

# more@TURCK

The Magazine for Customers of the Turck Group



## Extended Offering

Oliver Merget: "Connectivity is part of our integrated automation strategy"



## High-Speed Sensor

Arburg uses Turck's advanced LI linear position sensor as a motion control system



## RFID Intrinsically Safe

WACKER uses BL ident RFID solution to identify tumbler screens in dust Ex-zone 22

PROFINET

EtherNet/IP

Modbus



# Multi Language Talents

Turck presents the first multiprotocol gateways and block I/O modules that can address three Ethernet protocols

## Focus on the Customer



When the automation sector meets once more in Nuremberg at the end of November, Turck will also be there at hand to present our range of advanced solutions. The following pages introduce the interesting new products that we will be presenting together with the proven Turck portfolio at **Stand 351 in Hall 7**. We warmly invite you to visit us at the SPS IPC Drives fair in order to take a closer look at our products and services. Apart from our range of solutions, we will be pleased to show you what in our view is the key factor for the success of our business: our strong focus on the customer and his requirements.

From development to product management, right through to sales and service, customer orientation is at the center of all our activities. Ultimately, you as a user not only want to pay for high-end technological products, but also for the fact that they optimally fulfill your requirements. At Turck we therefore consider professional and direct communication with you as a customer an essential element of our corporate philosophy.

In recent years we have worked hard at establishing a situation where we can now offer you the support that you expect in all areas. In addition to our sales specialists in the sales force, your project will be supported if necessary by our colleagues in system sales, together with our in-house support and project management. For more complex automation issues – particularly in all aspects of RFID and image processing – our system partners, with their extensive sector know-how, will ensure that your project is implemented with optimum efficiency.

One result of these activities is presented on page 18: The further development of our inductive linear position sensors for the injection molding machine manufacturer Arburg, and in collaboration with them, went so far that they even used it for regulating the injection axis, making it the fastest inductive motion control linear measuring system on the market. Through close collaboration, all project partners could benefit. Arburg benefited from a non-contact and maintenance-free measuring technology that is unique, and Turck, from a high-speed sensor that is now available in the standard product range with an SSi interface.

Our specialists in Nuremberg will be pleased to show you how you too can benefit from Turck. We are looking forward to meeting you!

**Yours sincerely**

A handwritten signature in black ink, appearing to read 'J. Grabow', written in a cursive style.

**Jürgen Grabow, Vice President Sales Factory Automation**

**more@TURCK**



**NEWS**

**Innovations for automation specialists** 04

**COVER STORY**

**FIELDBUS TECHNOLOGY: Multi Language Talents** 08

Turck is presenting the first multiprotocol gateways and block modules that can communicate in three different Ethernet protocols

**INSIDE**

**INTERVIEW: „Part Of Our Integrated Automation Strategy“** 12

C&A editor Inka Krischke spoke to Oliver Merget, Vice President Automation Systems, about Turck's increased involvement with connectivity products

**TECHNOLOGY**

**SENSOR TECHNOLOGY: All Around Carefree Pack** 14

Turck has developed its first 2x360° inclinometer that can be set individually by the customer for any application

**TREND**

**RFID: No More Trial and Error** 16

A new simulation software based on the ray tracer algorithm enables Turck to calculate and plan complex UHF-RFID applications

**APPLICATIONS**

**SENSOR TECHNOLOGY: High-Speed Measuring** 18

In conjunction with Arburg, Turck has further developed its LI inductive linear position sensor into a genuine high-speed linear position measuring system for motion control

**SENSOR TECHNOLOGY: Perfectly Assembled** 22

The assembly systems with parallel arms from Möve-Metall are equipped with Turck's inductive RI angle sensors to ensure that screws are inserted exactly to specifications

**SENSOR TECHNOLOGY: All Around Protection Without Blind Zones** 24

Intronyx protects robot cells with Banner Engineering EZ Screen safety light curtains from the Turck range

**SENSOR TECHNOLOGY: Train Watch Out!** 26

A Chinese freight train uses Turck FCS flow sensors to monitor the air cooling in the current converter cabinets

**CONNECTIVITY: Good Connection** 28

How Turck's quick disconnect connectivity products helped the University of Wisconsin-Madison's Electric Ford F150 research vehicle come to life

**RFID: Safe Screening** 30

At its Burghausen site, WACKER is using Turck's BL ident RFID system for reliable detection in its tumbler screening systems in the dust Ex zone 22

**FIELDBUS TECHNOLOGY: Tradition and Modern Ways** 33

In the Irish Distillers whiskey distillery, Turck's excom remote I/O proves that traditional manufacturing processes can also benefit from state-of-the-art fieldbus communication

**RFID: Protection for Cap Tip Dressers** 36

Turck's BL ident RFID system enables the electrode cap tip dressers of AEG SVS Schweistechnik to reliably detect the correct cutting head for the electrode cap

**SERVICE**

**CONTACT: Your Fastest Way to Turck** 38

How, when and where to find us

**CONTACT: Imprint** 38



With the B2N-360-Q42, Turck is offering the world's first 3D inclinometer that offers a full 360° measuring range on two axes. **Page 14**



Intronyx protects robot cells for an automotive supplier with Banner Engineering EZ Screen safety light curtains from the Turck range. **Page 24**



In an Irish distillery, Turck's excom remote I/O proves that traditional manufacturing processes can benefit from state-of-the-art fieldbus communication. **Page 33**

## Turck Expecting 430 Million Euro



► The Turck Group is expecting a consolidated total **turnover of around 430 million euro** for financial year 2012. According to Turck managing director Christian Wolf, the automation specialist will thus exactly match the levels of last year's turnover figures. Developments in the economy and the market in 2012 have meant that an increase in the total result was not possible. However, the family-owned enterprise was able to achieve a slight increase in turnover of two percent in the German market with almost 100 million euro. The number of employees rose worldwide in 2012 from 3,000 to 3,200, with half of these employed by the Turck Group at its German sites in Beierfeld, Halver and Mülheim/Ruhr.

## New Connectivity Portfolio



► Turck has added its own connectivity portfolio to its range of products. The new product lines, **TXL** and **TEL**, are available with angled or straight M8 or M12 connectors. With the different combinations of 3, 4 or 5-pin female and male connectors and cable lengths from 30 cm to up to 10 m, every user will find the right cordset for their application. The connection and extension cordsets of the TXL line are jacketed in specially abrasion resistant polyurethane (PUR). The PVC cables of the TEL series are resistant to acids and alkalis, as well as being flame retardant and cULus and RoHS approved.

## Active Passive Junction Boxes

► Turck has extended its range of **passive junction boxes**. As well as standard junction boxes with 4, 6 and 8 input connectors and a multi-pole cable output, the customer will also be able to find two active IO-Link variants. The IO-Link junction boxes combine 16 switching status elements in a 16-bit IO-Link signal, thus bringing 16 switching signals from the machine to the control cabinet via a single standard cable. Instead of assigning each signal to the individual wire of an M23 master cable, terminating and routing them into the control cabinet with expensive multipole cables, the IO-Link junction box only requires a single standard M12 cable. The signals can come for example from proximity switches, pushbutton



actuators, optical switches or also temperature sensors with a switch output. The use of the junction boxes is particularly recommended when a large number of signals have to be routed from the machine to the control cabinet. Like the other standard passive junction boxes, the IO-Link junctions are provided with LEDs that indicate the switching status of each individual input.

## Linear Position Sensor for Motion Control

► For the first time Turck is entering the market for high-speed motion control with its further developed **LI inductive linear position sensor**. A new electronics architecture increases the effective output rate of the sensor from 1 to 5 kHz. In conjunction with the short signal run time (130  $\mu$ s) and the highly resolved SSi output, the inductive linear position sensors can thus achieve the performance of potentiometers but without their disadvantages. Unlike potentiometers, the LI sensors offer permanent protection to IP67, provide non-contact measuring and are absolutely wear-free. The magnetic field immune sensors are therefore suitable for measuring axes with high-speed controls such as is used in injection molding machines. Other application areas include axis measurement in packaging machines, presses or machine tools. With the high speed and precision of the sensor (system resolution of 1  $\mu$ m), machine builders can keep the position error in motor control applications to a minimum.



more on page 18 ►

## V. P. Sales Factory Automation

► **Jürgen Grabow** has been appointed vice president sales factory automation of Turck. The graduate engineer will thus direct and be responsible for all sales activities in the field of factory automation worldwide. The 49-year-old has extensive experience in international sales management in the industrial automation sector. Before moving to Turck, Grabow worked for several years in sales management positions at Kontron AG – since 2006 as executive vice president sales for the EMEA region. Jürgen Grabow studied electrical engineering at the RWTH Aachen university and acquired his first professional experience in the sale of electronic measurement technology and industrial computers. He is married and has two daughters



## Magnetic Field Sensor for Short Stroke Cylinders

► With the **BIM-UNTK**, Turck is offering the shortest magnetic field sensor for detecting the piston position in compact pneumatic cylinders. The sensor comes with protection to IP67 and is ideally suited with a length of only 19.7 mm for measuring particularly short hydraulic cylinders, pneumatic power clamps and grippers. The user not only benefits from increased switch point accuracy but also from the extremely compact mounting form: The sensor disappears completely in the T groove and thus does not present a target for any mechanical damage. An LED on the sensor enables the cylinder position to be read directly in the field. The new BIM-UNTK can be fitted simply into the T groove of a cylinder from above or from the side and can be secured with a hexagon socket screw. The sensor can thus be fastened with one hand in the standard T groove without the need for any additional accessories. Turck offers suitable mounting accessories for different cylinder and groove sizes for other cylinder types such as tie rod cylinders, round cylinders or dovetail groove cylinders.

## Multiprotocol Ethernet Gateways and Block I/Os

► Turck is presenting at the SPS IPC Drives fair the first fieldbus gateways and block I/O modules that communicate with Profinet IO, Modbus TCP or Ethernet/IP. The new **multiprotocol devices** can be operated automatically in each of the three Ethernet systems. The multiprotocol solutions help users of different Ethernet protocols to effectively reduce the range of device variants required. Multiprotocol devices also enable the identical planning of machines and plant sections with different Ethernet protocols. Depending on the requirements of the end customer, only the controller or master have to be changed in order to offer machines for three different protocols. Turck offers the devices for its modular BL20 series gateways for control cabinet mounting and also for the BL67 series for field mounting. IP67 block I/O modules including the space-saving BL compact series are also available as multiprotocol devices. [more on page 8](#) ►

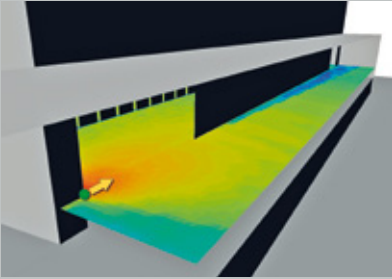


## Customized User Interface



► Turck is expanding its range of **RFID handheld devices** with software that can be specifically tailored to the requirements of individual customers. This enables the automation specialist to offer a complete solution, which, in addition to the special handheld device, includes a customized user interface, RFID tags and also stationary read/write heads if required. Write and read commands can be executed via the touch screen or keypad. The read information can be shown on the display according to customer requirements. The handheld readers are available for both HF and UHF systems and can also read barcodes or data matrix codes as well as RFID tags. The handhelds can communicate with mobile devices, PCs or other systems via Bluetooth, WLAN or a standard USB cable.

## UHF-RFID Simulation



► A software based on the ray tracer algorithm enables Turck to **simulate the complex UHF applications** of customers and thus more reliably estimate the accessibility of RFID tags and read/write heads. Turck specialists go through various scenarios in order to determine the optimum operating parameters and ideal positions of read/write heads and RFID tags. Read/write heads on moving elements or moving RFID tags can also be simulated. The simulation is particularly useful for applications where the expense required for a test application is disproportionately high. [more on page 16](#) ►

## Powerful LED Indicator Lights

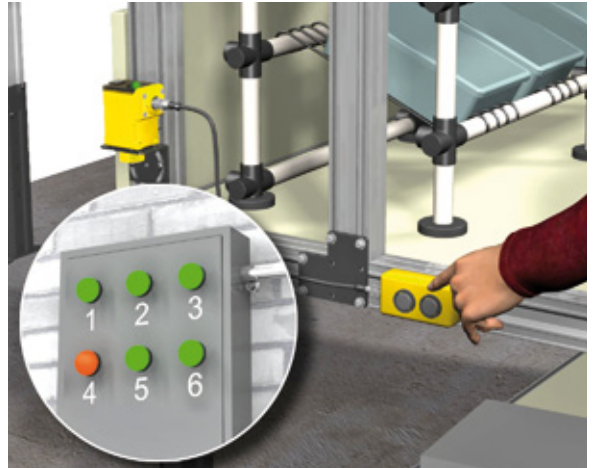


► Turck introduces five new **EZ-Light high intensity indicators** to provide clear long-range visibility in intense sunlight or brightly lighted indoor conditions. The Lights have been developed by Turck's partner Banner Engineering. All use advanced LED technology to provide longer life and lower energy consumption than fluorescent or incandescent light sources.

**Webcode** more21210e

## Wireless Sensor Series

► The first **self-contained wireless photoelectric sensing solution** for multiple monitoring and control applications has been introduced by Turck's partner Banner Engineering. The new Wireless Q45 includes a sensor, radio and internal battery power supply in a single compact and robust housing. A variety of sensing modes are available in the new series, allowing for functions including presence/absence, alignment, position, counting, monitoring and detection. Battery life is up to five years depending on sensor model and application, and the housing is IP67/NEMA 6 rated. Signals from the sensors are received at a wireless network gateway that interfaces with all common PLCs and other industrial control systems. Basic gateways control two and six sensors, and the system can be expanded for larger scale applications. Using a simple binding procedure, new sensors can be added to the network in minutes since there is no need to install any cabling. The wireless sensors are designed for rapid, low-cost deployment and dependable operation in a wide range of situations. These include providing remote input for dry relay contacts, replacing failed cable runs, adding sensors to mobile applications, replacing complex cabling and connecting locations that were previously impractical or impossible.



## Fully Parameterizable 3D Inclinometers

► With the **B2N-360-Q42**, Turck is presenting a 3D inclinometer that can be adapted extensively and precisely by the customer to the requirements of the application via IO-Link. With a double 360° measuring range, the sensor is not limited to a maximum  $\pm 85^\circ$  – as with all comparable models. Users can not only set individual vibration filters that precisely mask out the vibration frequency of your machine, but also define the zero point, switch points or switch windows – according to the mounting position and requirements at hand. As well as vibrations, the sensor also suppresses potential error sources such as accelerations or shocks. The extensive range of assignable parameters and the maximum sensing range of 360° on two axes enable the sensors to be suitable for virtually any application. It therefore reduces the number of variants that need to be kept in stock to a single type. Turck offers two variants of the sensor: The industrial variant for the temperature range from  $-25$  to  $+75^\circ\text{C}$  and a second variant according to the e1 specification for use in utility vehicles and construction machinery. [more on page 14](#) ►



ien.eu



The site everybody  
is talking about !

