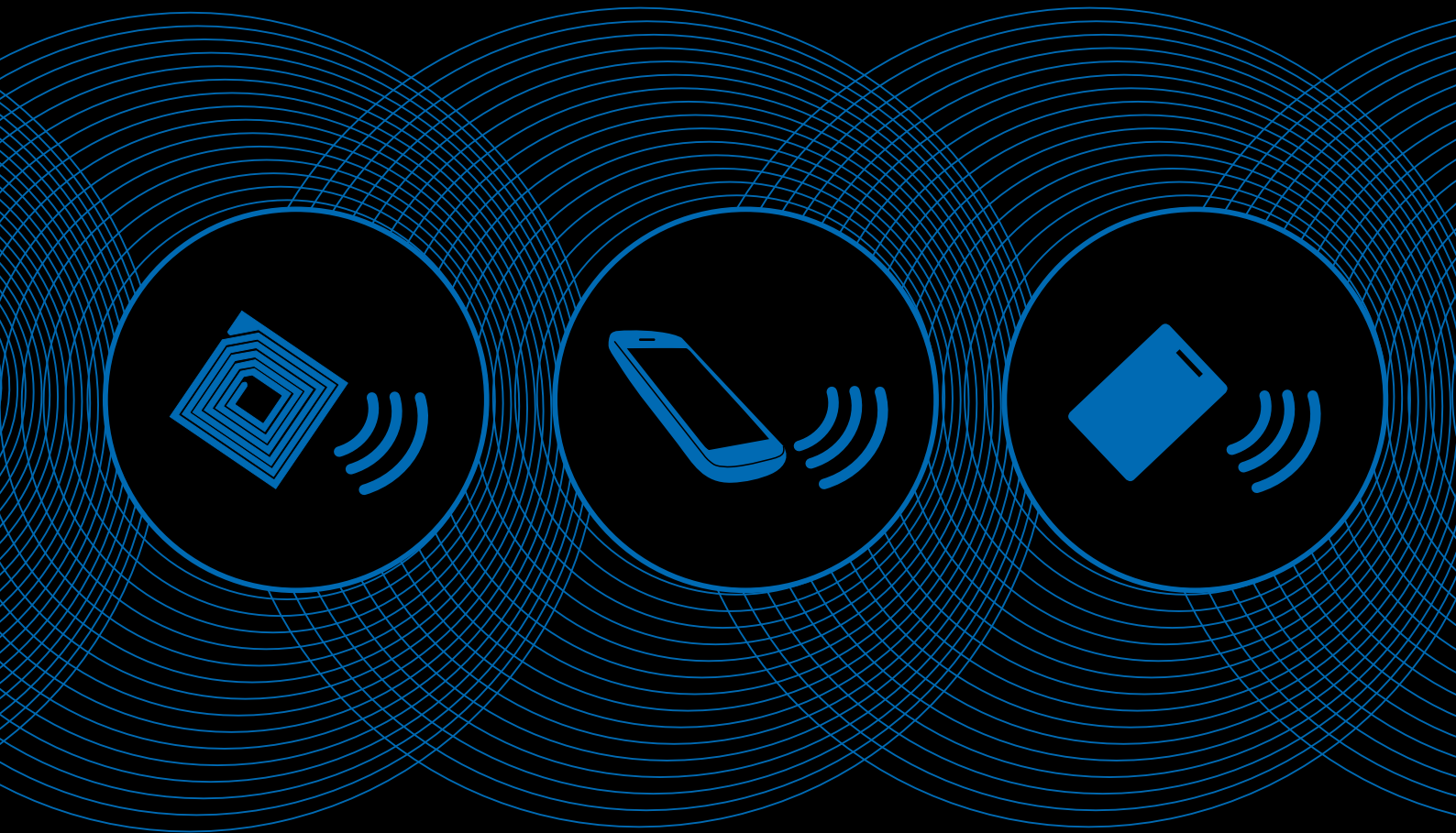
By combining NC and NO contacts in a single device, Turck was able t o reduce the number of var iants in the BCT series. The new device generation is available as an M18 and M30 var iant in the c ylindrical plastic housing with a male thread – with or without on-board teach. All four devices are available as NPN or PNP versions.

Typical applications

All fill level controls for tanks made of non- conductive material are typical applications for the BCT series. The tanks can contain liquid, fine particle, granular or also course mat erial fillings. The coloration or turbidity of liquids does not pla y a role with capacitive sensors. Foams likewise do not pr esent a pr oblem. They are detected as medium pr esent or medium not pr esent depending on ho w the switch point is set. ■

rfid ready®

www.rfid-ready.de | www.rfid-ready.com



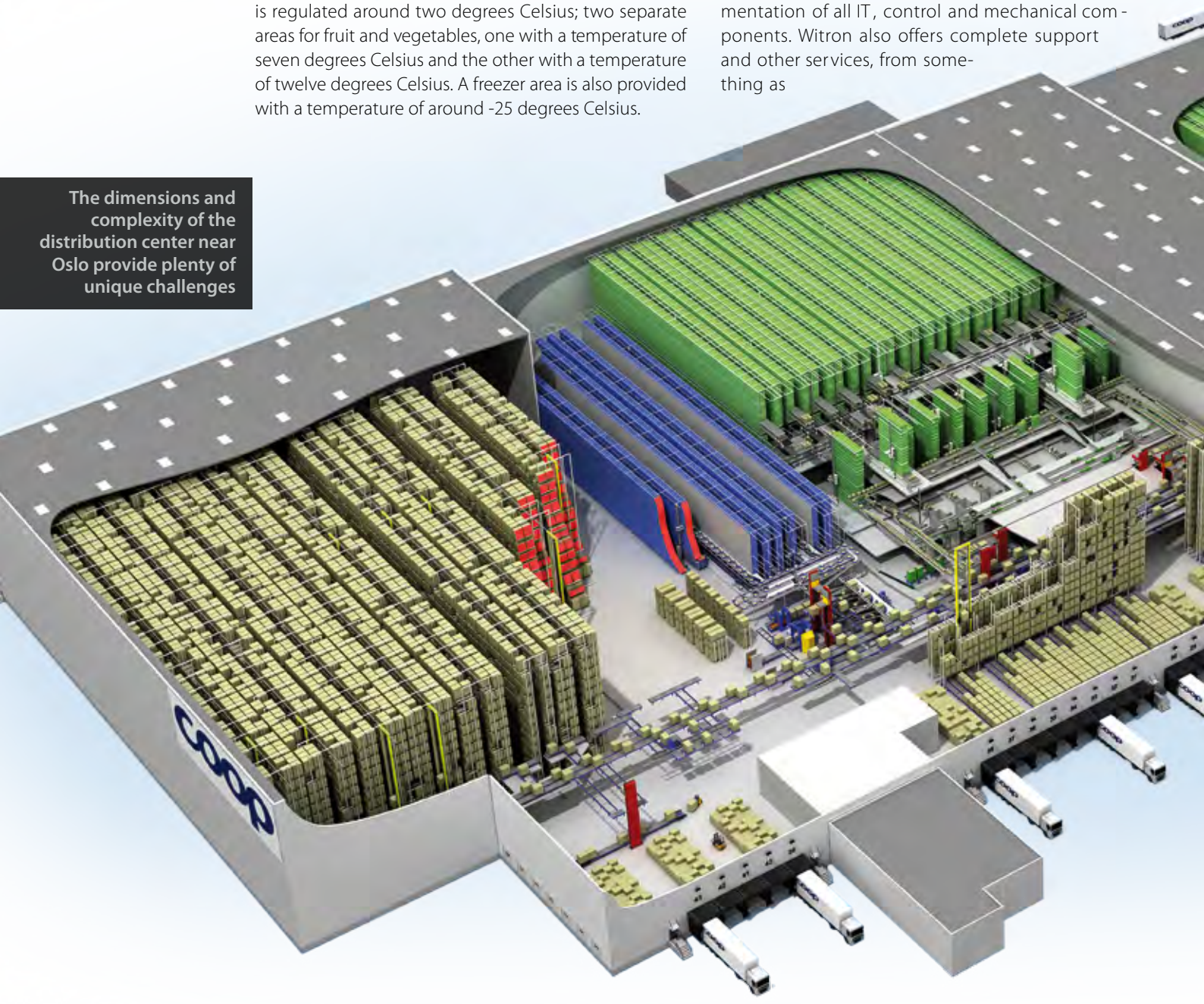
Your Source for RFID Technology News

Good Neighbors

With the construction of a distribution center for COOP in Norway, Turck and Witron demonstrate that UHF-RFID can also be used for short distances.

The new distribution center of the grocery retailer COOP Norge Handel AS, with headquarters near Oslo, is the size of approximately seven soccer pitches, or to be more precise: 50,000 square meters. It is therefore good that workers in the logistics center near the Norwegian capital don't have to cover the long routes in the halls on foot, let alone beyond the four main areas of the distribution center. The automated distribution center is divided up into: a dry area with a normal temperature of 18 Celsius; a chilled area that is regulated around two degrees Celsius; two separate areas for fruit and vegetables, one with a temperature of seven degrees Celsius and the other with a temperature of twelve degrees Celsius. A freezer area is also provided with a temperature of around -25 degrees Celsius.

The distribution center was planned, developed and built by Witron Logistik und Informatik. The very name of the company, based in Parkstein in the Upper Palatinate of Germany, indicates its specialization: As a general contractor for logistics and information technology, and all other services required for planning, implementing, servicing and operating large logistics centers, Witron offers all the key elements of the project from a single source. The range of products and services provided by Witron also covers the planning and implementation of all IT, control and mechanical components. Witron also offers complete support and other services, from something as



The dimensions and complexity of the distribution center near Oslo provide plenty of unique challenges

Webcode more21453e | **Customer** www.witron.com | **User** www.coop.no
Author Achim Weber is sales specialist at Turck

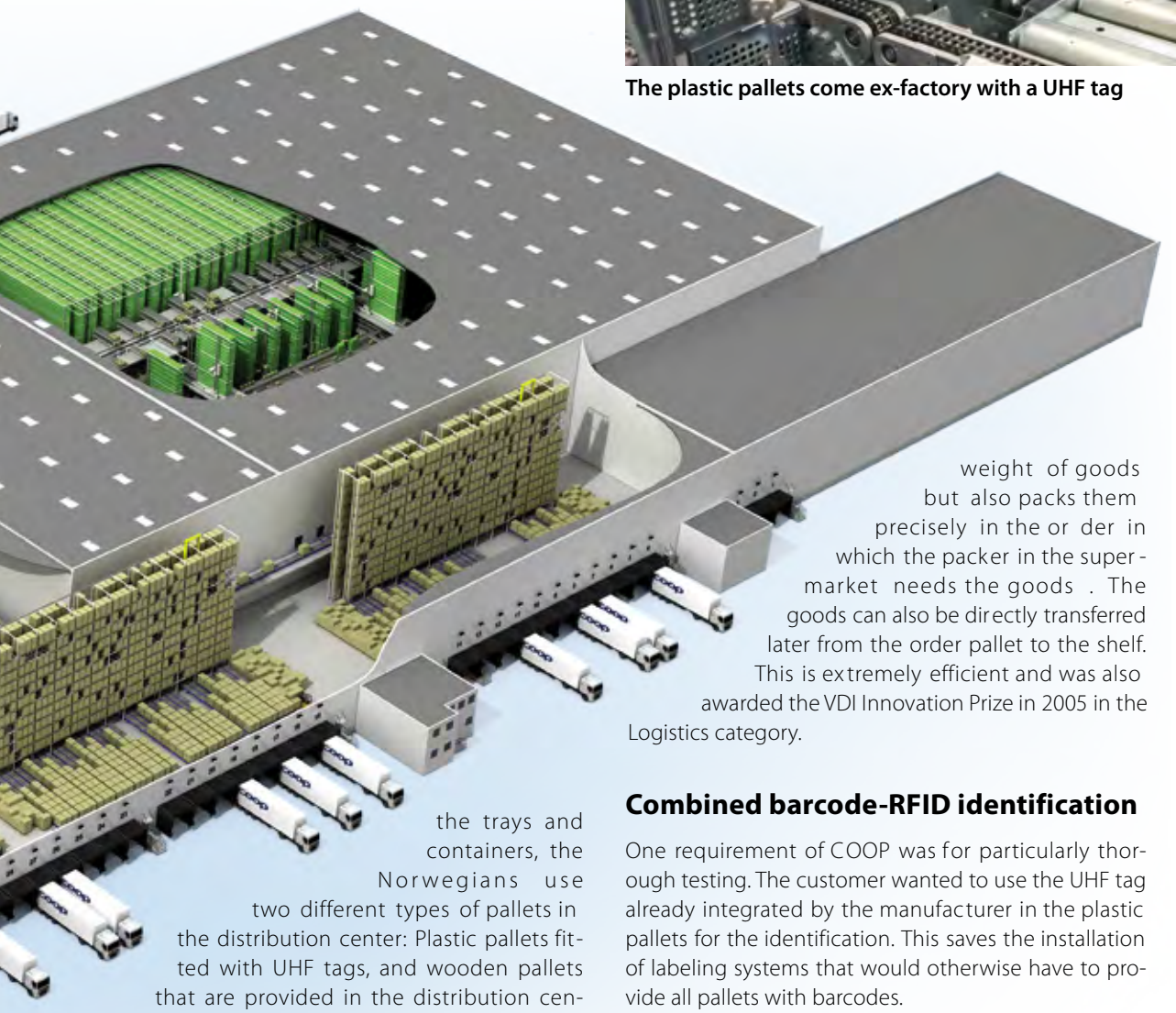
simple as a help hotline to more complex services such as warehouse management. Several large trading and logistics companies, particularly in Europe and the USA, appreciate this comprehensive approach and the flexibility of the company.

The distribution process

Goods arrive at the goods-in bays of the "COOP-Logistikksenter" on pallets. The pallets are unloaded here and temporarily stored in the pallet store. The unmixed pallets are then depalletized fully or semi-automatically and transferred to trays or containers. Besides the trays and containers, the Norwegians use two different types of pallets in the distribution center: Plastic pallets fitted with UHF tags, and wooden pallets that are provided in the distribution center with a combined bar code-UHF label. The barcode is used to identify the carrier as a wooden pallet. The trays and containers are likewise identified by their barcode.

The system conveys and sorts the goods automatically, takes them in and out of the warehouse and picks them for orders of all sizes without any personnel. Witron is well ahead of its competitors when it comes to the order-related picking of pallets. The central part of the OPM order picking machinery is known as COM, which stands for "Case Order Machine." The system optimally combines pallets and packs them together. COM not only takes into account the volume and weight of goods but also packs them precisely in the order in which the packer in the supermarket needs the goods. The goods can also be directly transferred later from the order pallet to the shelf. This is extremely efficient and was also awarded the VDI Innovation Prize in 2005 in the Logistics category.

The plastic pallets come ex-factory with a UHF tag



Combined barcode-RFID identification

One requirement of COOP was for particularly thorough testing. The customer wanted to use the UHF tag already integrated by the manufacturer in the plastic pallets for the identification. This saves the installation of labeling systems that would otherwise have to provide all pallets with barcodes.

"For us the project was proof of our mastery of UHF technology. This certainly goes for Turck as well."

Christian Fuhrmann, Witron

Quick read

The new distribution center of the COOP grocery retailer in Norway, planned and implemented by intralogistics specialists Witron, is one of the most modern distribution centers in Scandinavia. The sheer size of the warehouse and the complexity of the identification technology used are the benchmark in the sector. Witron implemented a combined barcode-RFID identification system using Turck's UHF-RFID technology. With the concentrated know-how of both companies, even the crosstalk that occurs when several neighboring UHF antennas are in operation could be prevented. Benefit for the customer: COOP can make use of the UHF tags that the company has already integrated.

UHF read/write heads, 250 in total, are installed at all crossing points in the pallet conveying system

During the planning phase the specialists at Witron closely examined the possibility of implementing UHF identification. The system required a UHF read/write head at each incoming goods area as well as each crossing point in the pallet conveying system – 250 in all.

Witron programs the controllers for its logistics systems itself using a Step 7-based system. The proven RS485 twisted pair fieldbus is normally used for connecting auto-ID systems. The stations are connected in a so-called "daisy chain." In this configuration the individual stations are not linked to the controller in a star structure but are connected to the controller along a line, hence the term "daisy chain." This network topology makes the use of gateways or other distribution points unnecessary.

RS485 interface and controllable antenna required

Besides the need for the RS485 interface, another requirement eliminated the possibility of using a large number of different UHF read/write heads for the application: "The controllability of the antenna was a very important selection criterion for us because we had to implement a great deal of near field communication in the plant. Apart from a few other suppliers, this feature was primarily offered by Turck," explained Christian Fuhrmann, who is responsible for the control technology development.

RSSI filter prevents crosstalk

Each new application is thoroughly checked in advance from top to bottom at the Parkstein factory. Witron noticed that there were read errors on UHF tags at specific locations despite the controllable power of the UHF antennas. This crosstalk occurs if an antenna energizes a tag that it is not at all meant to read. This tag can then also be energized by a read/write head in close proximity and thus achieves a range that exceeds its actual maximum range. This means that read/write heads receive data from very distant tags which their antenna output power should not allow them to see. "In this case we were able to prevent this by setting different parameters on the read/write head. RSSI filters can

The LED indicates the status of the read/write head directly on the device

Neighbor conflicts excluded: Both read/write heads only read the pallets directly in front of them

be used or you can restrict the number of read operations that the read/write head performs," Fuhrmann explains. The RSSI value specifies the strength of a signal. It is used to estimate the distance of a target. By setting filters, objects at a particular distance can be excluded from read operations.

This application makes it clear how different UHF is from HF-RFID. With UHF: Every application is different. The joint solution to the challenges that presented themselves during the implementation of the application was worthwhile for both companies. Turck provided Witron with the technical support needed to match the RFID systems and could offer and extend its application know-how in real conditions. In the incoming goods area, for example, mechanical shields were fitted to the labeling systems for wooden pallets in order to prevent crosstalk and read errors resulting from the high density of antennas.

Address card developed

Another unanswered question was the assignment of network addresses to the individual read/write heads in the fieldbus. Witron needed a so-called address card for this, which is actually a type of tag. Each read/write head reads in its address card and thus provides the controller with a unique network address on the bus. Turck was able to draw on the expertise of its development partner Deister electronic for the development of the card.

Christian Fuhrmann expresses his delight with the collaboration. "For us the project was proof of our mastery of UHF technology. This certainly goes for Turck as well. The project was extraordinary in terms of its requirements and size. Together, we were able to effectively solve any questions and difficulties that arose and we achieved very good results in the end."

Equipped for Industry 4.0

The UHF technology now enables the customer to implement with one tag a seamless identification system for the entire production and supply chain. For example, the entire cold chain from the manufacturer to the supplier to the individual retailer can be documented seamlessly on one tag. The great benefit of the UHF technology is the ability to use the already integrated tags in the pool pallets. ■

Precise Giants

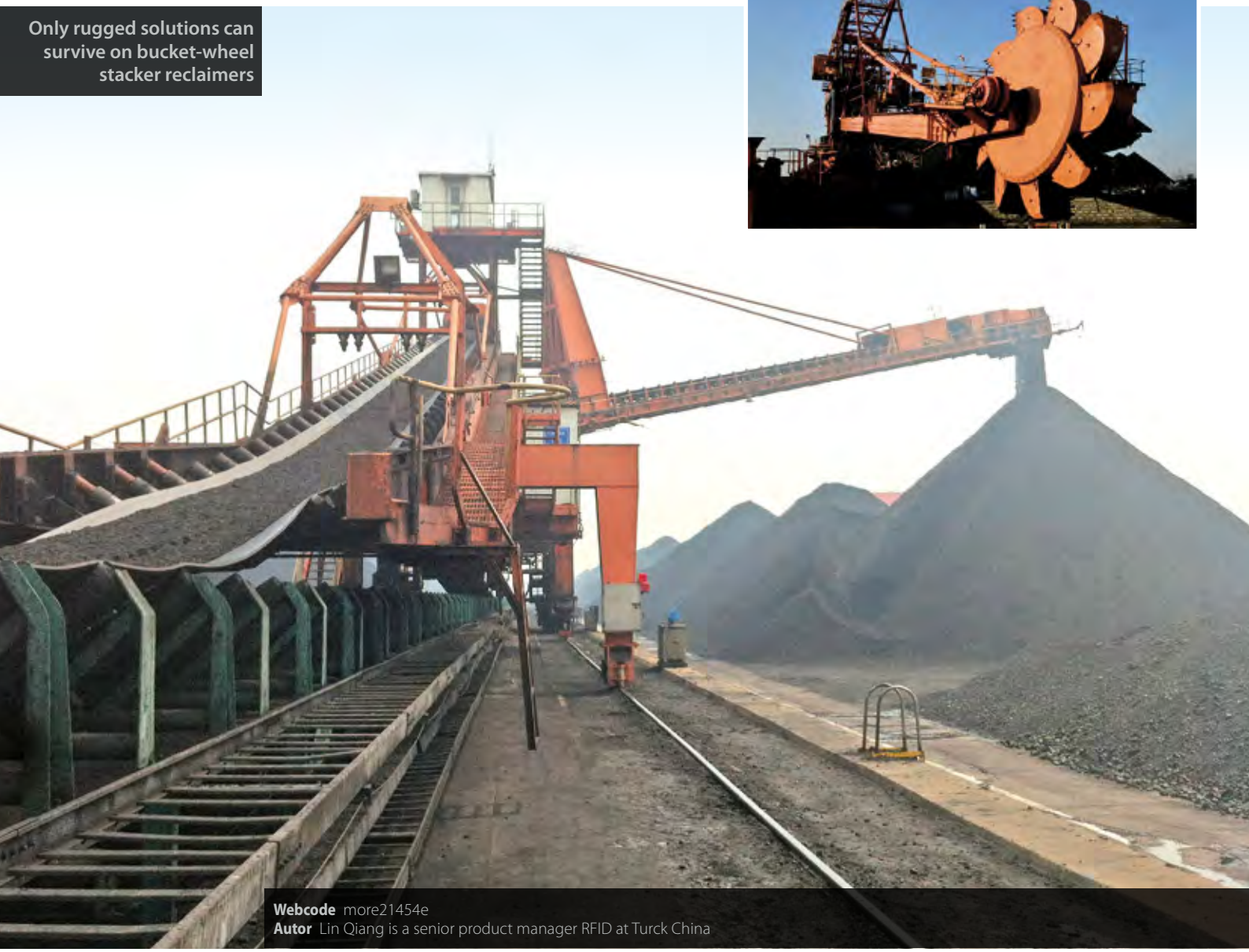
In the harsh environment of a Chinese open-pit mining application, Turck's rugged RFID system BL ident ensures for a reliable position detection of a bucket-wheel stacker reclaimer

At present, RFID is widely applied in industries such as tobacco, metallurgy, automobile manufacturing, machine processing, meter detection, food production and engineering machinery. In recent years, as RFID technology has achieved great success in overhead travelling crane location applications in iron and steel plants, more and more system integrators market RFID solutions at ports, docks and mine fields for locating bucket wheel machines.