With its new multiprotocol devices, Turck is offering an efficient way to utilize the option of Ethernet protocols

**PROFINET**

**EtherNet/IP™**

**Modbus**



Webcode more21200e

Author Jörg Kuhlmann is the director product management factory automation systems



# Multi Language Talents

Turck is presenting the first multiprotocol gateways and block modules that communicate in three different Industrial Ethernet protocols

**E**thernet-based bus systems like Profinet, Ethernet/IP or Modbus are becoming increasingly more established compared to conventional fieldbuses. For example, our Profinet devices can establish a physical point-to-point connection between two stations in linear topologies. This minimizes the risk of reciprocal interference between several stations. The possibility to implement ring redundancy also increases communication efficiency compared to fieldbuses. With Profinet, the Media Redundancy Protocol (MRP) responsible ensures that the communication direction is automatically changed in the event of a communication failure in the ring topology, in order to secure the possibility of further communication.

All these benefits have contributed to the rise of the Ethernet protocols in industrial automation. However, the hope that this transition from fieldbus to Ethernet networks would solve the specific protocol and connection requirements of different bus systems has not been realized. Like their adherence to proprietary Ethernet protocols, controller manufacturers have again developed proprietary installation guidelines for cabling their networks. As a legacy of the fieldbus era, the Ethernet era continues to be characterized by a plethora of protocols.

## Reducing complexity

The principles by which the controller manufacturers are marking out and securing their claims are resulting in a number of similar Ethernet protocols: the leaders of the standard Industrial Ethernet protocols, Profinet, Ethernet/IP and Modbus TCP, are sharing the majority of the automation market between each other. Automation manufacturers on the one hand, and machine and system builders on the other have to deal with this diversity – both with fieldbuses and with Ethernet. One trend therefore continues to characterize the industrial automation sector: The range of standards and devices that fulfill similar tasks but which are nevertheless based on different protocols continues to increase.

Turck has pursued a different approach which provides a solution for this challenge: The automation specialist is launching the first multiprotocol Ethernet gateways and block I/O modules in the world that can be operated with the Profinet, Ethernet/IP or Modbus TCP Ethernet protocols without any intervention required by the user.

With its multiprotocol devices, Turck is not only reducing the diversity of proprietary device types, but also the number of customers that use different protocols in different parts of their production or in different country-specific versions of their machines. In automotive production, for example, it often occurs that



**Different Ethernet protocols in a production line with Turck's multiprotocol devices are no longer a problem**

body construction and final assembly are automated using different protocols. In the future, all these users only have to keep one gateway type in stock, regardless of the Ethernet protocol used. As purchasing and stock-keeping are often centralized, this will enable the costs and complexity of stock-keeping to be effectively reduced.

The multiprotocol devices make it possible to implement machines and plants that can be planned and constructed identically. They can also be provided with different controllers or masters to meet specific

### ▶ Quick read

With new multiprotocol gateways and block I/O modules, that support Profinet, Ethernet/IP and Modbus at the same time, Turck is offering a new approach to effectively managing the variety of protocols that had developed over time. With no international vendor-neutral standards due in the foreseeable future, the multiprotocol gateways take a first step towards reducing the complexity of protocols and devices used in the industry. Also, the lean architecture of the new devices achieve by far the fastest startup times on the market.



**Turck FGEN Fast Startup modules achieve startup times of less than 150 ms (Profinet) and 90 ms (Ethernet/IP)**

customer specifications, enabling communication in different protocols. Besides the benefits with regard to spare parts management and procurement, the provision of multiprotocol devices from other automation manufacturers will make it possible to create identical installation plans for electrical designs which just have to be duplicated.

Turck has added the new multiprotocol devices to several Ethernet I/O product families: These include the gateways of the modular BL20 series for control cabinet mounting and BL67 for field mounting, as well as the IP67 block I/O modules, including the space-saving BL compact series for direct mounting on the machine. All gateways feature internal switches that enable installation in line. The Ethernet IP, Modbus TCP and Profinet protocols are combined in a single device firmware. In spite of the gateways' slim design the protocol stacks contain all the relevant protocols for this market.

The multiprotocol functionality is made possible by an intelligent identification routine of the gateways. During startup, they determine which Ethernet proto-

col is running on the cable by listening to the traffic in the so-called snooping phase. The devices then automatically switch to the detected protocol and ignore the telegrams of the other two. The implementation of the protocols is in no way inferior to that of the single protocol devices: In Profinet mode, topology detection and address allocation are supported with LLDP, and Ethernet/IP with QuickConnect and Device Level Ring (DLR media redundancy).

### Protocol detection and more

However, the multiprotocol talent is not the only source of innovation on the new Turck gateways. The multiprotocol devices also have a turbo on board that enables a high-speed startup. They support Fast Startup in Profibus mode and feature QuickConnect in Ethernet/IP mode. Due to the extremely slim architecture of the microprocessor and the operating system, they can achieve startup times that were previously impossible.

The automotive industry in particular required short startup times in order, for example, to increase the cycle rate for a tool change on robots in body shell construction. The faster the I/O module on the tool changer returns to operational readiness, the faster the cycle time for an operation. For the automotive manufacturer, a shorter cycle time means either more output per unit of time or fewer robots for a particular operation – both significant alternatives from an economic standpoint.

The Profinet User Organization first of all streamlined the startup protocol in order to shorten the startup times. The controller manufacturers added prioritized startup to the Profinet protocol: If a station was already logged in at the controller, both the station and the controller store all the necessary parameters. When a further login at the controller occurs, the matching of these two parameter sets is quickly checked. If they match, the station can continue with the next step. This shortens the protracted information ping pong between slave and master, which slowed down the Ethernet protocols with a standard startup. By accelerating the stack with the prioritized startup, Profinet eliminated this brake on the startup procedure with its fast startup protocol, and Ethernet/IP with QuickConnect.

### Optimum fast-startup solution

Turck developed an optimized electronic architecture for its Ethernet I/O modules that ensures that processors are operational considerably faster – largely regardless of any protocol modifications – and speeds up the startup times. The Turck block type fast startup modules (FGEN series) now achieve startup times of less than 150 milliseconds for Profinet and around 90 milliseconds for Ethernet-IP. Turck modules are thus well within the requirements set by the automotive industry, for which the maximum startup time is 500 milliseconds. There is currently no other supplier of fast startup I/O modules that can even approach the times of the FGEN series. ■



Oliver Merget: "The first two product lines in Turck's corporate design are the TEL and the TXL line in M8 and M12"



## "Part Of Our Integrated Automation Strategy"

C&A editor Inka Kruschke spoke to Oliver Merget, vice president automation systems business unit, about Turck's increased involvement with connectivity products

**Mr. Merget, Turck is covering new ground and for the first time is manufacturing its own cordsets and connectors for direct sale. Up**

**to now you always relied on your partner company Escha for connectivity products – why are you now developing them yourself?**

The idea of in-house development isn't entirely new – we have been producing our connectors and cordsets in the USA and in Mexico for over 20 years. At the

same time, we have been working worldwide in the connectivity sector for many years with Escha, a renowned manufacturer. Today connector/connectivity products are a fundamental and strategic component of Turck's integrated automation strategy. That is why we have now formalized our future long term collaboration with Escha in a cooperation agreement: An extensive technology cooperation and a mutual technology transfer will enable both parties in future to have full access to the technology and the products of the other company.

### And what does this mean in real terms?

The agreement makes it possible for Turck to produce connectors on its own and also to develop its own connector solutions – always in close cooperation and technological exchange with Escha. Full unrestricted access to all Escha products – also under the Turck brand – is retained. We will continue to work closely together in the further development of standard and special solutions.

### What is the aim of this cooperation?

A key objective is the better development of market potential in the target markets of both companies. Turck will thus be able to open up these markets faster, more competitively and more dynamically with Turck branded connector products, as is the case in the USA. This enables Escha, on the other hand, to develop additional market potential worldwide under its own name with its standard and niche market strategy. In-house manufacturing in our different factories will also enable us to considerably improve our own value creation depth, as well as improving logistics, thus ultimately offering our customers greater flexibility and shorter delivery times.

### Which connectors and cordsets will be affected by this?

The entire product range is going to be included in the Turck portfolio and will be manufactured by us. In this way, every Turck sensor and every further module can be connected with the company's own cable. The corporate design – the black grip with the yellow ring – will naturally play a significant role in terms of brand recognition. In a first step we have launched this year two product lines – the Economy Line and Extended Line. Most applications can be served with the stan-

dard connection and extension cordsets in M12 and M8.

### Which regional markets are you targeting?

In the North American market Turck's market leadership includes the connectivity sector. We now also want to achieve this success in Europe, South America and Asia – in this case, particularly in China where we are represented by our own subsidiary in Tianjin. For this we are using standard connector solutions on the one hand, but also customized solutions on the other.

### How do the requirements of the markets differ?

The key differences are in the individual regulations and standards such as UL, CCC or Goost. In Europe, for example, the so-called PUR cable (polyurethane) is often used, while in the USA TPE cables (thermoplastic elastomer) are used for similar applications. These are flame-retardant but do emit toxic fumes. In Asia on the other hand, certified cables or even the characteristics of the connector solutions only play a secondary role – the key requirement is rather for the function to be fulfilled at an attractive price.

### How is it possible to stand out from the competition in the connectivity business?

By offering a comprehensive portfolio from M8 standard to M40 power connectors. This hardly sounds spectacular but is not offered in this way by any of our competitors. And naturally with short delivery times – not only with standard solutions but also with special customer solutions. What we have learned and practiced in the USA market, we now want to implement worldwide. We will also expand the customized business for our customers.

### What kind of innovations are there in the new connectivity product line from Turck?

In this range, the innovations primarily focus at present on the optimization of production processes and the producibility of the individual assemblies and finished parts. However, we are currently working on the development of our own molded connectors and the associated accessories such as junction boxes and integral connectors in the Power range up to M40 for 600 V/40 A, which are suitable for use in logistics and conveying systems, as well as for mobile automation. ■



“Today connector/connectivity products are a fundamental and strategic element of Turck's integrated automation strategy.”

**Oliver Merget**



“What we have learned and practiced in the USA market, we now want to implement worldwide.”

**Oliver Merget**



**Author** Inka Krischke is an editor for the technical journal Computer & Automation

**Web** [www.computer-automation.de](http://www.computer-automation.de)

**Webcode** more21230e

# All Around Carefree Pack

Turck has developed its first 2 x 360° inclinometer that can be set individually by the customer for any application

**T**he operating principle of an inclinometer is based on the detection of all acceleration forces acting upon it. This measuring principle is like dropping a weight on the end of a string, by which a mass is aligned according to the gravitational field. This can involve the use of a mechanical pendulum, a bending beam or a liquid – as is the case with a bubble level. However, like when dropping a weight on a string, the pendulum not only reacts to accelerations but also to vibrations and shock. These factors interfere with the inclination measurement.

## Interference factors

The physical principles at play in the process, i.e. the inertia of the pendulum, are the reason why acceleration and vibrations can affect the measuring result. In

order to eliminate this error source, filters are used to mask out particular frequencies. The disadvantage of these preset filters is the fact that they can restrict the application range of a sensor. Different inclinometers are required for the different vibration frequencies of plants or vehicles, which complicates procurement and stock-keeping.

Even the zero setting of the sensor at the factory is often unsuitable in many applications if the sensor cannot be fitted on a 0° plane. In such cases, the customers have to order specific zero settings of 10°, 20°, -10°, -20° etc. or find a mechanical solution to adjust the sensor into the 0° position.

## Individual parameterization on site

Turck has developed the B2N-360-Q42 inclinometer, for which the customer can set every relevant parameter

New freedom: Unlike all comparable solutions, Turck's 3D inclinometer is not restricted to a maximum measuring range of  $\pm 85^\circ$



**Webcode** more21270e

**Author** André Brauers is product manager for linear and rotary position sensors at Turck

on site: this includes zero point, switch points, switch window, output signal, as well as vibration, acceleration or shock filters. In order, for example, to mask out machine vibrations, the vibration frequency of a machine is measured with the inclinometer, and the filter is then set specifically for this frequency. This filter is then used to output a cleaned inclination signal. Accelerations and shock can be calculated from the signal in the same way. The user sets their own zero point in similar fashion. The customer mounts the sensor in a way permitted by the application and then sets the zero point accordingly.

### 3D MEMS technology

The new inclinometers from Turck are based on 3D MEMS technology, with MEMS standing for “micro-electro-mechanical systems”. The core of the design is a micromechanical capacitive sensor element consisting of several adjacently positioned plate capacitors with a fixed and moving plate. If the sensor is moved or brought out of the perpendicular position, the plate moves and the capacitance changes.

The sensors operate on spring mass systems, the springs are made from silicon elements only a few micrometers wide. The mass is also manufactured from silicon. Any deflection caused by movement or tilt between the spring-loaded elements and the stationary reference electrodes produces a change in the electrical capacitance measured.

### 360° on two axes

Besides the parameterization function, the B2N-360-Q42 offers the user another benefit: It is the first sensor ever that enables full 360° detection in two axes. Although this is actually only required in a few applications, it can also be used in applications where sensing up to  $\pm 90^\circ$  is required on two axes. Traditional MEMS inclinometers offer at most  $\pm 85^\circ$ . The measuring range can be set to the specific requirements via the IO-Link interface, enabling an output signal with a higher resolution. Even if not every application requires the full functionality, the B2N-360-Q42 gives the customer a sensor model that allows inclinometer measurements to be implemented in a wide range of application fields.

Tunneling machines represent a typical application, in which precise information about the position of the machine is required. The greatest problems with these machines stem from the vibrations and the fact that in many cases the sensor cannot be mounted horizontally. With the B2N-360-Q42, the customer measures the machine vibration and then masks out this frequency precisely. The sensor can be mounted in almost any position. As it has a full detection range of 360° on two axes, the zero point is set after mounting.

Apart from the specific application-related benefits, the sensor is particularly useful for customers who have to use different models of inclinometers for different applications. Thanks to its IP69K protection, the new Turck sensor is ideal for virtually every application. This simplifies logistics and maintenance. In the event of a



**Application example of a tunneling machine: The B2N-360-Q42 measures the vibration of the machine and then masks out this frequency precisely**

sensor failure, a device can be replaced in an instant since the parameters are stored in the controller. These parameters can be copied directly to the new device via IO-Link.

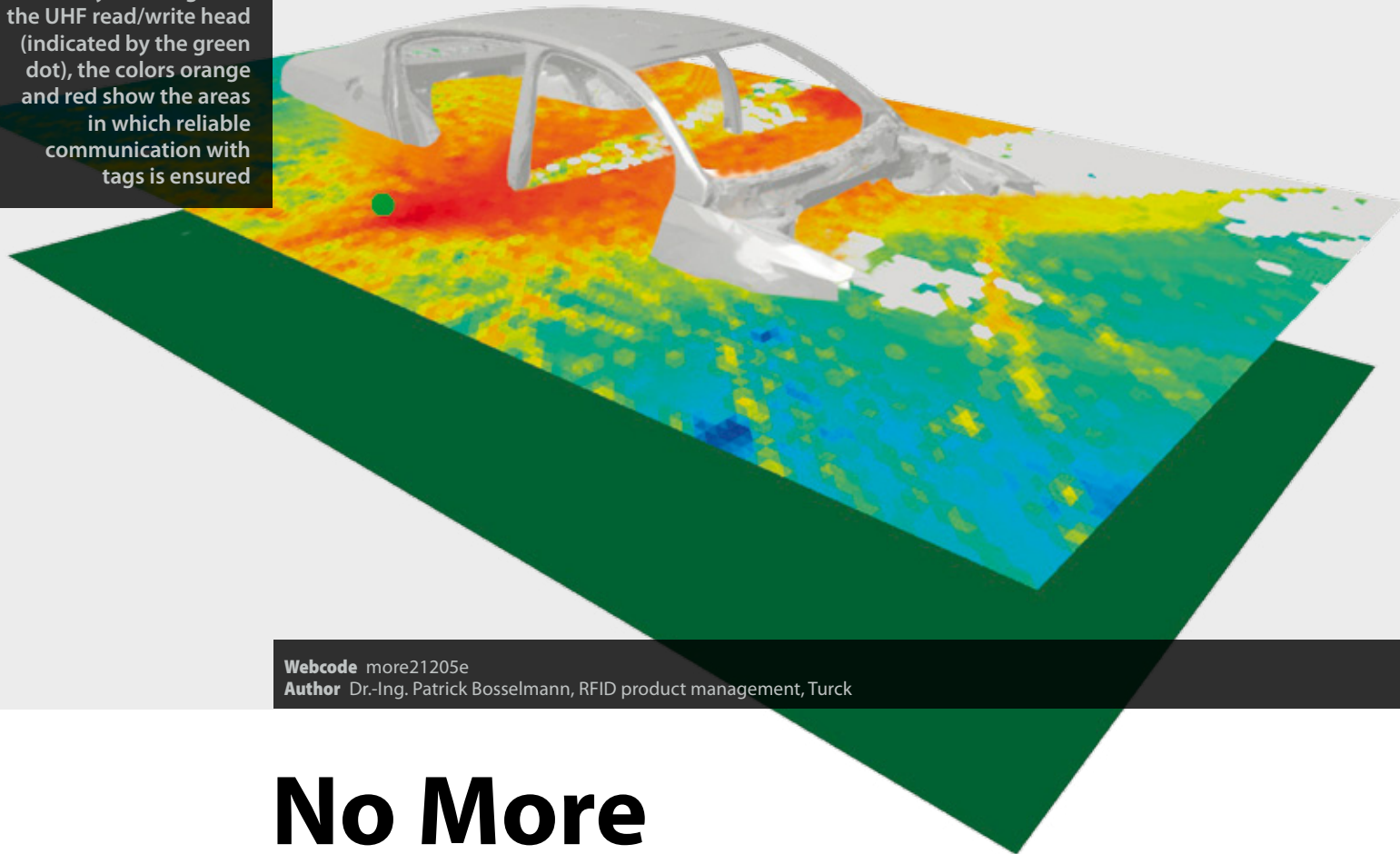
### Two variants

Turck offers two variants of the B2N-360-Q42: In addition to the industrial variant for the temperature range from  $-25$  to  $+75^\circ\text{C}$ , which is suitable, for example, for inclination measuring on solar panels or robots, a variant is also available for utility vehicles and construction machinery, which was developed to e1 specifications. This sensor is run with the standard vehicle on board power supply of  $8\text{...}30\text{ V}$  and is resistant to extreme temperatures from  $-40\text{...}+85^\circ\text{C}$ , as well as other stresses involved with the use on utility vehicles. The output signals of both sensor variants can be defined individually as required within the standard signal ranges of  $0\text{...}10\text{ V}$  or  $4\text{...}20\text{ mA}$ . All parameter settings are made via the IO-Link interface. ■

### Quick read

With the B2N-360-Q42, Turck is offering the world's first 3D inclinometer that offers a full 360° measuring range on two axes. The sensor can be parameterized individually in the field via IO-Link, from the  $0^\circ$  position to the measuring ranges to the output signals. The new sensor solution enables customers to not only go beyond the  $\pm 85^\circ$  range limit of existing solutions, but also to cover virtually any application field with a single model.

Simulation example of a car body: Starting from the UHF read/write head (indicated by the green dot), the colors orange and red show the areas in which reliable communication with tags is ensured



**Webcode** more21205e

**Author** Dr.-Ing. Patrick Bosselmann, RFID product management, Turck

# No More Trial and Error

A new simulation software based on the ray tracer algorithm enables Turck to calculate and plan complex UHF-RFID applications

One of the greatest challenges in planning and installing RFID solutions in the UHF frequency band (860...960 MHz) is finding the ideal locations and operating parameters for the read/write heads. As the ranges in this frequency band are considerably higher than the HF band, interference in the immediate surroundings may cause the tags to be read incorrectly. The actual range of a UHF read/write head in a specific customer application may therefore differ considerably from what is achievable in a laboratory setup.

In reality, the propagation of the radio waves depends on how they are reflected or shielded by walls, ceilings and other objects. Metals reflect particularly strongly, which may lead to superimposed waves (interference) – depending on the application. This interference can have a positive or negative effect on the accessibility of a tag. During an application process, ambient conditions may also have an effect on RFID performance, resulting in tags that may suddenly become inaccessible or are accidentally addressed due to the stronger or weaker reflection behavior.

If several read/write heads are used simultaneously in a UHF application, such as along an assembly line, the probability of interference is also increased due to the unsynchronized parallel operation of these transmission sources. In short: Most industrial applications are too complex to precisely predict whether a UHF-RFID tag will be addressable in read or write mode all the time.

## Simulation instead of gut feeling

Present day prediction techniques for UHF-RFID applications are based on estimates, empirical values and, to some degree, gut feeling. System planners ultimately have to examine their assessment of a UHF installation with a test system in the specific application. In order to make a reliable prediction, production processes have to be interrupted, antennas installed and, if necessary, measuring devices have to be positioned. The tests also require a great deal of time and expense. If the results are negative and tags can not be read (no reads), or are reached incorrectly (false positive reads), often a



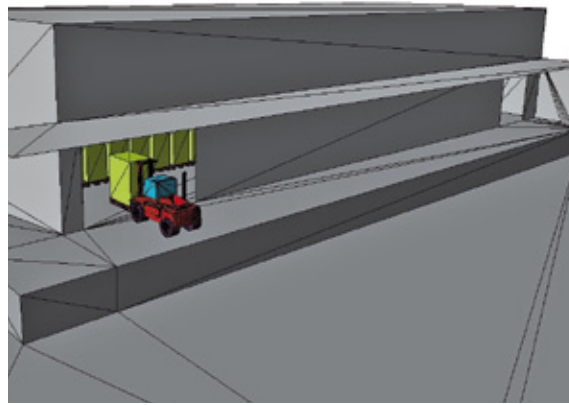
tedious trial and error search for the perfect location and the optimum operating parameters of the UHF antenna has to be carried out.

By making calculations for UHF-RFID applications with ray tracer software, Turck can eliminate this uncertainty for customers. The software calculates the propagation of UHF radio waves taking complex environmental conditions into account. It is based on the "ray tracing" algorithm, which is derived from the calculation of virtual, spatial scenes for graphics tasks. The radio wave simulation provides information about the supply of passive RFID tags with electromagnetic power in a predefined spatial environment.

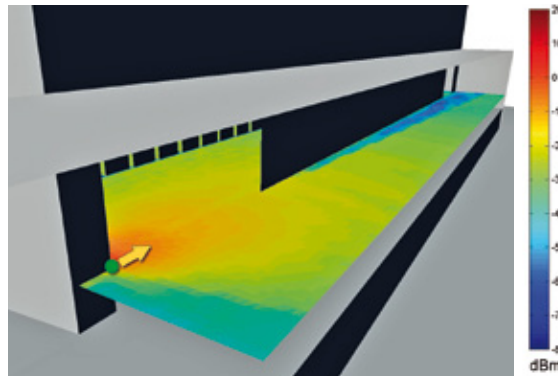
All relevant operating parameters are taken into account in a ray tracer simulation. The most important elements are the size of the building concerned, with precise consideration given to its rooms, gates, walls and other objects such as conveyor belts, fork lift trucks, machines or shelves. Besides the geometry of the room and the arrangement of its essential objects, its material properties must also be known in order to make an exact calculation and define reflection and transmission values. Other geometric factors include the positions of the RFID read/write heads and the areas of the tags to be detected. Electrical operating parameters such as transmission power, antennas used and polarization properties are also defined.

In this way, it is possible to create and simulate an entire UHF application in a three-dimensional model. All the physical effects of the ray optical propagation, such as attenuation, reflection and polarization flow into the calculation. The transmission paths found between UHF-RFID read/write head and tags are then added together in phase (superimposed) in order to produce a realistic interference pattern. The finished calculation makes it possible to determine the strength of the RF output received by each RFID tag in the application from the UHF antenna, whether this output is sufficient for operating the tag, and whether its return signal will also reach the read/write head without any interference. The result of the simulation is a two-dimensional, colored and scaled representation of the UHF-RFID link between the read/write head and the tags. This directly indicates the areas where tags can be reached with a radio frequency, taking all the critical constraints of the application into account.

The simulation result provides answers to questions that could previously only be answered with the time consuming installation of a test application: Where in the room is the best location for a read/write head? How can the reading of tags from other areas in the installation be prevented? What effects do objects that move like fork lift trucks have inside the application?



The measuring of the environment for a UHF-RFID application including the materials in place is the basis for simulation with the highest possible precision



The image shows the distribution of radio waves at the height of the read/write head fitted on the left-hand door frame; UHF-RFID communication with the tag is possible from around -15 dBm upwards

## Predictions create customer benefits

These questions can be answered faster with the help of a computer than completing the appropriate tests live on site. Answers to these questions and the visualization of radio wave propagation for UHF-RFID applications are the central benefit for Turck customers planning a UHF-RFID system. This increases planning security within the scope of the system evaluation and feasibility analysis.

Although the work required for the ray tracer modeling and the simulations cannot be ignored, the benefits they offer, particularly with complex installations, far outweigh the effort required, since different plant installations can be examined with greater flexibility and speed. During the subsequent application field tests it is usually possible to determine the almost final operating mode already with the first attempt thanks to the ray tracer results gained beforehand. This reduces the time and effort required for the live test phase and minimizes the trial and error interventions in existing processes on site. The ray tracer therefore considerably speeds up the planning of complex UHF-RFID applications. ■

### Quick read

The simulation software enables Turck to calculate the range of UHF antennas in specific industrial applications and provide better advice than before to its customers in the installation of a UHF application. The simulation results quickly determine the ideal location for UHF-RFID read/write heads in order to exclude both "no reads" and also "false positive reads".

# High-Speed Measuring

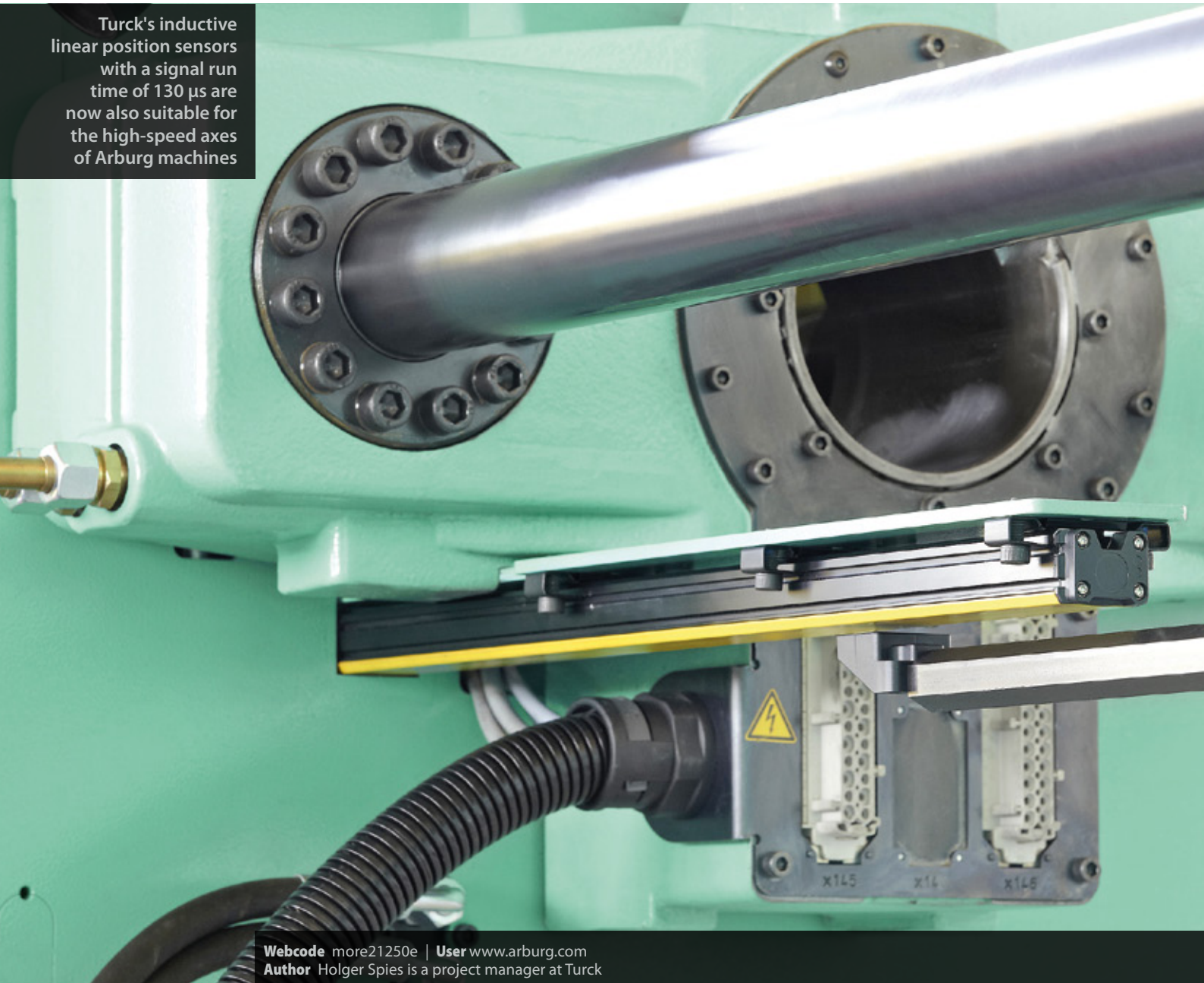
In conjunction with Arburg, Turck has further developed its LI inductive linear position sensor into a genuine high-speed linear position measuring system for motion control

**W**hen Karl Hehl developed the first injection molding machine for his own use in 1954, he could not have guessed that, together with his brother Eugen Hehl, he would develop the Arburg company for the next 60 years into one of the leading suppliers worldwide of plastic injection molding machines. Today, more than 1,800 employees in the Swabian town of Lossburg produce the world renowned "Allrounder", machines that are tailored individually with different drive concepts for the customer application at hand. Besides hydraulic machines, the

family-run business also offers electrical machines and hybrid variants that combine both drive concepts.