Bucket wheel machines, also called bucket-wheel stacker reclaimers, are modern, efficient devices for continuously loading and unloading bulk materials. At present, it has been widely applied to the stacking and reclaiming operations at bulk material storage fields (mined stones, coal, coke and sand) at ports, docks, metallurgical plants, cement plants, iron and steel plants, coking plants, coal storage plants and power generation plants. The operation of the bucket-wheel stacker reclaimer is very regular and completely automatic. In order to prevent collision, it must be located.

Usually, an incremental encoder is employed to detect the travel path of the bucket-wheel stacker reclaimer on the rails. The bucket-wheel stacker reclaimer slides when brakes are used, so the encoder is unable to read the value of this segment, and then after a time, the data will inevitably be incorrect. In addition,

Only rugged solutions can survive on bucket-wheel stacker reclaimers



Webcode more21454e
Autor Lin Qiang is a senior product manager RFID at Turck China

Four proximity sensors detect the metal flags for the code, the fifth triggers the recognition

The solution previously used with metal flags for position control was too error-prone for the operators

data jumps occur when there is surrounding interference, which also makes the encoder inaccurate.

Calibration with BCD code

Therefore, clients have considered using proximity switch matrixes to calibrate the encoder. This solution is as follows: a correcting lever that implements 8421 encoding is installed next to the travel rails of the bucket-wheel stacker reclaimer at regular intervals of 50 m; the bucket-wheel stacker reclaimer is equipped with five proximity switches, one of which serves as a synchronous switch and the other four identify the 8421 code of the correcting lever; when the bucket-wheel stacker reclaimer passes the correcting lever, the program detects the synchronous conditions and then decodes the correcting lever; upon the completion of encoding, the position value corresponding to the correcting lever can be obtained; and finally, the position value is assigned to the counter, thus completing the travel path correction of the bucket-wheel stacker reclaimer. However, the existing mark is made of iron. If a ferric substance passes through the detection switch, the detection switch will actuate, generate the wrong correction information and therefore output incorrect travel positions.

RFID for reliable position feedback

Therefore, we recommend that clients use RFID (Radio Frequency Identification) solutions to correct the encoder—Install the RFID read-write head at the lower end of the side of the bucket-wheel stacker claimer and install a carrier at the belt conveyor frame at an interval of several meters, wherein each carrier stores the current specific position information. When the read-write head passes the carrier, it reads the current position information from the carrier and then transmits the data to the S7-400 PLC system through the PROFIBUS-DP interface communication module. The PLC compares the data with the encoder position information and then corrects the travel path of the bucket-wheel stacker reclaimer. The RFID technology can greatly improve the accuracy of the travel location data of the bucket-wheel stacker reclaimer and provide reliable data for guarding huge machines against collision and for helping the operations department issue operational orders.

The read-write device is required to be installed outdoors, so we recommend that clients use the Turck BLident RFID system with a protection rating of IP67. The system has a working temperature of-25-+70°C, is completely dustproof, and can work under 1m of water for a short period of time. In addition, most of the materials transported by the bucket-wheel machine are powders, and the field environment is severe, so we selected the epoxy resin carrier with a protective rating of IP68. This carrier is suitable for the extreme environment. Even scratches and dirt on the carrier will not affect reading. Moreover, the carrier can be reused, which is very suitable for such closed loop applications.

Complete Turck solution

The Turck BLident RFID solution, Turck buses, plug connectors and proximity switches as well as photoelectric switches, completely depend on the superiority of the Turck all-around solution: the Turck bus is modular in design, can connect RFID modules and be compatible with all products of the BL67/20 platform, and is com-

Quick read

To avoid collisions on the most autonomously operating bucket-wheel stacker reclaimers in a Chinese mining, the exact determination of the position is required. However, the encoders used for this purpose work exactly only until the heavy equipment slide briefly during braking. To compensate for this slippage, the encoders were repeatedly readjusted using inductive sensors. Since the operator uses Turck's RFID system BL ident, the error-prone sensor method belongs to the past.

RFID data carriers are mounted on the conveyor belt of the bucket-wheel stacker reclaimer for position detection

The photoelectric sensors from the Turck portfolio withstand the harsh environment

"Turck's RFID S modules simplify program development and can directly control the read-write head to work through the I/O shift without a functional block."

Xiao Wang, Qinhuangdao Port Co. Ltd.

prised of the input/output module of swit ching quantity and analog quantity, RS232/422/485 communication modules, high-rate counting modules, etc. Thus, all field signals can be transmitted to the upper-layer controller through one gateway, saving hardware devices, lowering cost, reducing device installation spacing, and simplifying field wiring. The Turck molded cables for field applications are all of IP67 protective ratings, shock resistant, oil proof and anti-interference, making them extremely suitable for use outdoors.

Because of their acceptance of the high protective rating and high quality of Turck's products, the clients decided to use the Turck proximity switch to replace the traditional mechanical limit switch. In severe field environments, the contacts of the limit switches usually get stuck. Rust, coal dust, snow and rain also make the mechanical parts of the limit switch inoperable. Turck proximity switches have a very long detection distance and extremely high repetition accuracy and can realize the accurate position detection of the high-voltage motor brake and travel brake.

Simplified programming

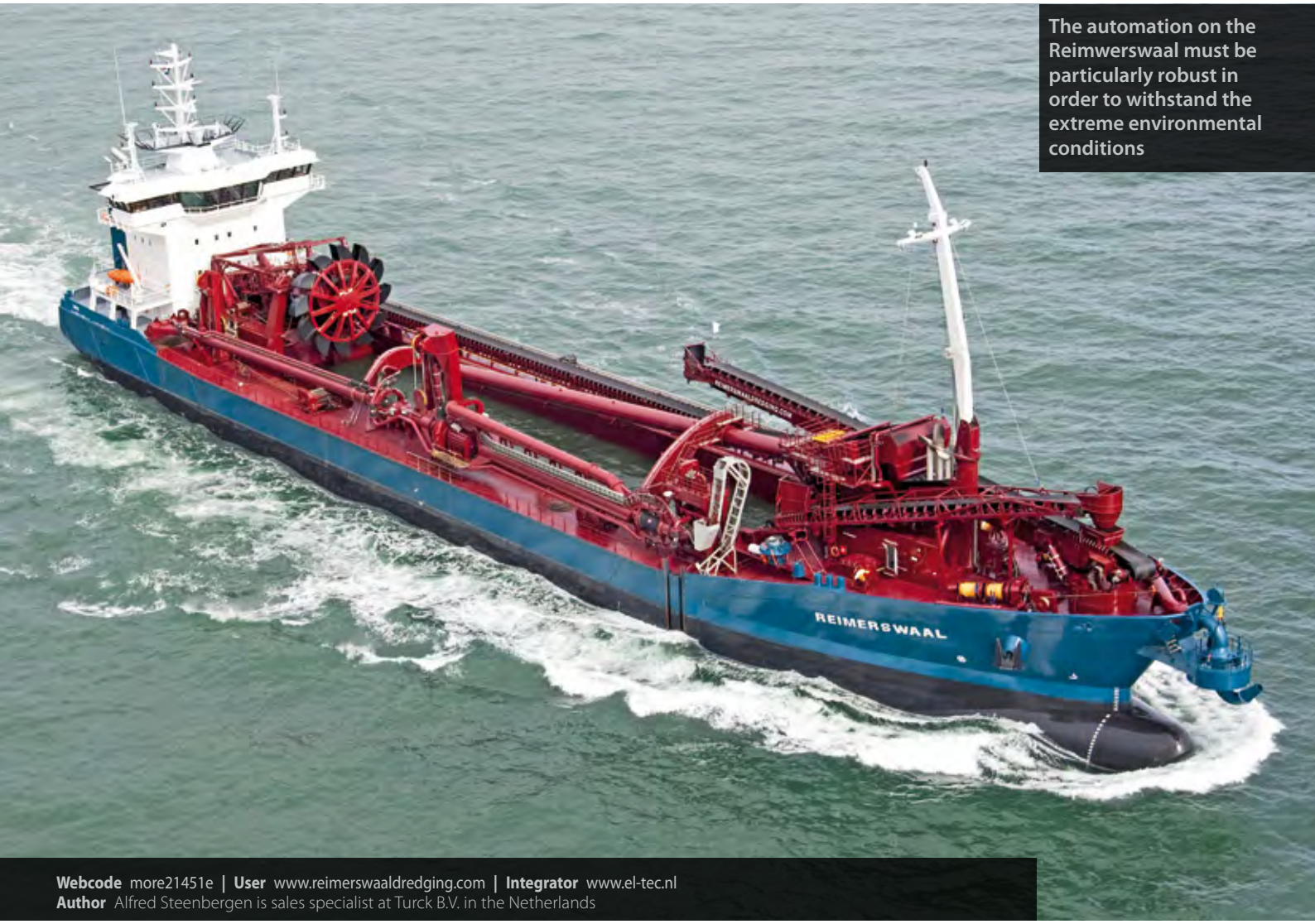
When talking about BLident RFID products, Manager Xiao Wang, the person responsible for this project of the Sixth Port Administrative Affairs Company of Qinhuangdao Port Co., Ltd. said, "Turck's RFID S modules simplify program development and can directly control the read-write head to work through the I/O shift without a functional block." It reads/writes 8 bytes each cycle, completely meeting demands when used on site. In addition, it is very flexible to use. Every gateway is connected with at most 8 read-write heads. Moreover, the product can also be connected with other input/output modules of digital quantity and analog quantity. If new points are required to be added on site, one only needs to add the modules and bases. Thus, gateway costs can be saved, and wiring in the field reduced.

In addition to the RFID read-write heads also switching signals are connected via the BL67 system

Furthermore, the read-write head can dynamically read the position information of the carrier and does not affect the travel speed of the bucket-wheel machine. The read-write distance at a range of 0-200mm meets the application requirements; through the LED indicator lights, the working state of the read-write head and the RFID module can be seen clear ly; the molded cables make the installation simple and ensure safe data transmission in the extreme environment; and the most important fact is that Turck's products support hot plugging, which reduces downtime and makes device repair quick and simple.

Conclusions

At present, Turck's BI ident RFID product as an encoder calibration solution has been widely applied in mine fields, coal fields, ports, docks, iron and steel plants and coking plants at home and abroad. As clients' demands for accurate location increase, RFID products will have broader development space in this field. Meanwhile, we also hope that more Turck products will be applied in this field by virtue of the BLident RFID product. ■



The automation on the Reimwerswaal must be particularly robust in order to withstand the extreme environmental conditions

Webcode more21451e | **User** www.reimerswaaldredging.com | **Integrator** www.el-tec.nl
Author Alfred Steenbergen is sales specialist at Turck B.V. in the Netherlands

Excavation at Sea

Turck's QR24 encoders enable the wear-free detection of rotation on electric winches for the Reimerswaal trailing suction hopper dredger

More than a quarter of the Netherlands is below sea level. Therefore it's hardly surprising that the Netherlands is a world leader in the field of water management technology. This discipline is also important in the protection of coastlines from erosion and flood damage. Part of this technology involves the use of hopper dredgers. The German word for this, 'Laderaum-Saugbaggerschiff' or literally 'hold suction excavator ship', not only offers a record number of Scrabble points, but describes quite accurately what a hopper dredger actually is: A ship that excavates sand and gravel from the sea floor and from river beds, and transports it to its hold. Trailing suction hopper dredgers therefore deepen the channels for ships and move gravel and sand material required for road building or concrete production.