At Arburg, the optimization of injection molding machines at critical points in step with actual practice has always been understood. The company was always able to generate new ideas to ensure the long term development of injection molding worldwide. One example of this is the Allrounder Edrive series, which Arburg offers as an entry model for electrical injection molding applications. The main axes for injection and metering, as well as for opening and closing the mold,

Turck's inductive linear position sensors with a signal run time of 130  $\mu$ s are now also suitable for the high-speed axes of Arburg machines



**Webcode** more21250e | **User** www.arburg.com  
**Author** Holger Spies is a project manager at Turck

are driven in the machine with servo-electric drives instead of hydraulically. This not only makes the axis movements completely independent of each other but also makes them more precise than in hydraulic machines.

Arburg uses the real-time Ethernet Varan bus for communication in the Edrive. "Our customer wants a robust and reliable machine. By changing to the real-time Ethernet system, we are able to further improve the maintainability of the machine," Werner Faulhaber, head of electrical engineering development at Arburg, explains the approach.

## Conventional solutions are not enough

Another aspect of Faulhaber's approach to the development of the machines applies to the sensors. Although the magnetostrictive linear position sensors primarily used on the electrical axes offer non-contact and wear-free measuring, "the performance of magnetostrictive sensors is not fast enough for the dynamic axes of the Arburg machines," Faulhaber explains. As the magnetostrictive measuring principle is based on the run times of structure-borne sound, the sensors have a comparably long signal run time. Today, magnetostrictive sensors with optimized run times and short lengths can reach an output rate of up to 4 kHz. Normally however, this is more likely to be 1 kHz. The propagation speed of the torsional wave of the waveguide is around 3,000 m/s, which means that the wave needs more than 300  $\mu$ s for a measuring length of 1,000 mm. The latency time of the electronic circuit then has to be added to this time. The run time and the output rate therefore depend on the measuring distance and the electronics – the greater the distance, the longer the signal run time of magnetostrictive sensors.

Some magnetostrictive sensors try to avoid the long signal run time with a prediction mode. They predict future measured values that occur between real measurements and can achieve output rates of 10 kHz at the interface. However, these types of systems only make sense on axes with an almost constant speed. The injection axis of the injection molding machine in particular requires a very dynamic position control. This axis has the most demanding control requirements as it is responsible for forming the molded part and therefore the quality of the final product. Magnetostrictive sensors, even with a prediction of the measured values, are out of the question for the injection axis of Arburg machines.

Today Arburg also uses a potentiometric linear position sensor in its hydraulic injection molding machines. The measuring principle enables short signal run times and offers the resolution required to measure very fast axis movements in real time. The speed of the potentiometric linear position sensors is only limited by the mechanical design and the signal processor. As with all analog systems, however, the resolution depends on the length. In addition to this is the fact that potentiometers are wear parts: "After

millions of cycles, the original degree of protection to IP54 of the potentiometers is no longer ensured. This means that water is likely to penetrate the sensor during a tool change, if for example a pressurized cooling tube is pulled out," Faulhaber qualifies.

"For a long time I had been in search of a non-contact and wear-free system that would achieve the performance that is possible today with a potentiometer. I haven't found any other system than the LI inductive system from Turck, as its accuracy and resolution are totally independent of the measuring length. Although there are other inductive sensors on the market, the resolution on these sensors depends on the length. As they are purely analog systems, these sensors are also unsuitable for conversion to a digital interface."

## Inductive measuring offers a solution

During the course of this search, Faulhaber drew up specifications that defined the requirements for a linear position sensor for use on the high-speed axes of the machines. Five requirements in particular had top priority: The sensor has to achieve a real output rate of at least 5 kHz, it must be contact-less, robust and wear free, and must be able to communicate via the Varan real-time bus. During the search for a supplier, Turck's LI inductive linear position sensor drew the attention of the Arburg specialists. With its non-contact and magnet-free resonator measuring principle, the IP67 sensor combines the performance and magnetic field immunity of a potentiometer with the robustness and wear-free design of a magnetostrictive sensor. Due to its operating principle, the LI is immune to external magnetic fields.

However, the output rate at that time of 1 kHz was insufficient for measuring the high-speed injection axis of the Arburg machine. "The physical measuring principle did not, however, prevent this," Faulhaber noted. "The Turck sensor has the potential to output the measured value faster. Unlike a magnetostrictive sensor, it is not limited by the measuring principle but only by the electronics." Besides precise and highly resolved measured values, motion control also requires extremely fast measured value calculations and corresponding output rates. In short: The most accurate measurement only has any value if the measured value can be provided fast enough at the sensor output. The LI sensors were not originally designed for closed-loop control tasks. However after an inquiry



“For a long time I had been in search of a non-contact and wear-free system that would achieve the performance that is possible today with a potentiometer. I haven't found any other system than the LI inductive system from Turck as its accuracy and resolution are totally independent of the measuring length.”

Werner Faulhaber,  
Arburg

### Quick read

As a world-renowned specialist for plastic injection molding, Arburg has always understood how to further optimize injection molding machines at the critical points in step with actual practice. This is also the case with position measuring. As conventional position sensors could no longer meet the demanding requirements, new solutions were needed that guaranteed a constantly high resolution regardless of measuring length. In Turck's LI inductive linear position sensor, the specialists at Arburg found a solution that today can meet all their requirements.



**The injection axis of the injection molding machine requires a very dynamic position control – the performance of magnetostrictive sensors is not sufficient for this**

from Arburg, Turk decided to use the potential of its measuring principle and make the LI series fit enough for high-speed positioning. The new high-speed linear position sensor, that could meet the demanding requirements of the customer, was developed in a 16-month pilot project involving the close collaboration between the developers at Turck and the Arburg specialists.

The Turck inductive linear position sensors have a signal run time of 130  $\mu$ s, which is considerably shorter than the 200  $\mu$ s required by Arburg. The challenge was to enable the signal processor to achieve an output rate of 5 kHz. For this Turck uses a new and more powerful generation of signal processors. A close adaptation of the front end of Turck's sensor to the Varan interface of Arburg allows a particularly slimline architecture of the entire system. Signal linearization and

synchronization, as well as device profile and interface definition, were fully implemented in an FPGA module (Field Programmable Gate Array). "The working collaboration with Turck was excellent and was definitely anything other than ordinary," Faulhaber emphasizes.

As the new LI sensor is now fit for motion control tasks, Arburg is using it on the high-speed axes of the electrical machines. However, the sensor could also be used for distance measurement on hydraulic axes. The design engineers benefit from the absolute magnetic field immunity of the sensor. Magnetostrictive sensors frequently used on hydraulic axes have to be fastened with aluminum components. They also have to be protected from nearby electromagnetic fields which corrupt the measuring result. "The Turck linear position sensors with the inductive measuring principle can be fitted without any problem close to strong fields or electromechanically actuated valves and valve coils," Faulhaber explains and also appreciates the compact design of the LI: "The low housing style with extremely short excess lengths is very convenient for our designers."

#### ► Reducing contouring error

The delay caused by slow sensors in high-speed applications is known to machine builders as "contouring error". If a moved object reaches a defined setpoint, the sensor detects it and outputs a corresponding signal. The object continues to move in the time between the detection and the signal output, and this results in contouring error. As result, the faster a body moves, the greater the contouring error. Conversely, the faster a sensor outputs the measured value, the smaller the contouring error. The important manipulated variables to minimize contouring error are therefore the output rate and the signal run time of a sensor. The output rate is the frequency at which a sensor can output a measured value. The signal run time is the time it requires to calculate a new measured value. It makes no sense to output a measured value before a new one could be calculated, and so the signal run time should be less than the output rate of a sensor.

#### Standard variant with SSI interface

It wasn't just the technical aspect of the collaboration that worked well. "A key factor in the success of the project was also the active engagement of Turck sales specialists who seriously promoted the project in their own company," Faulhaber says. Turck recognized early on that there were no solutions on the market for motion control applications and therefore pushed this project vigorously. And so this collaboration not only produced the customized solution for Arburg. The use of the resulting synergies also produced a standard product with an SSI interface for series production. Turck's LI inductive linear position sensor is therefore an attractive solution for a wide range of motion control applications. ■

# rfid ready®

[www.rfid-ready.de](http://www.rfid-ready.de) | [www.rfid-ready.com](http://www.rfid-ready.com)



Your Source for RFID Technology News

# Perfectly Assembled

The assembly systems with parallel arms from Möve-Metall are equipped with Turck's inductive RI angle sensors to ensure that screws are inserted exactly to specifications

**P**oka Yoke is a Japanese concept that stands for "mistake-proofing" or "avoiding inadvertent errors". The term describes the ongoing production trend of excluding errors already in the production process, instead of looking for them after assembly through the implementation of complex quality controls. With the poka yoke principle, faults are prevented by making it as difficult as possible for the production worker to carry out their working steps incorrectly.

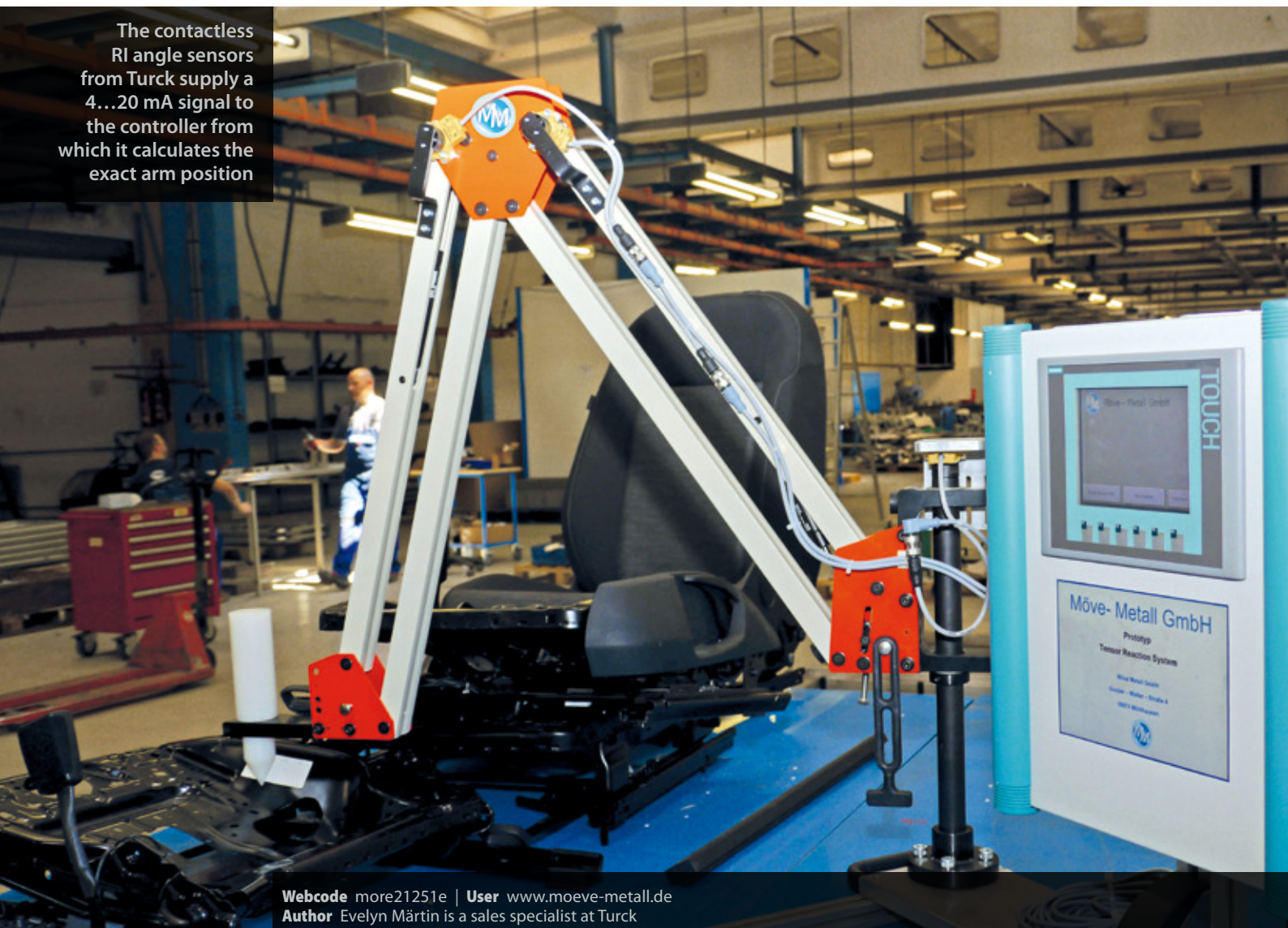
The US car parts supplier, Johnson Controls, a leading company worldwide in the supply of car seats, roof lining systems, door panels, dashboards and electronics for vehicle interiors, also follows this principle in its production processes. With car seat production, for example, this involves the following specific requirements: it must be ensured that each component is fitted to the

seat in the correct order, with the correct screw or rivet, the correct tool and with the correct amount of force.

This requirement is implemented using assembly devices with parallel arms or other so-called reaction arms supplied by Möve-Metall, in Mühlhausen. The company based in Thuringia, Germany, was formed out of the former VEB Möve Factory, has 50 employees and develops, designs and produces special machines, equipment, plants and, in particular, assembly and testing equipment for car parts suppliers. Möve-Metall developed a parallel arm with position detection for use in assembly processes. This enables the position measuring of the screw and rivet processes and reliably prevents incorrectly assembled parts.

"In order to screw in components, the car seat is fixed in positioning elements," Michael Zimmermann,

The contactless RI angle sensors from Turck supply a 4...20 mA signal to the controller from which it calculates the exact arm position



**Webcode** more21251e | **User** www.moeve-metall.de  
**Author** Evelyn Martin is a sales specialist at Turck



**With a resolution of 0.09°, Turck's RI sensors provide more than sufficient accuracy**

technical manager of the company, explains the principle. "A screwdriver device is clamped on the parallel arm. The operation is based on the principle of the parallelogram and ensures the precise and repeatable positioning of the screwdriver." The position monitoring at the three joints of the parallel arm is provided by Turck inductive angle sensors. A beneficial spin-off of this is the fact that the forces involved with the assembly processes can be measured as well. This eliminates the effect of reaction torques on the user. If positions closely situated together have to be identified, the inductive RI angle sensors are located at all three joints of the arm. If positions far apart from each other have to be identified, a single angle sensor on the swing arm of the parallel arm is enough.

The parameters for each screw set are stored in the controller. If the operator wishes to screw in the first screw, he guides the arm to the appropriate position. The controller registers the correct position and releases the power or the compressed air for the screwdriver (first OK). The operator screws in the screw until the controller has registered the required number of screwdriver rotations (second OK) and the required torque has been reached (third OK), which guarantees that the screw is seated correctly. Only when these three OKs have been registered by the controller can the next screw be fitted: If the sequence was programmed beforehand, it is only possible to fit the screw that was stored in the controller as the second screw.

### Tolerant sensors

"The torque monitoring has been implemented here for a long time," Zimmermann explains, "but the position monitoring is relatively new. This offers an addi-

tional level of safety for the assembly process and is also easy to implement with the inductive angle sensor. A great benefit of the Turck sensor is its non-contact operation, thus requiring no mechanical connection to the positioning element. The four millimeter tolerance for the offset of the positioning element helps us considerably with the assembly process: we no longer have to fit so precisely and protect the sensor from contact, since slight impacts do not impair measuring."

Another benefit of the RI angle sensor is its immunity to magnetic fields and metal environments. The majority of other sensors on the market either have a mechanical connection between the rotary encoder and the sensor, or are susceptible to magnetic environments produced by large motors or welding equipment. The immunity of the sensor is based on its innovative resonant circuit measuring principle which eliminates the need for a magnetic positioning element. The resonator measuring principle from Turck uses instead an oscillation circuit that is formed by the sensor and the positioning element. The principle combines maximum precision with an excellent level of interference immunity and vibration resistance.

Another benefit of the sensors is their ease of adjustment and the setting of positions using a program developed by Möve. Zimmermann shows on the display of the Siemens controller how the mounting points are programmed. With the controller in Teach mode, he guides the parallel arm to the required mounting point and taps on the display. The controller defines the position and accepts the actual values of the three angle sensors as x, y and z coordinates of mounting point 1. Depending on how exact the position has to be defined, and the distance from the next mounting point, the user can define a tolerance window around the point.

### "Considerable benefit"

"Our assembly device is simple and reliable to use for today's customers. For us also, the use of Turck angle sensors is a considerable benefit. We previously designed the parallel arm with an optical length sensor between the two arms in order to also detect the arm position. However, the optical sensor was considerably heavier to fit and was more susceptible to faults during operation," Zimmermann summarizes. ■

#### Quick read

With their assembly and testing devices, Möve-Metall GmbH in Mühlhausen primarily supports the car parts suppliers in fault-free production. Wherever a manufacturing process requires manual interventions, the machines and devices from Thuringia in Germany ensure precise assembly conditions. This also includes the screwing in of car seats using various assembly devices with parallel arms, for which the arm positions are detected with Turck's inductive RI angle sensors.



“A great benefit of the Turck sensor is its non-contact operation, thus requiring no mechanical connection to the positioning element.”

**Michael Zimmermann,  
Möve-Metall**

# All Around Protection Without Blind Zones

Intronyx protects robot cells with EZ Screen safety light curtains from Banner

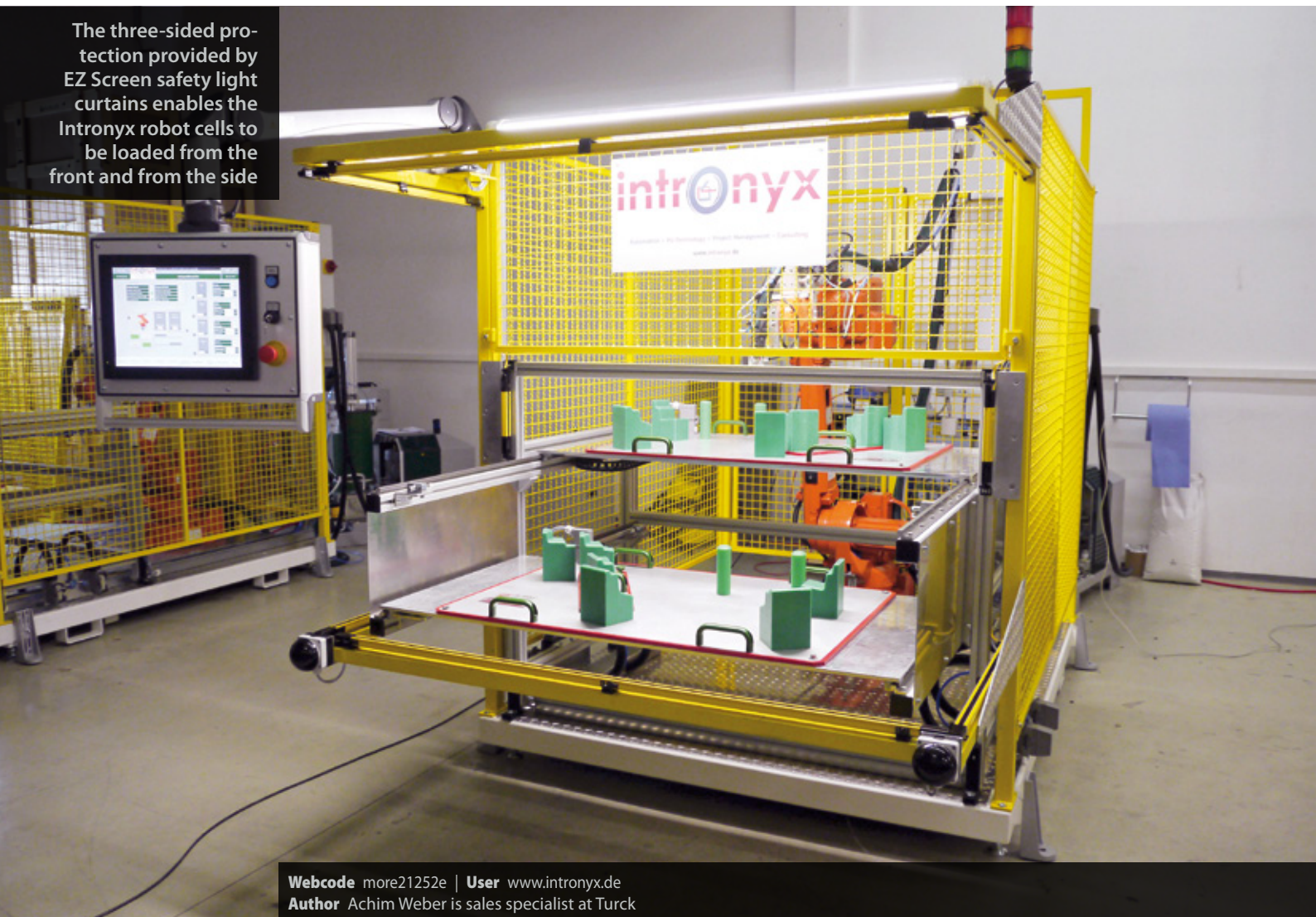
Intronyx GmbH & Co. KG is a company based in Neutraubling, Germany, that offers tailored complete solutions for industrial automation. The portfolio on offer ranges from consulting and design to engineering and implementation, right through to commissioning and onsite optimization. The small and yet successful company includes several well-known car parts suppliers, machine builders and food manufacturers.

"Since the founding of the company in 2003, we have guaranteed a fast and flexible response to our customers' requirements based on our technical closeness," Alfred Kautzki, one of the three managing directors and responsible for the technical area, reveals

the secret of the company's success. "We offer a wide range of solutions for all aspects of machine engineering, with a focus on machine and plant optimization including programming," Kautzki explains.

One of the last orders completed by the eight-man team was the design and turn-key implementation of four robot cells for a leading car parts supplier. The order required adhesive to be applied in the production process automatically and as efficiently as possible. The cells were used for bonding door components from pressed wood chip material with reinforcements. Intronyx designed, produced and fully programmed the robot cells in order to ensure the application had a defined amount of adhesive. The cells have been given

The three-sided protection provided by EZ Screen safety light curtains enables the Intronyx robot cells to be loaded from the front and from the side



**Webcode** more21252e | **User** [www.intronyx.de](http://www.intronyx.de)  
**Author** Achim Weber is sales specialist at Turck



a flexible design so that they can also be used to process larger parts when necessary. In the production process, the parts are first placed manually in the holder. A slide containing the part is then moved into the cell where the robot applies the adhesive. In the next step the part is removed and transferred to a jointing unit where all of the components are pressed together until the adhesive has hardened.

### Protection on three sides

While these types of cells are normally loaded from the front, in this case the customer wanted the possibility to insert and remove parts from the side. This prevented the possibility of a mechanical guard for the sides so that safe shutdown of these cells could only be ensured through the use of several light curtains that cover all three open sides. In order to guarantee full protection, also on the corner areas, light curtains were needed that have small blind zones and could therefore be mounted as closely as possible to each other in the corners.

"We ran through several different solutions that also cover the area over the corners. Only the EZ Screen safety light curtain from Turck could really make

an impression. With all other systems we would have had to install overlapping and therefore longer light grids," Kautzki explains. The high resolution safety light curtains from the SLPCP25 series were developed and produced by Turck's optical sensor partner Banner and consist of an emitter and receiver that operate without any blind zone. As the system is optically synchronized, no wiring is required between the emitter and receiver unit. The safety switching outputs of the receiver are directly connected to a load relay and trigger the immediate stop of a dangerous machine cycle. With two-channel monitoring of the switching device and the diversely redundant design with mutual processor control, the light curtains guarantee personnel safety category PLe acc. to ISO 13849-1.

### Cables instead of connectors

For Gerhard Korunka, managing director responsible for software and hardware, the EZ Screen models also offer another unbeatable benefit: "Even the cable outlet is optimally designed. Other systems mostly have a plug connector terminal that sticks out at the end. This is not a problem with vertical mounting since the connector can be mounted upwards. If the light curtains are mounted horizontally, however, you have a protrusion with the connector that has to be mechanically protected. With the direct cable outlet on the EZ Screen models this is implemented considerably better. Here I can route the cable directly to the side and mount devices absolutely flush. Nothing sticks out that requires mechanical protection later."

As well as the direct cable output, the light curtains also stood out on account of their simple mounting options: "The very compact light curtains and the small, well-designed brackets made our design work much easier," Korunka explains. "They are very easy to mount and adjust. As we don't have to terminate any connectors, the mounting of the light curtains was done in next to no time."

Although the Turck light curtains were not originally listed in the list of approved suppliers, Intronyx was able to convince its customers of this solution's capabilities and "win approval". Ultimately the fact that the entire cell could be designed more compactly with the EZ screen safety light curtains was also a factor. Korunka adds: "As we scan all light curtains simultaneously unlike with cascade solutions, we are able to achieve faster response times. The systems can thus be built smaller because the minimum clearance does not have to be so large." ■



“We ran through several different solutions that also cover the area over the corners. Only the EZ Screen safety light curtain could really make an impression.”

Alfred Kautzki,  
Intronyx



Gerhard Korunka was looking for protection right into the corners without any dangerous protrusions

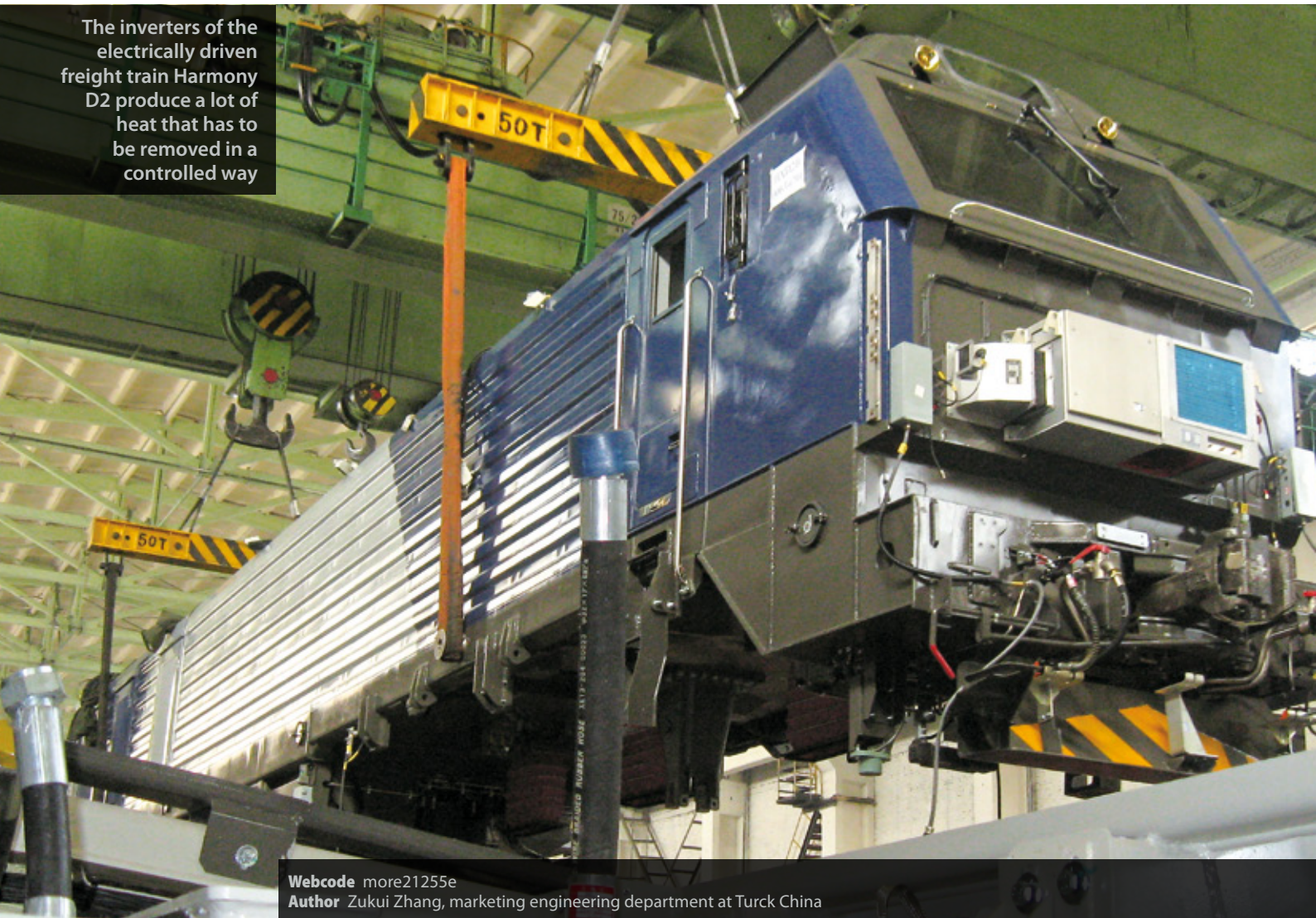


Well thought-out concept: No blind zones, integrated cable outlet and variable compact holders

### Quick read

Intronyx was given the task of designing and implementing robot cells for the bonding of car door components for a well-known car parts supplier. In order to ensure the safe loading of the cells from the front and from the sides, the company used the EZ Screen safety light curtains from Banner Engineering. The light curtains of Turck's optical sensor partner are unique on the market and could meet all requirements.