The special ships can also use a pump to unload the mixture of gravel, sand and water at the bow of the ship in order to create artificial sand banks. This is

Quick read

Previously, the rotary encoders on the winches of the Reimerswaal hopper dredger hardly lasted a year due to the extreme stresses they were subject to on the high seas. The Dutch electrical engineering company eL-Tec therefore developed a wear-free solution for detecting cable winch rotation – using Turck's QR24 inductive encoders. The contactless encoder offers impressive performance, particularly due to its robust design. As the Profinet connection is implemented with Turck's BL20 multiprotocol I/O system, the crew on board can now also replace an encoder themselves.

"We looked for an encoder that doesn't have any mechanical connection to the winch shaft and is permanently sealed. For this there was only one encoder, and it comes from Turck."

Dick de Vries, eL-Tec Elektrotechnologie

also called 'rainbowing' due to rainbow-like jet produced in the process. The most well-known new land produced by trailing suction hopper dredgers is the group of artificial islands The Palm Jumeirah off the coast of Dubai. However, the Dutch had been already been using trailing suction hopper dredgers for a long time to create artificial sand banks for the protection of their coastline.

One of the world's largest trailing suction hopper dredgers with a dry discharge system is the Reimerswaal, which has a hold capacity of 6,000 cubic meters and is operated by Reimerswaal Dredging. The family-owned enterprise has over 45 years of experience in the field of sand and gravel excavation on river and sea beds. Over the years, the high-tech ships have always been fitted with the latest technology in order to optimally meet the requirements at hand. The special ship is around 130 meters long and 22 meters wide. The ship dredges the sea floor with a 90 centimeter pipe at a depth of up to 60 meters and pumps the sand and gravel mixture into its hold. Here the stone mixture is either drained and transported to shore on the ships own bucket conveyor, or discharged via the "rainbow pump."

The electronic controls and installation of the ship comes from the Dutch electrical engineering company eL-Tec Elektrotechnologie BV. Maritime automation is one of the most important sources of business for the 50-man company based in Hattem. eL-Tec provided the entire electrical installation and automation of the excavator system of the Reimerswaal, including the 6 kV connection for the installation of the ship 's 1,800 kW submersible pump.

eL-Tec was also responsible for the control of the suction pipe. The central suction pipe is extended and guided by three steel cables that are wound in and let out using electric winches. Three encoders on the winches detect the unwinding and winding of the steel cables on the Reimerswaal. Two other encoders are mounted on the cable winches that lower and raise the two spud poles at the fore and aft of the ship. The spud poles can be lowered up to 18 meters below the

Sander Lensen and Dick de Vries (right) have removed the protective cover on the winch

Three of theses winches guide the suction pipe, at top left, an encoder detects the rotation of the shaft.

The QR24 encoder is also protected by the metal plate

keel so that the ship can be securely moored on the sea or river bottom for unloading without the need for any other mooring facilities. The navigating officer operates the winches for lowering the spud poles from his bridge.

Frequent failure of magnetic encoders

Previously, all five winches were fitted with magnetic encoders with an integrated Profinet interface. However, the encoders had to be replaced frequently due to mechanical faults. The high seas are an inhospitable environment for electronic components. Waves sweep over the deck. Foam sprays over the bow and, in the case of the Reimerswaal, sand is present as well as the aggressive salt. The metal cover that the winch manufacturer had fitted to protect the encoders didn't help very much either. Water penetrated the brass flange which also couldn't drain any more out of the protective housing.

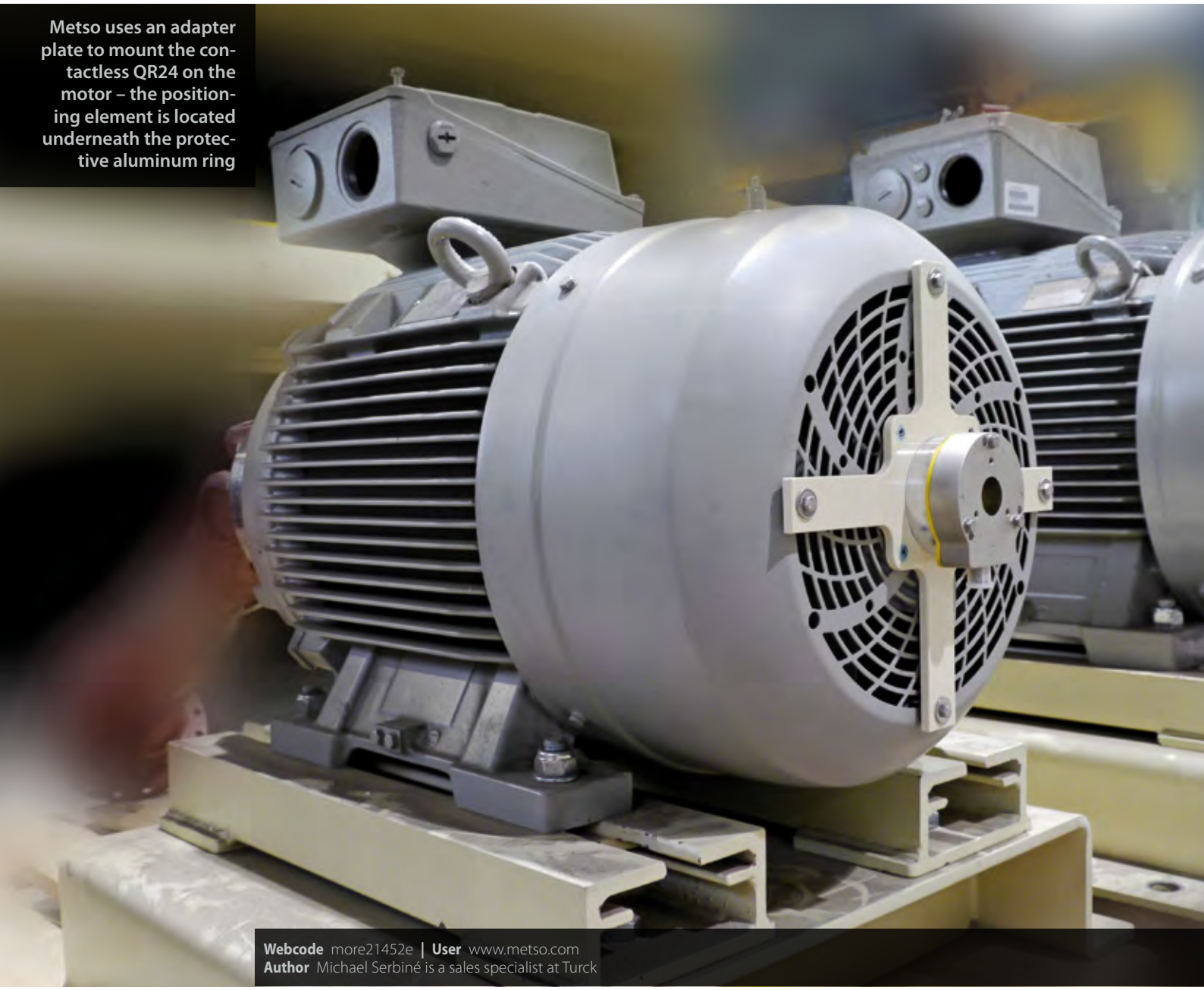
"Four out of five encoders failed within a year," as Sander Lensen, programmer at eL-Tec, described the wear. Lensen must know. During servicing, he and his colleagues repeatedly had to assign an IP address to the new encoders and teach the devices. For these reasons Reimerswaal Dredging wanted a better encoder solution for the five winches on the hopper dredger.

"The new encoder had to be wear-free and enable the replacement of encoders to be carried out by the technical personnel on the Reimerswaal themselves," Dick de Vries, head of the service department at eL-Tec, describes the central requirements for a new encoder. "We therefore looked for an encoder that doesn't have any mechanical connection to the winch shaft and is permanently sealed. For this there was only one encoder, and it comes from Turck."

Wear-free and plug-and-play

EL-Tec now uses the absolute version of the QR24 contactless encoder with an SSI output. The Profinet interface was implemented using the Ethernet gateway from Turck's BL20 modular I/O system. The device is a multiprotocol gateway and talks Profinet as well as Ethernet/IP and Modbus TCP. The encoder is connected to the gateway via an SSI input card. This makes the solution plug and play enabled. The ship's crew could easily replace the encoder themselves in the event of a fault. The gateway stores the Profinet address and a new encoder could be put into operation without any additional parameter setting required. This option would not be possible with an encoder with an integrated Profinet interface.

The manufacturer of the winches fitted the metal cover with a drain at the same time as the magnetic encoder was replaced. This enabled any penetrating water to be removed by suction. The protective cover was also provided with a protective coating to make it even more difficult for water to penetrate. In this way, the possibility of the QR24 failing is even more unlikely. The design of the inductive encoder enables the complete separation of the sensor and the positioning element. Both elements are fully encapsulated and are therefore highly resistant to liquids and other substances. Dick de Vries is confident that he and his colleagues will soon no longer have to visit the Reimerswaal. "If the solution becomes established permanently, we will also be using the QR24 in other projects. Up to now it looks pretty good." ■



Metso uses an adapter plate to mount the contactless QR24 on the motor – the positioning element is located underneath the protective aluminum ring

Webcode more21452e | **User** www.metso.com
Author Michael Serbiné is a sales specialist at Turck

Hard As a Rock

Metso, the specialist in equipment for mining and building materials, is successfully testing Turck's QR24 contactless encoder in a new mining machine

When marble, stone, iron and other types of ore are excavated in open cast and underground mines all over the world, you are likely to find the machines of the Finnish Metso Corporation and its German subsidiary Metso Minerals (Germany) in operation. Mining equipment represents an important source of business for the company. Metso machines cover the entire process chain from coarse rock to the mineral concentrate, from crushers to separating equipment and conveyor belts, right through to mineral grinders.

In search of a robust encoder

The mining sector is one of the harshest environments ever for the operation of mechanical systems. Wherever mountains have to be moved, rocks crushed, bulk material, gravel, grit and ore transported and sorted, severe shock and vibration are the order of the day. Dust and coarse contaminants such as slurry present the technology used in mining with a considerable challenge – particularly sensitive technology, such as encoders. If these environmental conditions are compared with

the electromechanical equipment available to mining companies for measuring movements, one thing stands out: The high-precision encoders with their delicate shafts and small bearings on the one hand, and large heavy duty machines on the other, are definitely not a perfect match.

Metso therefore also began to doubt whether the encoders available on the market were robust enough for a newly designed mining machine. Previous experience with resolvers showed that they often had to be replaced after only six months. The vibrations of the machines cause the bearings to be damaged relatively quickly. Dust can even penetrate the sealing rim and impair the function. Even though the resolvers are supplied with protection to IP67, this level of protection cannot last long. The same applies to optical encoders.

The mounting of conventional encoders is also not straightforward, since the axle of the electric motor on which the encoders are used can have up to one millimeter axial play. In order to maintain the required degree of precision, the torque support must absorb this movement, while remaining absolutely rigid in the radial direction at the same time. The mounting of conventional encoders thus requires a high level of precision.

Benefit: Contactless

The presentation of Turck's QR24 contactless encoder therefore caught the attention of the Metso specialists. Based on the inductive measuring principle, it is ideal for use in extremely harsh environments. The QR24 enabled Metso to implement a new feature for which the position of the motor shaft had to be measured constantly. As the positioning element of the QR24 can be mounted up to 3 millimeters away from the sensor housing of the encoder, vibrations and the axial movement of the motor shaft can be absorbed perfectly. There is no mechanical connection between the positioning element and the sensor housing.

The shaft of the motor is extended out. The technicians mount the positioning element of the inductive sensor on the extension. The sensor itself is secured on an adapter plate, which in turn is mounted on the motor housing. A housing guard for the sensor is later fitted to this adapter. Even if the sensor could have been fitted basically at an open position, it was intended for the device to be protected from severe rock damage, as can happen in the mining sector. The sensor is fully protected, with only the M12 connector and the LEDs visible from underneath for straightforward and rapid diagnostics with power supply and operating state indication.

Other contactless systems were not a realistic alternative for Metso. The magnetic positioning elements of these systems attract metal dust, particularly in iron ore excavation, and are therefore likewise unsuitable for a broad application range.

The metal housing protects the encoder from rock damage. The M12 connector and the LEDs remain accessible

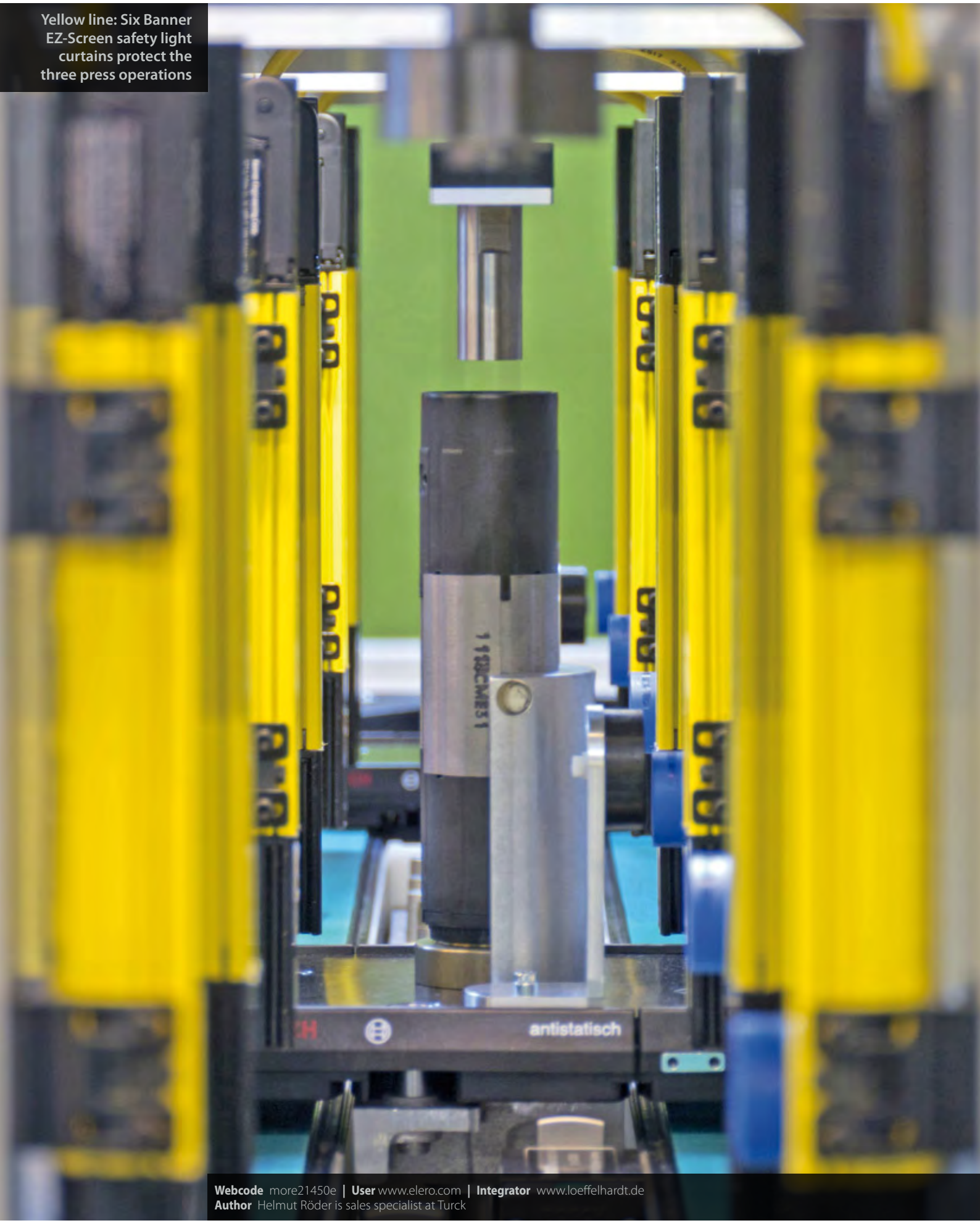
Motion control with vector control

The controller of the machine was programmed for a vector control in order to achieve optimum control results with the data of the QR24. The controller operates with the sensor in single turn mode and counts the revolutions itself, so the multiturn signal of the sensor is not used at all in this case. The controller uses the highly resolved SSI digital signal of the QR24, and the motor speed of 1,000 revolutions per minute far from uses the full counting capacity of the sensor. The magnetic field of the motor also does not disturb the inductive measuring system.

The machines of Metso are in operation in mines and open cast sites round the clock – 24 hours a day, seven days a week. The decision makers at the company are expecting a lot from the use of the QR24. Compared to other encoders, the maintenance required is considerably reduced. The tests so far have been very successful and confirm their expectations. ■

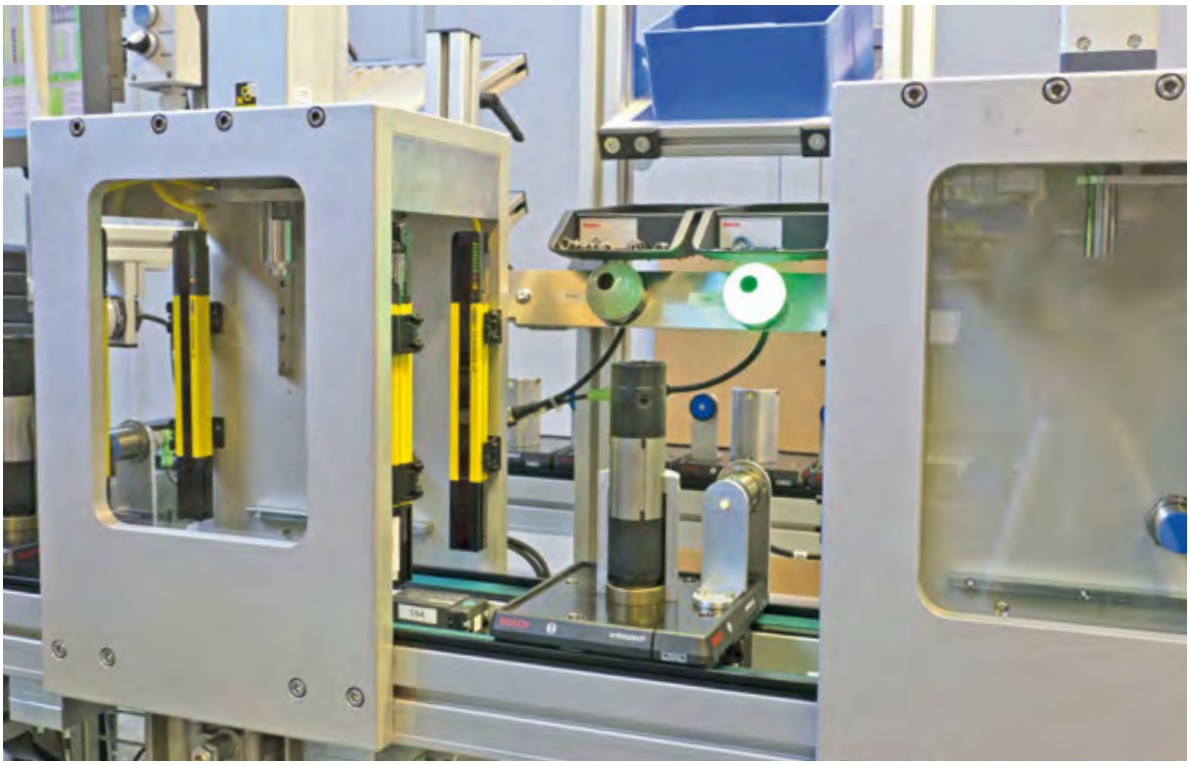
Quick read

With its processing equipment for the mining and building materials industry, Metso Minerals (Germany) GmbH is renowned as one of the leading suppliers. The harsh application conditions bring automation technology to their limits. This also applies to the encoders used in specific applications, which have up to now required very frequent maintenance. Through the use of Turck's QR24 contactless inductive encoder, Metso is expecting a degree of robustness that the devices used so far cannot provide. The results of the tests are positive.



Yellow line: Six Banner EZ-Screen safety light curtains protect the three press operations

Webcode more21450e | **User** www.elero.com | **Integrator** www.loeffelhardt.de
Author Helmut Röder is sales specialist at Turck



The green signal on the K50 light indicates the next part to be taken

Light That Protects

Elero protects the automated production plant for its shutter motor drives with EZ Screen light curtains from Turck's photoelectric components partner Banner Engineering

If it is true that progress cannot be stopped, then the smart home – the automated and networked home – will be as common in a few decades as central heating and a bathroom. The lighting of the smart home is controlled automatically according to weather conditions, time of day and whether people are present. The heating, ventilation and air conditioning system registers this automatically and knows the temperature preferred by the occupants. The system is completed with an electronic access control.

The smart home will also include automated technology with electric roller shutters or blinds – often driven by motors from Elero. The drives are fitted in the shaft and offer low noise operation as well as a compact design. Elero is headquartered in Beuren near Stuttgart. The company has 330 employees and produces around one million drives a year. Elero also offers the complete control technology for automated sun protection systems – right up to a smartphone app for controlling components remotely. Previously, the production of the motor drives was semiautomatic; in 2013 motor production was automated for the first assembly components, and additional lines will follow this year.

Elero has engaged the consulting services of electrical wholesaler Emil Löffelhardt. This company is a member of the Deha Group, a national association of electrical wholesalers. Readers of the current 2013/2014 sensor catalog of the Deha Group will find the Turck yellow on a lot of pages since Löffelhardt uses a large number of Turck solutions in its projects. Uwe Binder, technical adviser for the wholesaler, also relied on the safety light curtains and other products of the Mülheim-based automation specialist for the Elero automation project.

Partial automation most economical

Elero has now automated the first assembly section for the roller shutter motor drives, on which four components are fitted at three stations. At the first station a

Quick read

There are many types of light curtains. An automation project for the roller shutter manufacturer Elero enabled Turck to show how the features of these devices can vary considerably. EZ screens offer no blind zones, simple parallel connection of emitter and receiver, as well as the possibility to cascade were the key reasons for choosing Turck. A pick-to-light system which ensures production quality rounds off the automation project.

"The benefit of the Banner light curtains is the fact that I just have to connect the wires of the two cables in parallel in the controller. The two sections of the light curtain then detect each other automatically. I don't have to calibrate or set them up."