The inverters of the electrically driven freight train Harmony D2 produce a lot of heat that has to be removed in a controlled way



**Webcode** more21255e

**Author** Zukui Zhang, marketing engineering department at Turck China

# Train Watch Out!

A Chinese freight train uses Turck FCS flow sensors to monitor the air cooling in the current converter cabinets

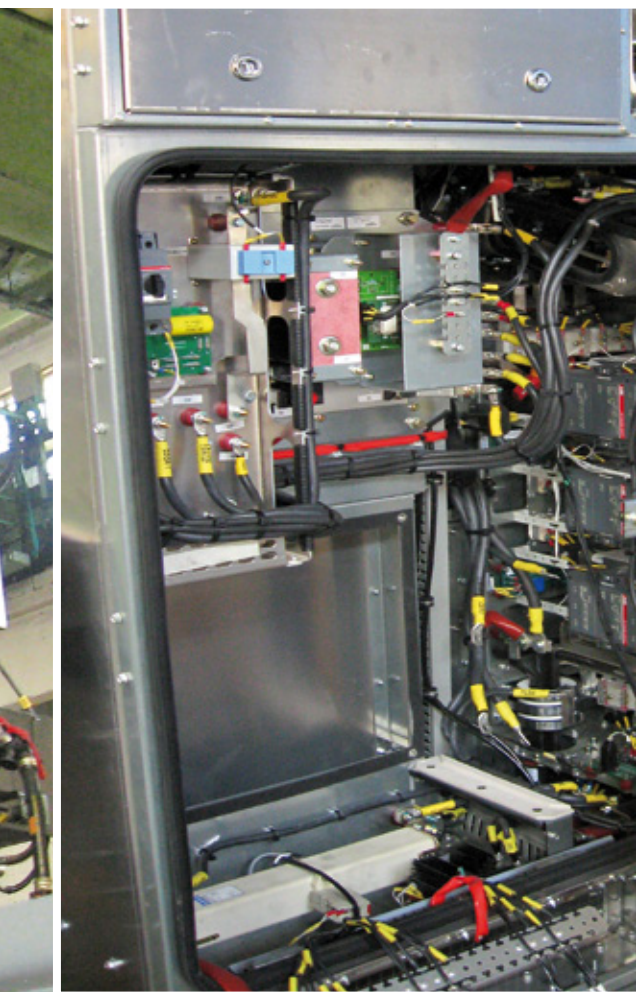
**T**he expansion of the Chinese rail network has been advanced ever since the founding of the Peoples' Republic of China in 1949. In spite of all the improvements, the rail network and the trains continue to be in need of further expansion. In this respect, powerful freight trains are at the top of the wish list. As in other areas, Chinese manufacturers are building on the proven technology of foreign partners and are developing this further for their own market. This also applies to a manufacturer of electric rail vehicles that is a leading developer in China of state-of-the-art drive technologies.

The manufacturer recently developed a freight locomotive based on the Prima BB 43700 freight train of its cooperation partner Alstom. Harmony D2 is the name of the 8-axle Chinese version of the freight locomotive with a high performance AC drive. The loco-

motive is a showcase project for the modernization of the Chinese rail traffic. Besides the microcomputer control system, the Harmony D2 also shares the high performance range of its European example. With its high shaft output and good traction, the Harmony D2 also offers a broad application range. The low operating costs of the locomotive are due in part to its ease of maintenance. Turck has contributed here with a flow sensor that monitors the reliable cooling of the converter cabinets.

## Heat dissipation in the converter cabinet

The drive power of the high performance AC locomotive is provided by a traction converter. This is a traction current converter, which is installed in the main conver-



**The compact Turck sensors even fit in the restricted space of the converter cabinets**

ter cabinet. The locomotive is also equipped with two independent auxiliary power converter cabinets. The auxiliary power converters supply power to the ancillary units such as cooling fan, water and oil pump, air conditioning unit, main compressor as well as battery chargers, heating units and other additional equipment. The auxiliary power converters are operated redundantly: one converter in normal operation and one in standby mode. With such a large number of connected loads, the fault-free operation of the locomotive largely depends on the function of the converters and the cabinets in which they are installed.

The temperature in the control cabinet rises the longer the converters are in operation. The cabinets are therefore equipped with an active air cooling system in order to remove the resulting heat. The air circulation must be monitored constantly in order to ensure that permanent cooling continues without interruption.

Problems had occurred several times with the flow sensors of another manufacturer that the customer had installed for this purpose. The sensors were not only insensitive but were also not able to compensate the frequent temperature changes that took place inside the cabinets. The sensors had misinterpreted temperature changes as a drop in the air flow and therefore

### ▶ Quick read

A Chinese locomotive manufacturer relies on Turck flow sensors for a freight locomotive. The flow sensors for gaseous media monitor the air flow in the converter cabinets for the supply of the ancillary units. Turck was able to impress the customer with a compact sensor with a male thread, which could correctly measure the flow speed even when the medium changes temperature.

often supplied incorrect measuring results. The specialists building the locomotive therefore went in search of a sensor solution that provided a steady output signal when the flow was constant, irrespective of any temperature changes. It also required a solution that could be installed in the restricted space of the converter cabinet without any problems.

### Turck solution: Aligned fitting

Turck's M18 flow sensors for gaseous media proved to be the sensor solution that could meet all the locomotive manufacturer's requirements. The FCS-M18-LIX is a compact flow sensor in a cylindrical housing with a male thread that enables it to be mounted even in restricted spaces. Although the calorimetric measuring principle used here is susceptible to temperature changes, the Turck sensor compensates for this with its special sensor design and a so-called aligned fitting: The measuring resistor and the heatable measuring resistor have to be positioned parallel to the flow direction. The aligned fitting enables the full precision potential of the sensors to be used. If the sensor was incorrectly fitted, the heated air could also cause the measurement to be incorrectly interpreted as a change in flow. With aligned fitting on the other hand, the sensor cannot be affected by temperature changes of the passing air current.

Once the FCS-M18-LIX, specially designed for gaseous media, is correctly aligned, it can fully utilize its potential. It now reliably monitors the flow with the electric locomotives in continuous operation – even when the temperature increases. The Turck sensor therefore also helps to keep the maintenance times of the locomotive to a minimum and to improve its efficiency. Turck's flow sensor also fulfills the second customer requirement on account of its compact design which combines sensor, probe and processing unit in a single housing. Sensors with a larger housing style or with separate processor units could not be installed in the conditions at hand. ■

**When the fitting of the FCS-M18-LIX is aligned, it can compensate for any temperature fluctuations**



# Good Connection

How Turck's quick disconnect connectivity products helped the University of Wisconsin-Madison's Electric Ford F150 research vehicle come to life

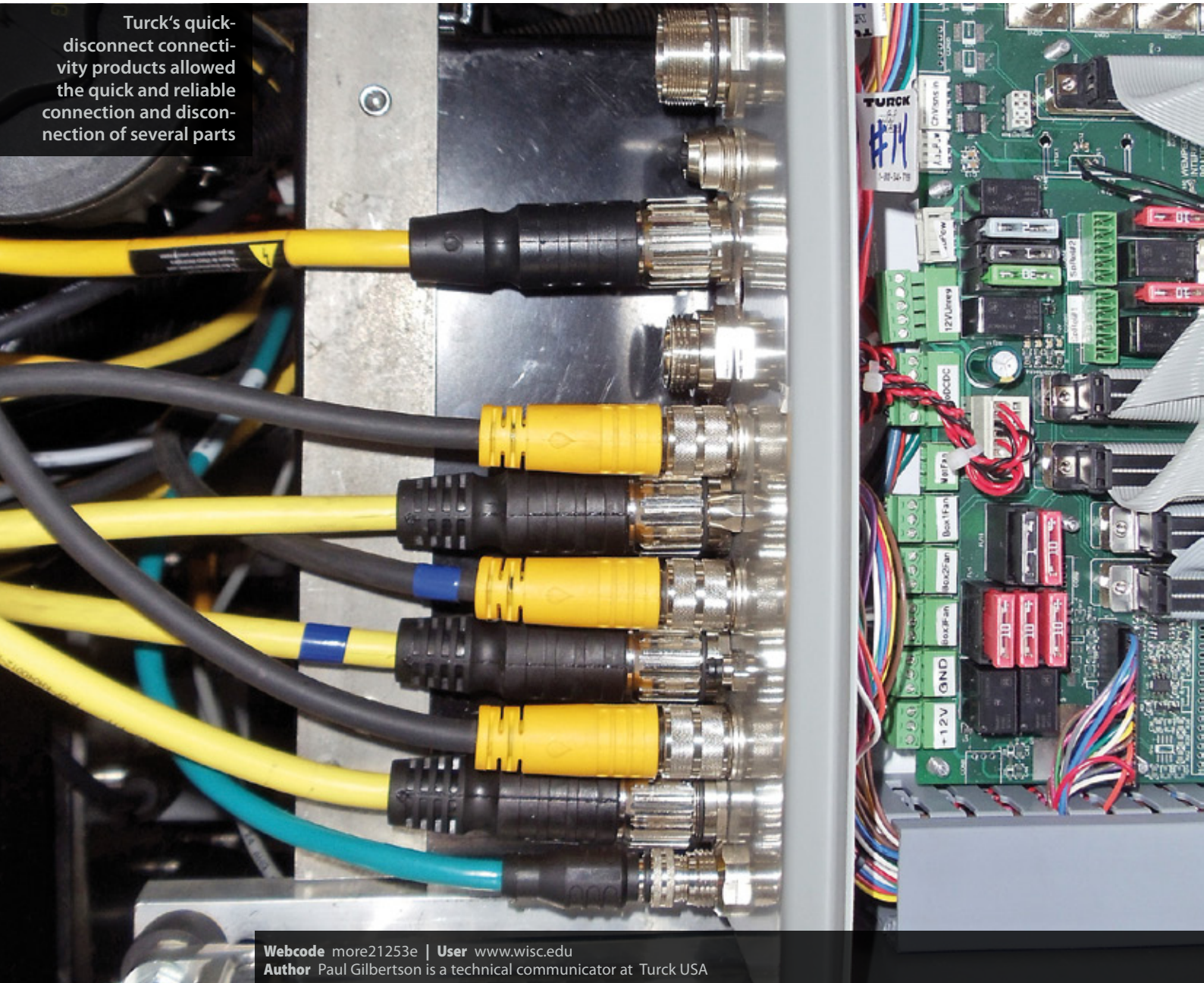
**P**hillip Kollmeyer has long been interested in building a research vehicle. He wrote his master's thesis on the electromechanical modeling of a Corbin Sparrow, a red, three-wheeled single seater electric car manufactured in California a few years ago in 2001.

For his doctoral thesis at the University of Wisconsin-Madison Kollmeyer took it one step further: he strived to build a state of the art electric research vehicle, with a modern battery pack, electric motor, and motor drive. Kollmeyer's dream vehicle included technology on par to commercialized vehicles along with a hefty

budget for advanced sensing and control hardware. The electrical engineer found support for his ambitious project at Orchid International, a metal stamping and manufacturing company, Orchid had been involved in building a prototype electric motor for a startup electric vehicle (EV) company, and expressed an interest in sponsoring a project with the university.

Orchid provided the foundation for the project – it designed and built a prototype electric motor, mounted the drivetrain, and also helped provide funds to ensure the extensive list of parts that were needed could be secured.

Turck's quick-disconnect connectivity products allowed the quick and reliable connection and disconnection of several parts



## Benefits of electric

One goal of electrifying a Ford F150 was to be able to better quantify the benefits of utilizing an electric powertrain versus the stock F150 powertrain.

The electrified vehicle has zero emissions; lower energy costs from about \$0.22 per mile to \$0.07 per mile, offers similar power to the stock vehicle while requiring a simpler, more efficient two speed gear box, and reduces brake wear through regenerative braking. If those benefits aren't enough, it is also exceptionally quiet, with the only noise coming from the battery, motor, and radiator cooling fans. As the project continues, modeling, control, and design projects will continue to explore further opportunities to improve the efficiency and reliability of the vehicle, as well as lower the cost of individual components.

## Strong support

Although Orchid provided strong support the postgraduate also took the project as an opportunity to collaborate with others. As Kollmeyer explained, "As the detailed plans were coming together, I realized I needed to find a way to connect all these systems together. At that time I remembered that Turck's range includes cabling"

Kollmeyer got in touch with Larry Jacob, Sr. Sales Engineer for Turck representative MTech, who was a key to the cabling and connectivity success of the project. As Kollmeyer describes, "I started out with an abstract block diagram of the whole vehicle, with lines connecting all the different components. Larry Jacob helped me get from the block diagram, to an actual specification for each cable in the vehicle. I really started out unfamiliar to the world of industrial cabling, and Mr. Jacobs met me personally, suggesting specific specialty cables for certain applications including Ethernet cable and power cables where they fit. Then I spent a long time with the big Turck connectivity catalog, and ended up with 34 cables providing interconnection between more than a dozen vehicle systems."