Oleg Oster, Elero

ball bearing is press fitted, at a second station a locking element and spring element are fitted, and at the third station a magnet. Employees previously operated the presses by hand. Today, a conveyor belt guides the motors from one station to the next. Linear shafts press fit the components at the three stations. Only the insertion of the parts now has to be done manually. With the quantities involved here, the manufacturer has calculated that the additional automation of this working step is not yet worthwhile. The objectives of the automation are a reliable, constantly high product quality and a reduction of faults in the process. The elimination of manual presses also relieves the work load on the employees in the motor manufacturing plant.

The motor drive moves on a material carrier to the first station. A K50 light with integrated photoelectric sensor indicates to the employee the box with the ball bearing to be inserted. Although only one bearing type is fitted at this point, Elero appreciates the benefit of certainty that the bearing has been taken out. The photoelectric sensor enables the K50 light to indicate whether a component was taken, and makes the subsequent press operation dependent on this condition. After the ball bearing is inserted, the material carrier moves on to the first press station. As soon as the press operation is started and the linear shaft moves down, a magnet is released and activates the light curtains via the controller. They protect workers from accessing inside the press. However, if an object or body part enters the light curtain during the press operation, the safety PLC aborts the process immediately. The second station has two K50 lights installed, which indicate to the worker the parts to be fitted. An EZ-Screen light curtain is installed here and also at the third station.

Cascading saves space in the cabinet

The benefit of the light curtain from Banner Engineering, Turck's partner for photoelectronics, is the fact that the devices do not have any blind zone. "The housing length of the devices is precisely the same height as the protection field. Without this feature, it would not have been possible to use the light curtains here," Uwe Binder describes. Another feature impressed Oleg Oster, head of the equipment construction at Elero: "The cables of the emitter and receiver section of the light curtains are both designed for eight wires." The emitter actually only needs five wires, but Banner has made the number of wires the same for emitter and receiver in order to simplify the connection in the switch cabinet. Three wires are therefore not connected on the emitter. "The benefit of the Banner light curtains is the fact that I just have to connect the wires of the two cables in parallel in the controller. I do not have to carry out a lengthy check on which of the 16 wires belong to the emitter and which to the receiver," explains Oleg Oster. "The two sections of the light curtain then detect each other automatically. I don't have to calibrate anything or set them up."

Elero intends to build other automated assembly plants of this kind using products from the Turck range

A Y junction or splitter can even be used to connect an emitter and receiver pair with a single cable. This saves the user time and space in the control cabinet. Up to three pairs of emitters and receivers can be connected with an eight-pole cable. For this kind of cascading, all light curtains must monitor the same condition. Oleg Oster and Uwe Binder soon rejected the possible alternative solution involving a mechanical door locking of the press operation. The setting up, installation and maintenance required would have involved too much time and effort. This alternative was not attractive in terms of price.

Pick-to-light increases safety

The pick-to-light system enables Elero to permanently control the production process. At the end of the process the "not OK" parts are removed. A QS18 light sensor checks whether the faulty tubular motors have really been removed from the material carriers. To do this, Oleg Oster just had to teach the sensor one point. The part to be detected is held in front of the light curtain and the sensor is taught with just two clicks. The firmware automatically defines a switch window of one centimeter around the taught point, and the areas in front and behind this window are masked out. With many light sensors this function is either not available at all or must involve complex parameter setting using two switch points.

As Elero manufactures most of its machines for producing its motors itself, the company must comply with the Machinery Directive. Part of this Directive is the European Standard EN 13849-1, which requires machine builders to carry out a risk assessment for their machines. For this the machine builders must define the so-called PLR or Performance Level Required.

In order to evaluate the compliance of safety-related machines and controllers with EN 13849, machine builders can use the Sistema software utility (safety of controllers on machines). The program helps to verify whether the selected safety-related components – from the controller to the light curtain – also achieve the calculated Performance Level. "The fact that I could find in the Sistema libraries the data blocks for all Turck and Banner products used was very helpful," says Oleg Oster. Instead of having to engage in laborious searches at the right place for the relevant information from the product data sheets and entering them manually, he simply selects the components and adds them to his machine project. This simplifies the verification of the achieved Performance Level.

Elero is so satisfied with the Turck solution that the automation of the production lines will be continued this year. Two similar machines for manufacturing tubular motors are planned. "We will continue to engage the consulting services of Emil Löffelhardt," says Oster. Uwe Binder adds: "And we will continue to use the Turck products. They give us good technical support and the products often offer technical features and benefits that similar products don't offer." ■

"The housing length of the devices is precisely the height of the protection field. Without this feature we wouldn't have been able to use the light curtains."

Uwe Binder, Löffelhardt

A good view: The QS-18 light sensor allows a switch window to be taught in just two clicks

The protection field height is the same as the housing length, so there are no blind zones

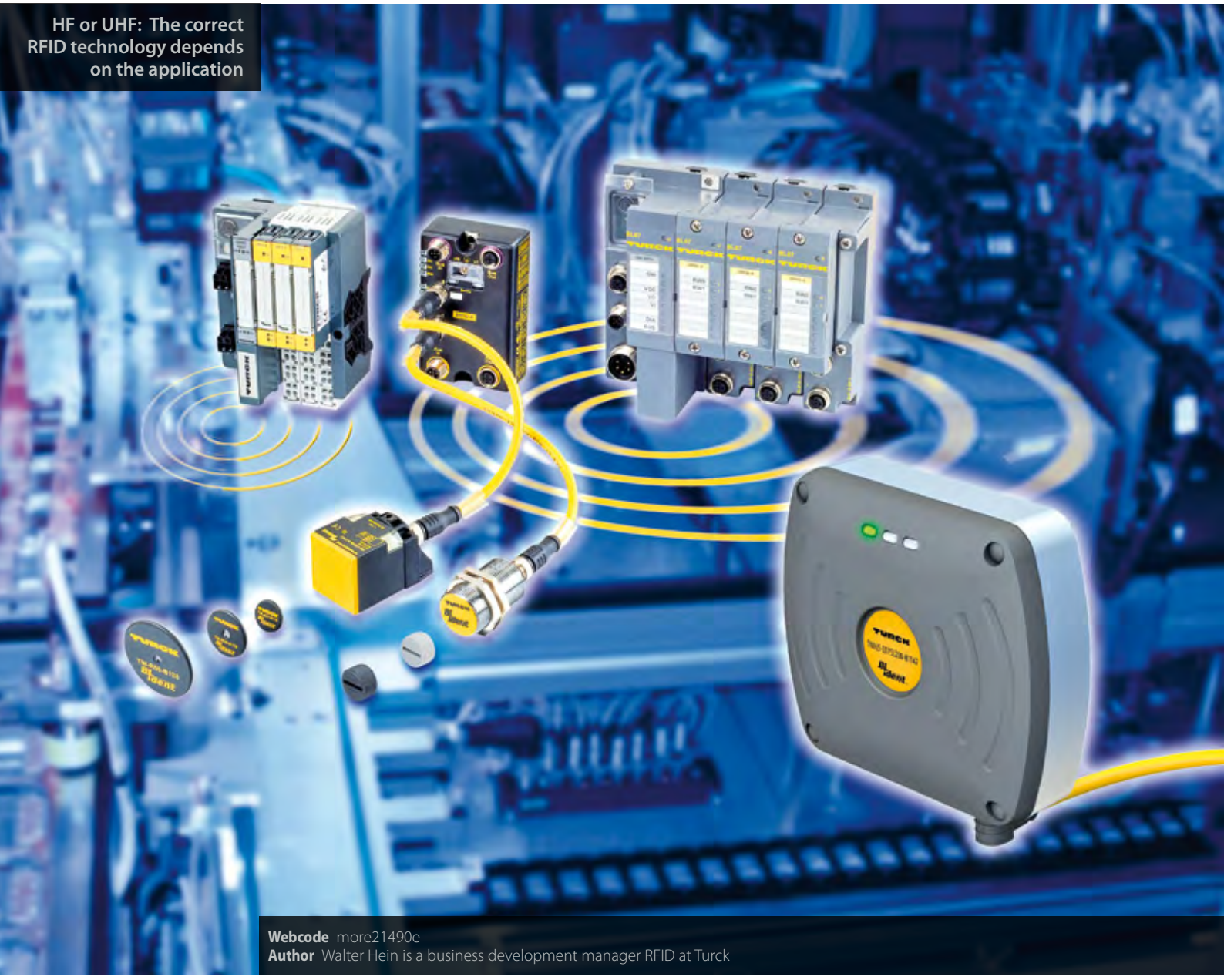
Identifying the Right RFID

Wireless identification using RFID is a powerful technology, if used properly. But what system fits to what industrial application?

Industrial manufacturing is constantly adapting to meet the ever-increasing productivity and efficiency demands on the factory floor, and track and trace technologies play an important role in satisfying these goals. Radio frequency identification (RFID) has been providing manufacturers with high-quality monitoring systems to deliver unparalleled control and visibility over automated operations for increased efficiency gains and improved production.

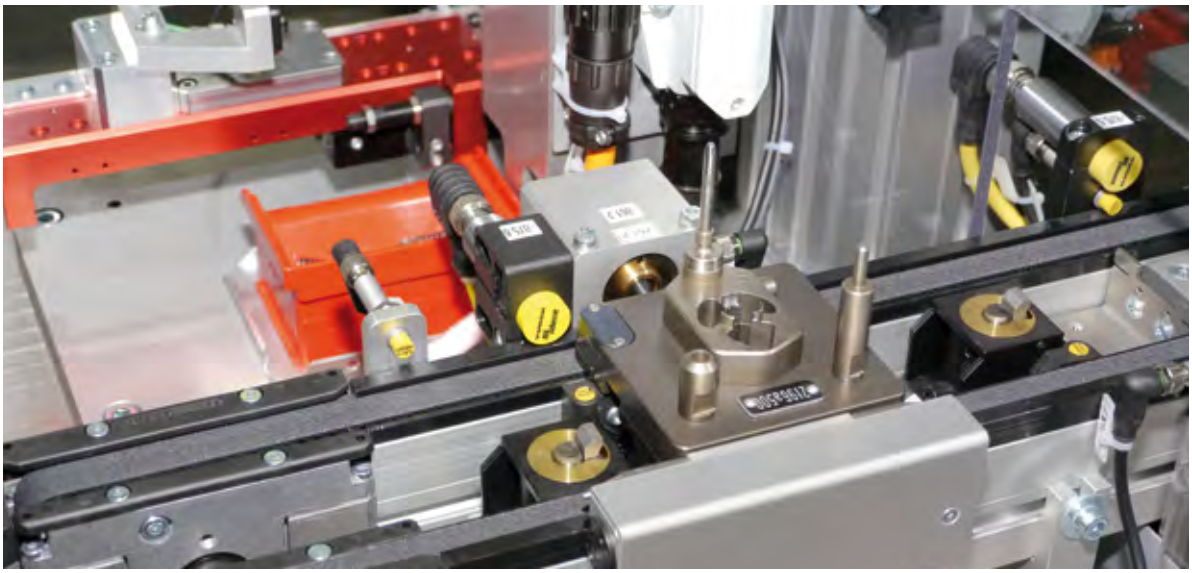
When selecting the ideal track and trace technology, options are no longer limited to the debate between the capabilities and advantages of radio frequency identification over optical identification methods. Now, manufacturers should examine the difference in performance capacity between the various RFID frequencies in order to ensure the correct solution is implemented to meet corresponding application requirements.