## Quick disconnect

One of the most convenient features of Turck's cables is their quick disconnect feature – basically a few minutes is all that is needed to disconnect or reconnect a set of cables. With the research vehicle continuously having components and different systems worked on, there is a need to constantly remove and reinstall parts of the system. Turck's quick disconnect connectors made what would otherwise be a major undertaking, one which for a vehicle typically involves a maze of hand assembled wire harnesses and comparatively fragile automotive connectors, a painless and easy part of the process.

Kollmeyer has taken full advantage of this feature to minimize the hours needed to complete the project. He explained the benefits as follows: "Many of the connections in our research vehicle are sensitive signal level cables, requiring shielded cabling. If I had to build



**Research vehicle: With support from Orchid and Turck Phillip Kollmeyer developed an Electric Ford F150**

all these cables by hand, it would have taken weeks, and I wouldn't be nearly as confident in their performance. And a further benefit of the Turck solution is the receptacles, which are populated with color coded flying leads making populating connectors quick and easy compared to traditional methods."

## Conclusion

With the exception of the high current battery cable, Turck provided all the cabling in the vehicle. Compared to a production electric vehicle there is an exorbitant amount of cabling, which is due to one of the research features of the vehicle – extensive measurements of component efficiency and power consumption. As Kollmeyer puts it, "Turck's quick disconnect connectors really made it possible for me to develop a reliable, water proof, prototype electric vehicle." The vehicle is now being shown at events across the country, including the 26th annual International Electric Vehicle Symposium in Los Angeles and the 1st annual International Transportation Electrification Conference in Detroit. Each show requires the vehicle to be in show worthy condition, which means many long days leading up to the show preparing the vehicle for tech savvy crowds eager to see the vehicle which Kollmeyer is proud to show. ■



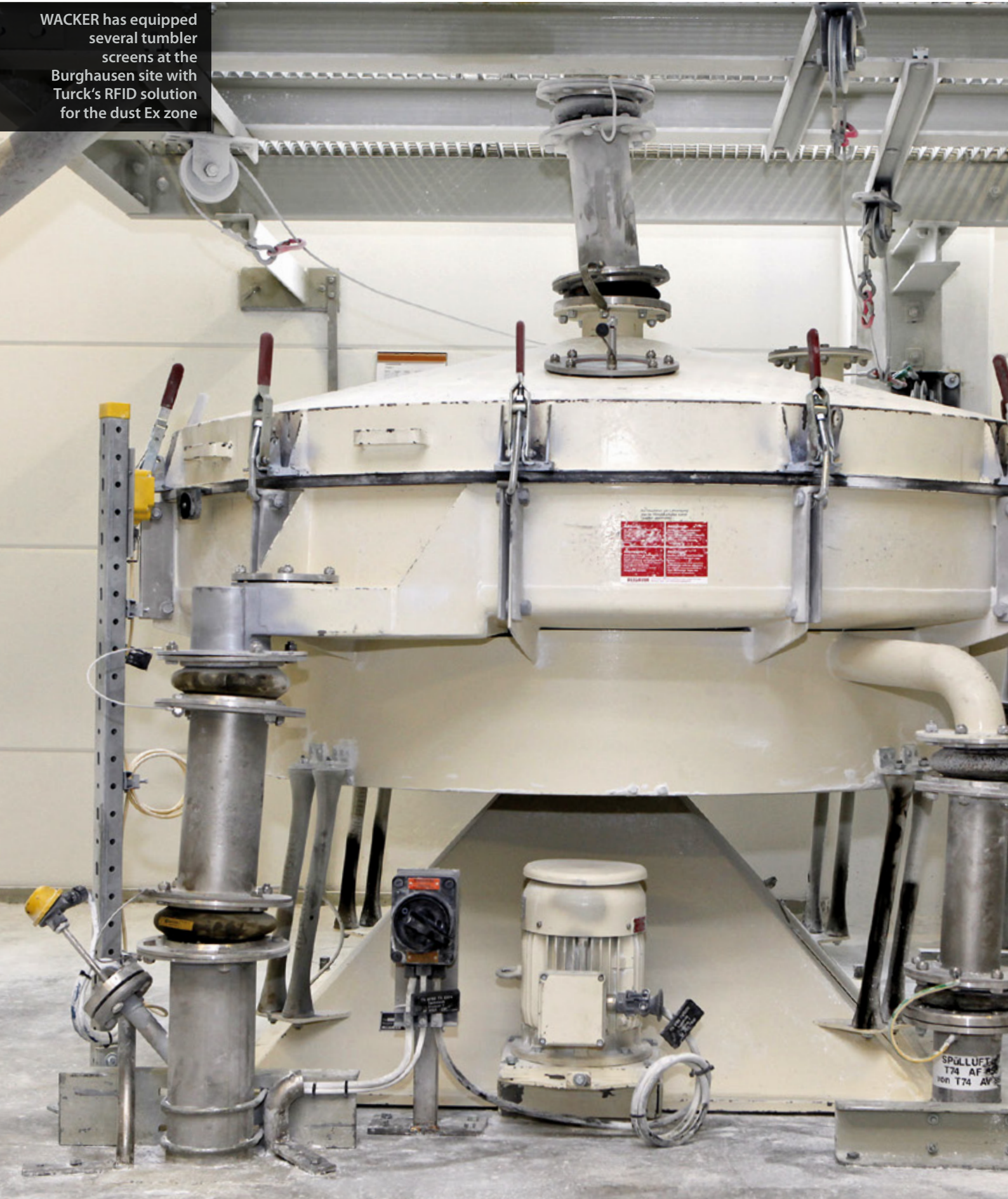
“Turck's quick disconnect connectors really made it possible for me to develop a reliable, water proof, prototype electric vehicle.”

**Phillip Kollmeyer,  
University of  
Wisconsin-Madison**

### ▶ Quick read

For his doctoral thesis in electrical engineering at the University of Wisconsin-Madison Phillip Kollmeyer developed and built an electric research vehicle. The postgraduate equipped a Ford F-150 with a modern battery pack, electric motor, and motor drive – including quick disconnect connectivity from Turck.

WACKER has equipped several tumbler screens at the Burghausen site with Turck's RFID solution for the dust Ex zone



# Safe Screening

At its Burghausen site, WACKER is using Turck's BL ident RFID system for reliable detection in its tumbler screening systems in the dust Ex zone 22

If screed is flowing well and tile adhesive is particularly flexible, it's highly likely that a WACKER product has something to do with it. The globally operating chemical company with around 17,200 employees has 25 production facilities, 20 technical centers of excellence and 53 sales offices worldwide.

The most important production site for WACKER is the plant in Burghausen, idyllically situated on the Austrian border, in the so-called 'Bavarian chemical triangle'. The chemical plant, covering a two kilometer area, employs 10,000 people in around 150 facilities, and produces thousands of different products. These products also include dispersion powders that are added to tile adhesives, plaster, screeds and other building materials so that they are given particular properties. To produce the end product, a liquid is dried in a drying tower at the end of the production process. The resulting powder then has to be vibrated through a screen before it can be packaged. This ensures that the product concerned has the required grain size.

In order to increase transparency and traceability in the production of dispersion powder, the production plant expressed the wish for the automatic detection of the screen size used in the tumbler screens. "The correct screen size was previously measured manually by colleagues in the plant," Michael Holzapfel, plant engineer responsible for electrical engineering in the Construction Polymers division, explains. "In order to exclude the possibility of human error, the screen used for each batch now has to be measured automatically. This enables us to not only guarantee the 100% quality of the ongoing process, but also to have a retrospective record of the correct screening process."

## Continuous vibration requires a wireless solution

Holzapfel soon discarded his original idea of using a coating in conjunction with inductive sensors: "The

### ▶ Quick read

Depending on the application, dispersion powder must be manufactured in different grain sizes. To ensure and document this process, WACKER in Burghausen has for the past year been identifying the mesh width of its tumbler screens with Turck's BL ident RFID system, which is also approved for use in dust hazardous areas. As a result of its good experience with this system, the company is also now equipping the first coupling stations with it.



“The Turck RFID system works so well in the tumbler screens, so that we are now expanding the system for use in our coupling stations, as dust-Ex approval is also required here.”

**Michael Holzapfel,  
Wacker Chemie AG**

screen is continuously vibrating, over almost the entire year, and so cable-based solutions are not feasible. We already have first-hand experience of this. Every month we have to replace the grounding cables of the screens in order to ensure that they don't break, even though highly flexible cables are used.”

We therefore gradually came to the idea of using an RFID solution. Due to the particular environmental conditions at Burghausen, the solution nevertheless had to be approved for use in the dust Ex zone. “Turck was the only manufacturer that could offer us an RFID system that is Ex-approved for zone 22 dust,” Holzapfel describes the original reason for choosing the system of the Mülheim automation specialist.

Up to now, WACKER has fitted four tumbler screens with a type TNLR-Q80-H1147-Ex read/write head that is approved for use in Ex zones 2 and 22. All the screens used there were fitted with a TW-R50-B128-Ex tag on which the mesh width is stored. The disk-shaped tag is fitted at the edge of the screen, directly under a strap with the optical marking of the mesh width. The read/write head reads the mesh width and passes on the data to the process control system via Profibus using one of three BL20 I/O stations.

During the course of the installation yet one other hurdle had to be overcome: “The function block supplied with the RFID system is programmed for a Siemens

S7 PLC and not for a Siemens PCS7 process control system like we use here,” Holzapfel explains. “However, our software specialists worked in close collaboration with Turck Support to quickly adapt the S7 function block so that it can now also run on the PCS7.”

### New project: coupling station

The system has been in operation at WACKER for the past year to the customer's complete satisfaction. Due to the good experience he has had with his supplier, Holzapfel has already started to tackle the next project. “The Turck RFID system works so well in the tumbler screens, so that we are now expanding the system for use in our coupling stations, as dust-Ex approval is also required here,” the plant engineer describes the next step. Around 20 targets and nine sources are to be recorded via RFID in order to guarantee the transparency of the process. For this purpose, each of the 20 DN80 hoses will be provided with a tag containing the individual hose number. Each target is fitted with a compact read/write head. When a hose is connected, the system reads the appropriate number and enables operation if it is connected correctly. Via its subsidiary mecatec, Turck is supplying the coupling station project with a ready-to-connect solution which is provided with a customized male connector and is fully encapsulated. ■



An Ex read/write head reads out the mesh width of the screen from the tag on the screen (left)



The screen data reaches the PCS7 process control system via Profibus and Turck's BL20 I/O system





Mick McCarthy monitors whiskey production with up-to-date plant data transferred to the control system via Turck's excom remote I/O system

**Webcode** more21254e | **User** www.irishdistillers.ie  
**Author** Frank Urell is the managing director of Turck's Irish agency Tektron

# Tradition and Modern Ways

In the Irish Distillers whiskey distillery, Turck's excom remote I/O proves that traditional manufacturing processes can also benefit from state-of-the-art fieldbus communication

**T**he art of making Whiskey is believed to have been brought to Europe through Irish missionary monks. Production of 'Uisce Beatha', meaning 'water of life' in Gaelic, began over 800 years ago. The knowledge of distilling spread through the Church and eventually reached beyond the monastery walls.

The Old Midleton Distillery was founded in the early seventeenth century by brothers James and Jeremiah Murphy when they bought and converted an old woolen mill. The distillery is located in the town of Midleton approximately 20 kilometres east of Cork

## ▶ Quick read

According to legend, Midleton is the birthplace of Irish whiskey. Even today, the heart of the Irish whiskey industry is still beating in this small town south of Cork. Close to the historical Old Distillery, which still serves today as a museum, the Irish Distillers Limited (IDL) produces the most famous distillates of the Irish Republic, including Jameson, Paddy and Powers. The traditional manufacturing process has since recently been supported by the latest I/O technology: Twelve excom remote I/O stations from Turck ensure the safe and transparent communication between the control system and field devices in Ex zone 1.



“The high signal density of the MT18 module rack was one of the reasons we chose excom. The hot swap functionality also impressed us, as we can now remove and fit all modules during ongoing operation – without having to interrupt fieldbus communication.”

**Mick McCarthy,**  
Irish Distillers Limited

City in the south of Ireland. The Irish whiskey industry was booming at the time and the distillery soon had 200 people employed and produced 1.5 million litres of whiskey a year. The world’s largest pot still is in this distillery holding 32,000 gallons.

In 1975, production at the Old Midleton Distillery was moved to the New Midleton Distillery which was built right next to the original one. The new distillery was built by the newly formed Irish Distillers Group. In 1988, Irish Distillers group was bought by Pernod-Ricard, and with access to their global marketing and distribution network sales for Irish Whiskey grew, with Jameson Irish Whiskey now the fastest growing international whiskey in the world.

As a result, production at the distillery in Midleton is being maximized, with expansion plans in place to increase the output potential of the plant. It is planned in the coming years to double the output production capacity of the plant. Part of these expansion plans was a full upgrade of the VAT House automation system, which has recently been completed.

### Profibus for the VAT House

The old automation system in the VAT house consisted of three ITT PLC systems, with conventional wiring via barriers to the hazardous area. Irish Distillers have previous experience of utilizing fieldbus with Profibus DP and PA networks installed elsewhere on the site, so it was not surprising that it was decided to utilize Fieldbus in this upgrade.

DeviceNet was selected for use with Motor Control Stations, and Profibus DP for communication of all field automation signals. Irish Distillers selected Turck’s Excom Profibus DP for zone 1 hazardous areas as the

best solution for the interface of the automation signals. Turck excom systems were supplied by Turck’s Irish Distributors Tektron, based in Cork, Ireland, who also provided technical advice to the project.

### High channel density and hot swap

Mick McCarthy, IDL E&I Manager for this project, selected excom over other hazardous area remote I/O vendors, “due to the high density that can be achieved in the MT18 module rack. The hot swap functionality also impressed us, as we can now remove and fit all modules during ongoing operation – without having to interrupt fieldbus communication.” Another benefit: the automatic adjustment of power from the DO40Ex digital output card regardless of the voltage and current enabled IDL to use this single type of I/O card for all Digital Output cards thereby reducing specification and design engineering.

The ease of implementing full communication and power redundancy was an obvious factor. IDL chose to utilize communications redundancy from the outset. However, they have not implemented power redundancy for the present and see that it is a big advantage that they can implement power redundancy simply by fitting an additional power supply to the MT18 rack. LED indication for every device on the rack was another feature which led to excom being selected. The Turck stainless steel field panels have a viewing window to allow the operator or maintenance engineer see the status of a card or channel without opening the door. IDL has taken this a step further by fitting a printed matrix to each door, which details the card and channel number, identifying the relative instrument tag number.