With each industrial application presenting a unique set of challenges and demands, it is important to know the speed, range and number of tags individual operation requires to achieve the necessary level of control. This white paper will explain how RFID technology operates, and will further break down high-frequency and ultra-high frequency RFID. The white paper



HF or UHF: The correct RFID technology depends on the application

Webcode more21490e
Author Walter Hein is a business development manager RFID at Turck



If only minimal constant distances must be bridged, the HF technology is ideal, even at higher speeds

will also highlight the distinct strengths and weaknesses of each frequency, along with identifying the industries and applications that suit each technology best.

An RFID breakdown

Unlike conventional optical identification methods, such as barcodes or the data matrix code, RFID transmits information using electromagnetic radio waves, eliminating line-of-site requirements. While printed labels attached externally to the product become unusable by the time they are exposed to high temperatures or moisture, special RFID tags and mobile reading devices make it possible to use RFID systems even under the toughest conditions.

RFID systems contain three parts: the tag, transceiver and the interface. Tags can be active (require a battery) or passive reflecting the signal back to the transceiver, which is often called a reader or antenna. The interface is the means of communicating the data from the tag a data collection device such as a computer or a programmable controller.

The transceiver is used to read the RFID tag, and an I/O device will communicate information on the tag with the enterprise or higher-level control system. RFID tags contain internal circuitry that respond to a radio frequency field that is provided by the transceiver. During operation, when the RFID tag passes through the field of the transceiver, it detects the signal from the antenna. This activates the RFID tag, signaling it to transmit or receive information on its microchip.

Originally, this technology was developed as a method to remotely gather data through tags or transceivers. However, given their data storage capacity, manufacturers have been attaching or embedding these tags into an object during production and programming them with information about the product, equipment or tool. RFID tags are designed to read and write thus users can collect and store more data than with other systems.

To accommodate various application requirements, RFID operates at diverse frequencies, including low, high and ultra-high. The frequency implemented will determine the distance in which RFID tags can be read, how many tags can be read at one time, how fast these tags are read, the actual size of the tag and how the application environment will impact its performance.

Low frequencies operate below 135 KHz and are least impacted by their surroundings. However, they are unable to read/write tags over a large distance and are limited to a single tag in the field. For this reason, low frequency is not often used in manufacturing environments. Alternatively, High Frequency RFID operates between 13.553 and 13.567 MHz and can read/write tags over longer distances, and while it can read more than one tag in the field, it is better suited for single tag applications. Further, since HF is not overly impacted by its surroundings, it offers an ideal solution for manufacturing processes, such as inventory management or work-in-progress.

Ultra-High Frequency RFID features fast speeds, which enables it to quickly identify objects in the field and offers long-range read/write capabilities. However, UHF is highly susceptible to interference from its surroundings. When looking at the different technologies for an application it is best to have an expert review your requirements and assist in selecting the correct technology for the application.

High Frequency vs. Ultra-High Frequency

High-Frequency (HF) RFID is among the most commonly used track and trace technology in industrial applications, and is often implemented because of its reliable operation. HF RFID tags use inductive cou-

Quick read

RFID systems not only differ in their range. The different frequency ranges LF, HF and UHF bring specific advantages and disadvantages. The decision for the right RFID system is anything but banal. The advice provided by experienced professionals can help to put together the optimal solution for any industrial application.

UHF applications bridge larger distances but are sensitive to interference

pling to communicate between read/write heads and transponders. The reader emits a magnetic field, and when a transponder passes through, an electric current is created that powers the RFID tags and transmits data.

Inductive coupling creates a well-defined magnetic field that is smaller but easier to control. With high-frequency systems, the strength of the signal is dependent on the distance from the antenna. This accounts for its short-range operation, reaching up to 50 cm. HF RFID has an operating frequency of 13.56 MHz and can accommodate read-only, write-only and rewritable tags, with a memory capacity from 64 bytes to 8 kilobyte and can handle up to 20 tags at one time. Further, the amount of memory on the tag determines the amount of data that can be stored, and to accommodate various application requirements, tags are available in many different shapes, sizes and materials.

Along with performance capabilities, it is crucial to consider the limitations of each RFID frequency, more specifically its air interface, which defines the way the tag communicates with the reader. By knowing a frequency's air interface, the tag's read range is determined and compatible readers can be identified. For HF RFID systems, the air interface size and shape are independent of the surrounding environment. High-frequency distribution fields are a homogeneous shape, which prevents communication gaps or blind spots, making it less susceptible to environmental influence. Additionally, with long wavelengths, HF RFID prevents the absorption or penetration of liquids and the radio waves will not bounce off metal and cause false reads – making it resistant to performance degradation in wet applications or metallic environments.

Ultra-High Frequency Unlike HF RFID, Ultra-High Frequency (UHF) RFID offers both near-field and far-field read ranges. Near-field RFID operates similarly to HF RFID, where the antennas generate a magnetic field. Since the tag is closer to the antenna, near-field UHF has a narrower field of view and a shorter read range (comparable to HF RFID). For an additional performance advantage, near-field UHF features an antenna that reduces magnetic shielding, enabling it to block visibility of other tags in close proximity.

Far-field UHF uses electromagnetic waves propagating between reader and tag antennas, delivering a wider field along with an increased possibility for interference. While able to accommodate high speeds and longer read distances, far-field UHF technology technologies is more complex and performance of RFID system gradually degrades because of its absorption, refraction and reflection properties.

Using radio waves to communicate between the read/ write head and the tag, UHF RFID can accommodate long-range application requirements, as the electric field features strength that extends much further than possible with high-frequency options. Capable of communicating over several meters with an operating frequency between 860 and 960 Mhz in the far-field,

▸ RFID solution from experts

With many years of experience and application-optimized products, Turck offers a wide range of solutions for HF and UHF-RFID. At the beginning, there is usually a feasibility study to evaluate the basic feasibility of a proposed solution. For the UHF range, Turck with its specially designed ray-tracer software can even simulate applications and thus determine many potential sources of error in advance. RFID solutions often offer the greatest commercial value, if RFID data is integrated into the MES and ERP software of a company. Here Turck works closely with system partners, who bring the specific IT expertise for this task.

RFID is a robust medium to identify tools or, as shown here, impact screens

UHF RFID can solve fast-paced, complex applications that require multiple tags to be read simultaneously – handling as many as 200 tags at a time.

UHF RFID systems do offer multiple capabilities over high-frequency options, but they also have several limitations that may impact their ability to deliver the necessary performance capacity for industrial applications. For instance, UHF tags have lower memory capacity, only carrying between 24 to 110 bytes of data. UHF RFID is also more susceptible to the presence of various dielectric and conducting objects in the tag vicinity.

Additionally, the size and shape of air interface is highly influenced by the surrounding environment. UHF systems that use propagation coupling are harder to control because energy is sent over long distances. Further, with UHF, the field distribution tends to be inhomogeneous, resulting in blind spots, communication gaps and even overshoot areas, making the systems more susceptible to performance malfunction from surrounding environmental elements. UHF RFID is vulnerable to interference from both metal and liquids. When considering UHF technologies for industrial applications, environmental conditions need to be tested and proven as many times the bounce of the waves leaves large holes.

In the field with HF and UHF

When choosing between these two technologies, it is important to understand their individual performance capabilities, strengths, weaknesses and application suitability. By examining the various operating principles and potential environmental concerns, manufacturers can make an informed decision prior to implementing any track and trace technology.

For example, water, carbon and other materials absorb UHF energy. This means that products containing a high water or carbon content can impact the reliability of the signal. Therefore, when implementing RFID in and around liquid-bearing or carbon-composed products, high-frequency tags are better suited due to their resistance against liquid absorption. Further, when selecting RFID, understanding metal susceptibility is also important. HF tags have a shorter maximum range and are more reliable on an object made of metal. Alternatively, UHF frequencies typically offer better range and can transfer data faster than low- and high-frequencies, but use more power and are less likely to pass through materials.

Another consideration when selecting the appropriate frequency for a corresponding application is the amount of electromagnetic interference (EMI). EMI is noise that can make it more difficult to obtain a clear signal and can be caused by a wide range of machines. Motors emit EMI and may need to be shielded to prevent interference with RFID systems. Conveyors with nylon belts and robots on assembly lines also cause interference in manufacturing processes.

Also important, RFID must adhere to individual restrictions imposed by each country. For HF, the same technology is accepted worldwide, but UHF frequencies differ depending on region. For example, the read range for UHF is only achievable up to 33 cm in Europe due to current power restrictions in those countries.

Conclusion

RFID on the plant floor enables users to improve accuracy, provide faster production speeds and minimize errors, as well as achieve substantial cost savings from both a material and labor standpoint. In order to achieve these improvements, it is crucial that manufacturers know and understand the distinct differences between HF and UHF RFID to implement the correct capabilities and tolerances to meet specific application requirements. ■

Turck at Trade Shows

At numerous **national and international trade shows**, Turck will introduce you to current product innovations and reliable solutions for factory and process automation. Be our guest and see for yourself.

Date	Trade Show	City, Country
28.01. – 29.01.2015	Euro Expo Industrimesser	Trondheim, Norway
28.01. – 30.01.2015	IFAM	Celje, Slovenia
10.02. – 12.02.2015	LogiMat	Stuttgart, Germany
09.03. – 11.03.2015	SPS – Industrial Automation Fair	Guangzhou, China
17.03. – 20.03.2015	Automaticon	Warsaw, Poland
23.03. – 26.03.2015	ProMat	Chicago, USA
24.03. – 27.03.2015	Amper	Brno, Czech Republic
08.04. – 10.04.2015	Automation Technology Expo West	Anaheim, USA
13.04. – 17.04.2015	Hannover Messe	Hanover, Germany
15.04. – 17.04.2015	RFID live	San Diego, USA
22.04. – 23.04.2015	ISA	Calgary, Canada
22.04. – 23.04.2015	ACIconnect	Sidney, Australia
22.04. – 23.04.2015	Euro Expo Industrimesser	Stavanger, Norway
04.05. – 07.05.2015	Offshore Technology Conference	Houston, USA
06.05. – 08.05.2015	Indumation	Kortrijk, Belgium
12.05. – 14.05.2015	SPS IPC Drives Italia	Parma, Italy
13.05. – 15.05.2015	Industrial Automation	Beijing, China
19.05. – 21.05.2015	Smart Automation Austria	Linz, Austria
15.06. – 19.06.2015	Achema	Frankfurt, Germany
16.06. – 19.06 2015	Expo Pack	Mexico City, Mexico
23.06. – 26.06 2015	Mioge	Moscow, Russia
14.07. – 16.07.2015	Semicon	San Fransisco, USA
14.09. – 18.09.2015	MSV	Brno, Czech Republic
22.09. – 24.09 2015	hi Technology and Industry Expo	Herning, Denmark
28.09. – 30.09.2015	Pack Expo	Las Vegas, USA
07.10. – 10.10.2015	Convención Internacional de Minería	Acapulco, Mexico
13.10. – 15.10.2015	Elo Sys	Trenčín, Slovakia
20.10. – 22.10.2015	Distributed Control System	Miskolc-Lillafüred, Hungary
27.10. – 29.10 2015	Automation	Saint Petersburg, Russia
27.10. – 30.10.2015	Gastech	Singapore, Singapore
03.11. – 07.11.2015	China International Industry Fair	Shanghai, China
09.11. – 12.11.2015	Fabtech	Chicago, USA
11.11. – 14.11.2015	Adipec	Abu Dhabi, United Arab Emirates
24.11. – 26.11.2015	SPS IPC Drives	Nuremberg, Germany

Turck on the Web

In the product database on **www.turck.de/products** you will find all relevant infomation on Turck products and solutions, from data sheets to CAD data in many export formats.

- **Full Text Search –** Are you looking for a product name, a known identification number or a special feature? Then simply enter it in the above search field.
- **Hierarchical Structure –** Are you looking for products from a certain group, such as inductive sensors? Then click through the menu structure on the left.
- **Power Search –** Are you looking for a product that meets very specific technical parameters? Then use the feature search that specifically leads to your solution.
- **CAD Data –** Simply generate the data record that you need in our product database on the Internet – you can choose from between 80 export formats in 2D and 3D. This service is absolutely free, registration is also not required.

www.turck.com

Impressum

Publisher
Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim an der Ruhr, Germany
Tel. +49 208 4952-0
more@turck.com
www.turck.com

Editorial staff
Klaus Albers (responsible), klaus.albers@turck.com
Simon Dames, simon.dames@turck.com
Paul Gilbertson, paul.gilbertson@turck.com

Contributors to this issue
Peter Arnold, Walter Hein, Jörg Kuhlmann, Frank Nolte, Lin Qiang, Helmut Röder, Michael Serbiné, Alfred Steenbergen, Achim Weber

Art Direction / Graphic Design
Arno Kraemer, Britta Fehr (Art design)

Webcode more21480e

Turck on Site

With **28 subsidiaries** and numerous branch offices, 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 ı Mülheim an der Ruhr ı + 49 208 4952-0 ı more@turck.com

ARGENTINA ı Aumecon S.A.
(+54) (11) 47561251 ı aumeco@aumecon.com.ar
AUSTRALIA ı TURCK Australia Pty. Ltd.
(+61) 3 95609066 ı australia@turck.com
AUSTRIA ı TURCK GmbH
(+43) (1) 4861587 ı austria@turck.com
BAHRAIN ı TURCK Middle East S.P.C.
(+973) 16030646 ı bahrain@turck.com
BELARUS ı FEK Company
(+375) (17) 2102189 ı turck@fek.by
BELGIUM ı Multiprox N. V. (TURCK)
(+32) (53) 766566 ı mail@multiprox.be
BOLIVIA ı Control Experto
(+591) 4 4315262 ı conexturck@controlexperto.com
BRAZIL ı TURCK do Brasil Ltda.
(+55) (11) 26769600 ı brazil@turck.com
BRUNEI ı TURCK Singapore
(+65) 65628716 ı singapore@turck.com
BULGARIA ı Sensomat Ltd.
(+359) (58) 603023 ı info@sensomat.info
CANADA ı TURCK Chartwell Canada Inc.
(+1) (905) 5137100 ı sales@chartwell.ca
CHILE ı Seiman S.A.
(+56) (32) 2699310 ı ventas@seiman.cl
CHILE ı Egaflow S.P.A.
(+56) (9) 866 19642 ı info@egaflow.cl
CHINA ı TURCK (Tianjin) Sensor Co. Ltd.
(+86) (22) 83988188 ı china@turck.com
COLOMBIA ı Dakora S.A.S.
(+571) 8630669 ı ventas@dakora.com.co
COSTA RICA ı TURCK USA
(+1) (763) 5539224 ı usa@turck.com
CROATIA ı Tipteh Zagreb d.o.o.
(+385) (1) 3816574 ı tipteh@tipteh.hr
CYPRUS ı AGF Trading & Engineering Ltd.
(+357) (22) 313900 ı agf@agfelect.com
CZECH REPUBLIC ı TURCK s.r.o.
(+420) 495 518 766 ı czech@turck.com
DENMARK ı Hans Folsgaard A/S
(+45) (43) 208600 ı hf@hf.dk
Dominican Republic ı TURCK USA
(+1) (763) 553-7300 ı usa@turck.com
ECUADOR ı Bracero & Bracero Ingenieros
(+593) (9) 7707610 ı bracero@bracero-ingenieros.com
EGYPT ı Electric Technology
(+20) 3 4248224 ı electech@electech.com.eg
EL SALVADOR ı Elektro S.A. de C.V.
(+502) 7952-5640 ı info@elektroelsalvador.com
ESTONIA ı Osauhing "System Test"
(+37) (2) 6405423 ı systemtest@systemtest.eem
FINLAND ı Sarlin Oy Ab
(+358) (10) 5504000 ı info@sarlin.com
FRANCE ı TURCK BANNER S.A.S.
(+33) (0) 160436088 ı info@turckbanner.fr
GREAT BRITAIN ı TURCK BANNER LIMITED
(+44) (1268) 578888 ı enquiries@turckbanner.com
GREECE ı Athanassios Greg. Manias
(+30) (210) 9349903 ı info@manias.gr
GUATEMALA ı Prysa
(+502) 2268-2800 ı info@prysaguatemala.com
HONDURAS ı TURCK USA
(+1) (763) 5539224 ı usa@turck.com
HONG KONG ı Hilford Trading Ltd.
(+852) 26245956 ı hilford@netvigator.com
HUNGARY ı TURCK Hungary Kft.
(+36) (1) 4770740 ı hungary@turck.com
ICELAND ı Km Stal HF
(+352) 5678939 ı kalli@kmstal.is
INDIA ı TURCK India Automation Pvt. Ltd.
(+91) 7768933005 ı india@turck.com
INDONESIA ı TURCK Singapore Pte. Ltd.
(+65) 65628716 ı singapore@turck.com
IRELAND ı Tektron Electrical
(+353) (21) 4313331 ı webenquiry@tektron.ie
ISRAEL ı Robkon Industrial Control & Automation Ltd.
(+972) (3) 6732821 ı robkonfr@inter.net.il
ISRAEL ı Nisko Electrical Engineering & System Ltd.
(+972) (8) 9257355 ı joseph.shapira@niskoeng.com
ITALY ı TURCK BANNER S.R.L.
(+39) 2 90364291 ı info@turckbanner.it
JAPAN ı TURCK Japan Office
(+81) (3) 52982128 ı japan@turck.com
JORDAN ı Technology Integration
(+962) 6 464 4571 ı info@ti.jo
KENYA ı Westlink Limited
(+254) (53) 2062372 ı sales@westlinkltd.co.ke
KOREA ı TURCK Korea Co. Ltd.
(+82) (2) 20831630 ı korea@turck.com
KUWAIT ı Warba National Contracting
(+965) 24763981 ı sales.wncc@warbagroup.com
LATVIA ı Will Sensors
(+37) (1) 67718678 ı info@willsensors.lv
LEBANON ı Industrial Technologies (ITEC)
(+961) 1 491161 ı support@iteclive.com
LITHUANIA ı Hidroteka
(+370) (37) 352195 ı hidroteka@hidroteka.lt
LUXEMBOURG ı Multiprox N. V. (TURCK)
(+32) (53) 766566 ı mail@multiprox.be
MACEDONIA ı Tipteh d.o.o. Skopje
(+389) 70399474 ı tipteh@on.net.mk
MALAYSIA ı TURCK Singapore Pte. Ltd.
(+65) 65628716 ı singapore@turck.com
MEXICO ı TURCK Comercial, S. de RL de CV
(+52) 844 4116650 ı mexico@turck.com
NEW ZEALAND ı CSE-W Arthur Fisher Ltd.
(+64) (9) 2713810 ı sales@cse-waf.co.nz
NETHERLANDS ı TURCK B. V.
(+31) (38) 4227750 ı netherlands@turck.com
NICARAGUA ı Iprocen S.A.
(+505) 22442214 ı ingenieria@iprocen.com
NIGERIA ı Milat Nigeria Ltd.
(+234) (80) 37236262 ı commercial@milat.net
NORWAY ı HF Danyko A/S
(+47) 37090940 ı danyko@hf.net
OMAN ı International Business Development LLC
(+968) 24487147 ı ibd@ibdoman.com
PAKISTAN ı Speedy Automation
(+92) 51 4861901 ı speedyisb@speedy.com.pk
PANAMA ı TURCK USA
(+1) (763) 5539224 ı usa@turck.com
PERU ı NPI Peru S.A.C.
(+51) (1) 2731166 ı npiperu@npiperu.com
PHILIPPINES ı TURCK Singapore Pte. Ltd.
(+65) 65628716 ı singapore@turck.com
POLAND ı TURCK sp.z o.o.
(+48) (77) 4434800 ı poland@turck.com
PORTUGAL ı Bresimar Automação S.A.
(+351) 234303320 ı bresimar@bresimar.pt
PUERTO RICO ı TURCK USA
(+1) (763) 5539224 ı usa@turck.com
QATAR ı Doha Motors & Trading Company WLL
(+974) 4651441 ı dohmotor@qatar.net.qa
ROMANIA ı TURCK Automation Romania SRL
(+40) (21) 2300279 ı romania@turck.com
RUSSIA ı O.O.O. TURCK Rus
(+7) (495) 2342661 ı russia@turck.com
SAUDI-ARABIA ı Binzagr Factory
(+966) 3 8640980 ı avig@bfim.com.sa
SERBIA ı Tipteh d.o.o. Beograd
(+381) (11) 3131057 ı damir.vecerka@tipteh.rs
SINGAPORE ı TURCK Singapore Pte. Ltd.
(+65) 65628716 ı singapore@turck.com
SLOVAKIA ı Marpex s.r.o.
(+421) (42) 4440010 ı marpex@marpex.sk
SLOWENIA ı Tipteh d.o.o.
(+386) (1) 2005150 ı info@tipteh.si
SPAIN ı Elion S.A.
(+34) 932982000 ı elion@elion.es
SOUTH AFRICA ı R.E.T. Automation Controls (Pty.) Ltd.
(+27) (11) 4532468 ı sales@retautomation.com
SWEDEN ı TURCK Office Sweden
(+46) 10 4471600 ı sweden@turck.com
SWITZERLAND ı Bachofen AG
(+41) (44) 9441111 ı info@bachofen.ch
TAIWAN ı Taiwan R.O.C. E-Sensors & Automation Int'l Corp.
(+886) 7 7323606 ı ez-corp@umail.hinet.net
TAIWAN ı Jach Yi International Co. Ltd.
(+886) 2 27312820 ı james.yuan@jachyi.com
THAILAND ı TURCK Singapore Pte. Ltd.
(+65) 65628716 ı singapore@turck.com
TRINIDAD AND TOBAGO ı TURCK USA
(+1) (763) 5539224 ı usa@turck.com
TURKEY ı TURCK Otomasyon Tic. Ltd. Şti.
(+90) (216) 5722177 ı turkey@turck.com
Ukraine ı SKIF Control Ltd.
(+380) (44) 5685237 ı d.startsew@skifcontrol.com.ua
UNITED ARAB EMIRATES ı TURCK Middle East S.P.C.
(+973) 77 082882 ı bahrain@turck.com
URUGUAY ı Fidemar S.A.
(+598) 2 402 1717 ı info@fidemar.com.uy
USA ı TURCK Inc.
(+1) (763) 553-7300 ı usa@turck.com
VENEZUELA ı CADECI C.A.
(+58) (241) 8345667 ı cadeci@cantv.net
VIETNAM ı TURCK Singapore Pte. Ltd.
(+65) 65628716 ı singapore@turck.com


Page 08


Page 14


Page 18


Page 22


Page 25


Page 28


Page 30


Page 34

TURCK

Industrial Automation

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

D900901 1114