**High channel density:**  
As well as the redundant power supply, the excom module rack can take up to 128 binary or 64 analog inputs/outputs



The project size was in the region of 800 I/O, with the integration works carried out by Rockwell Engineering, Cork, using an Allen Bradley PLC. The Project required 12 new excom remote I/O stations (MT18). To ensure the maximum speed available (1.5 MBaud) could be achieved, four Turck SC12Ex segment couplers were used, providing four sets of redundant intrinsically safe Profibus segments in the field, which allowed the design engineers ensure that the maximum Profibus DP cable length was less than 200 m. The Remote I/O panel locations were selected to ensure good distribution and that instrument cable lengths were kept to a minimum.

The VAT house is an important part of the distillery process. It was critical that as much of the installation work and in-fact testing and commissioning be carried out before disconnecting the existing system. This was easier to implement due to the use of excom remote I/O panels as the new automation cabling could be installed without obstructing production.

## Conclusion

Irish Distillers now have the capability to utilize the diagnostic tools available to them over the Profibus Network. Channel, Module and Panel diagnostics are now available via the Allen Bradley Master and can be visualized in the new control room. The operators and maintenance staff now have a more efficient plant, and will be able to implement predictive maintenance pro-

cedures which will assist in increasing the efficiency and the production from this part of the plant.

Once the project was complete, and the VAT House returned to full production, the task of stripping out the redundant tray work, cabling and panels associated with the old system could begin. Four large rubbish skips of cabling alone were removed from the site. Areas where it had been impossible to gain access due to large cable trays, were now accessible, making the building a more efficient working environment, assisting in the overall drive to increase efficiency, reduce downtime and increase production. ■



**Mick McCarthy is delighted with the support provided by Tektron sales specialist Adrian O'Mahony (r.)**

**IDL has fitted all twelve excom cabinets with a terminal layout, showing the allocation of each output to a field device**

# Protection for Cap Tip Dressers

Turck's BL ident RFID system enables the electrode cap tip dressers of AEG SVS Schweisstechnik to reliably detect the correct cutting head for the electrode cap

In spite of all the progress made in bonding and joining technology, spot welding continues to be the most cost-efficient joining process for stressed connections, particularly in industrial mass production such as in the automotive industry. The welding tongs operating in the fully-automated assembly lines use electrodes to exert pressure and heat on the sheet metal parts to be connected.

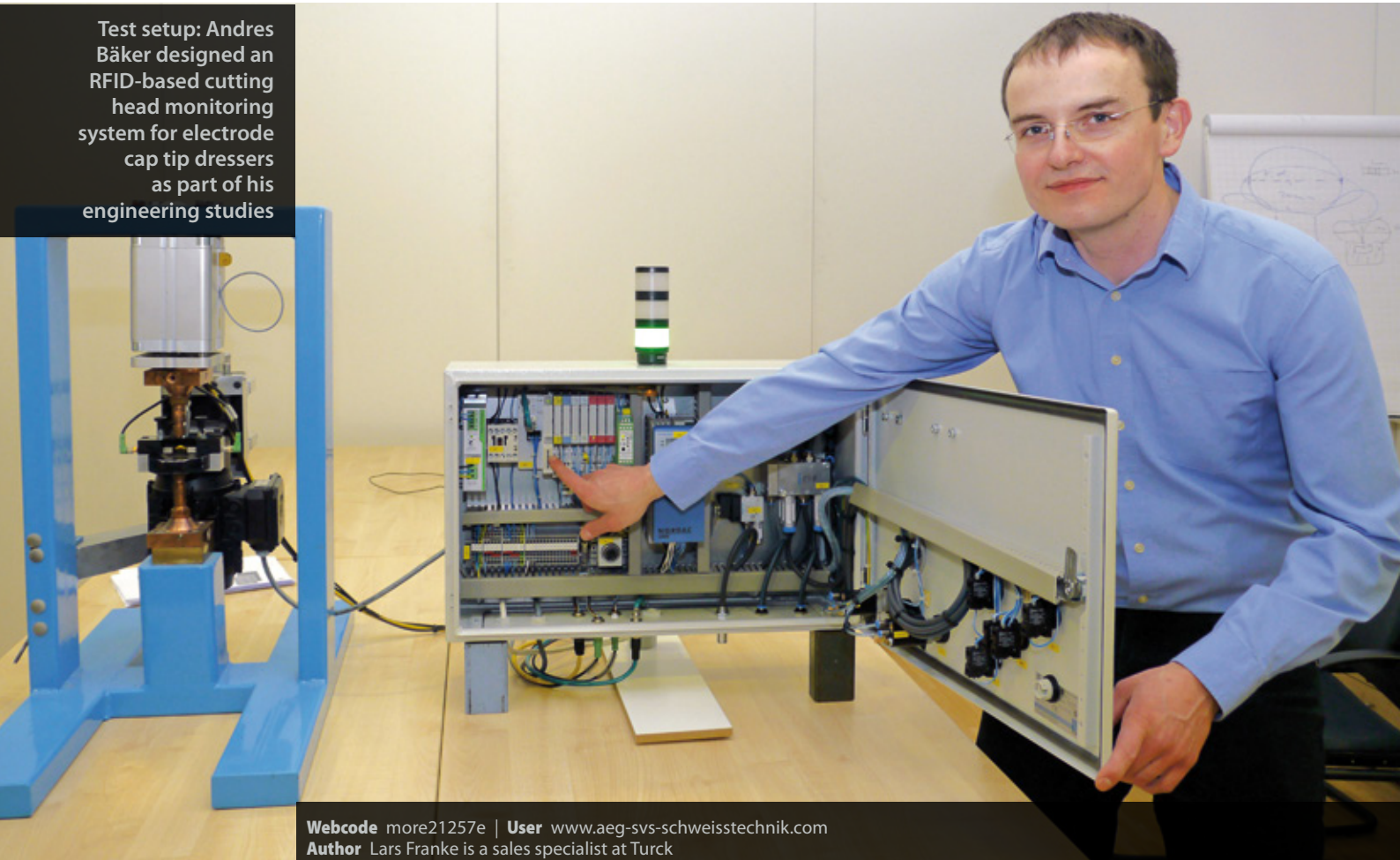
After a specific amount of time, known as the tool life, the working surfaces of the electrodes widen and collect impurities. This prevents the reproducibility of the individual welding results, and the quality of the welded joint is impaired. In order to ensure absolute process reliability and the reproducibility of the welding result, the electrodes have to be reworked according to empirically calculated values by using a dresser to restore the original tip geometry of the electrode cap.

## Challenging cutter identification

AEG SVS Schweisstechnik from Mülheim produces the electrode cap tip dressers required for this process, as well as electrode caps and around 200 different cutting heads. If a dresser is fitted with the wrong cutting head, this can lead to critical faults in the production process.

As the cutting heads are very difficult to identify visually, AEG Schweisstechnik in 2010 looked for a method of automating the identification process. The aim was also to create a test application in order to determine the optimum settings for the cutting parameters for speed, number of cutting strokes and pressure. The company approached the Mönchengladbach College for Technology and Media with these questions. Andres Bäker, who at that time was completing the last stages of his engineering studies, was keen to take on

Test setup: Andres Bäker designed an RFID-based cutting head monitoring system for electrode cap tip dressers as part of his engineering studies



**Webcode** more21257e | **User** [www.aeg-svs-schweisstechnik.com](http://www.aeg-svs-schweisstechnik.com)  
**Author** Lars Franke is a sales specialist at Turck

the challenge together with two fellow students as a final course project.

Bäker and his team first examined the possibility of optical barcode identification directly at the cutting head or cap tip dresser. However, the idea of optical identification was quickly discarded since metal swarf can cover or scratch the barcode and lubricant grease could restrict legibility. The team then focused instead on wireless identification using RFID.

## Support from Turck

Supported by Turck, the budding engineers used the BL ident RFID system to develop a solution that detects the cutting head during fitting. A read/write head with an 18 millimeter diameter is fitted diagonally above the cutting head. It does not prevent the cutting process and is nevertheless close enough to the tag to ensure identification in spite of the fast rotation. The engineers have integrated the tag directly in the cutting head. The mini tags used are only 1 millimeter high and 7.5 millimeters in diameter. The 128 byte memory is entirely sufficient for basic identification tasks. It is only necessary to write the eight-digit identification number on the tag so that it can be identified uniquely.

The read/write head is connected to a BL ident I/O slice module on Turck's BL20 I/O system. The Codesys-programmable BL20 gateway implements the control of the entire application. In addition to identification

tasks, the engineers also developed a solution for detecting the speed and rotation direction of the cutting head. For this, they fitted two inductive sensors in the swarf extraction system, which detect two recesses in the cutting head. An appropriate control logic is used to determine the rotation direction and the speed of the cutting head from the switch pulse of the rotating disc. If the incorrect cutting head is fitted, a yellow LED signal is output and the plant is prevented from starting up.

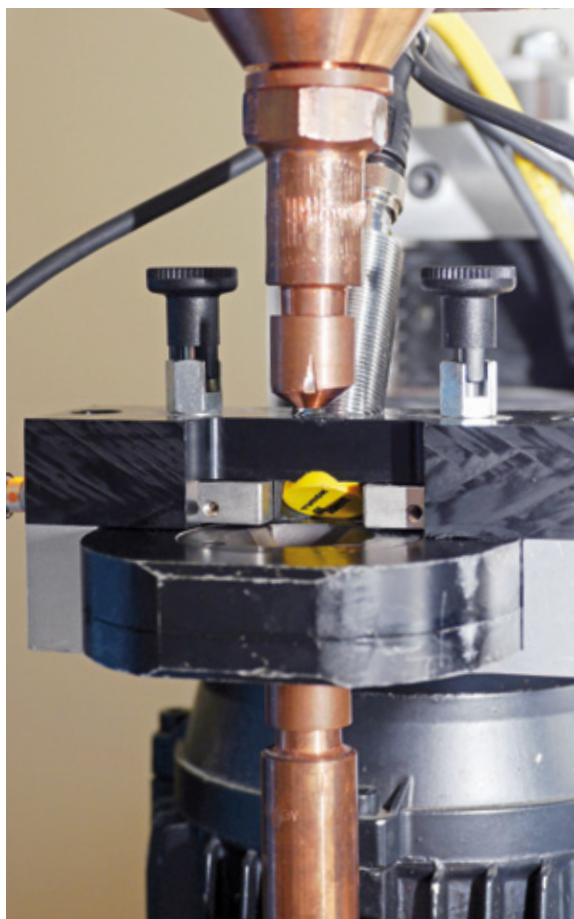
The test plant can display all cutting parameters via the Codesys user interface: speed, pressure and number of cutting strokes can be defined individually via the controller in order to test the optimum configuration for cutting on different caps. "The result of the engineering study project is more than satisfactory for us since we can include the RFID solution directly in our product portfolio nearly without any additional requirements," Jürgen Rosendahl, product manager at AEG SVS Schweisstechnik, explains. "The engineering study was always of a high technical standard. I also found the collaboration with Turck to be very productive since they took the prospective engineers under their wing and left none of the students' questions unanswered."

For Andres Bäker contact with Turck has also proved to be worthwhile after the successful project work was completed. He now works as an engineer in the RFID support area at Turck in Mülheim. If AEG



“The result of the engineering study project is more than satisfactory for us since we can include the RFID solution directly in our product portfolio nearly without any additional requirements”

**Jürgen Rosendahl,**  
AEG SVS Schweisstechnik



The yellow read/write head reads the tag in the cutting head during rotation



The integrated compact tag could be well protected in the cutting head (right)

SVS wants to develop its idea to market maturity, Rosendahl knows who to turn to: "We are particularly pleased that Andres Bäker was able to join Turck directly after his engineering studies were completed successfully." ■

## ▶ Quick read

As specialists for welding system accessories, AEG SVS Schweisstechnik from Mülheim primarily produces electrode caps, electrode cap tip dressers and the associated cutting heads. In order to ensure that the correct cutting heads are used for the corresponding welding cap geometry, the company searched for a reliable identification solution, which Andres Bäker developed with two students as part of the final project work of their engineering course – with excellent support from Turck.

# Turck at Trade Shows

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

Date	Trade Show	City, Country
21.01. – 24.01.2013	ProMat	Chicago, IL, USA
30.01. – 31.01.2013	Euro Expo Industrimesse	Trondheim, Norway
30.01. – 01.02.2013	IFAM	Celje, Slovenia
01.02. – 03.02.2013	IATF	Mumbai, India
12.02. – 14.02.2013	Automation Technology West	Anaheim, CA, USA
13.03. – 16.03.2013	Aimex	Seoul, Korea
19.03. – 22.03.2012	Amper	Brno, Czech Republic
19.03. – 22.03.2013	Automaticon	Warsaw, Poland
21.03. – 24.03.2013	WIN Automation	Istanbul, Turkey
10.04. – 12.04.2013	Automatisa	Bogotá, Colombia
08.04. – 12.04.2013	Hannover Messe	Hanover, Germany
17.04. – 18.04.2013	ISA	Calgary, Canada
24.04. – 26.04.2013	Indumation	Kortrijk, Belgium
17.06. – 21.06.2013	Exponor	Antofagasta, Chile
03.09. – 06.09.2013	HI13	Herning, Denmark
10.09. – 12.09.2013	Assembly Tech Expo	Chicago, IL, USA
23.09. – 25.09.2013	Pack Expo	Las Vegas, NV, USA
15.10. – 18.10.2013	EloSys	Trenčín, Slovakia
23.10. – 25.10.2013	DCS	Miskolc-Lillafüred, Hungary
18.11. – 21.11.2013	Metalform	Chicago, IL, USA
19.11. – 21.11.2013	Electron	Prague, Czech Republic
26.11. – 28.11.2013	SPS IPC Drives	Nuremberg, Germany



## Turck on the Web

In the product database on [www.turck.de/products](http://www.turck.de/products) you will find all relevant information 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 left search field.
- ▶ **Hierarchical Structure** – Are you looking for products from a certain group, such as inductive sensors in cylindrical design? 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](http://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](mailto:more@turck.com)  
[www.turck.com](http://www.turck.com)

#### Editorial staff

Klaus Albers (responsible)  
[klaus.albers@turck.com](mailto:klaus.albers@turck.com)  
Simon Dames  
[simon.dames@turck.com](mailto:simon.dames@turck.com)  
Paul Gilbertson  
[paul.gilbertson@turck.com](mailto:paul.gilbertson@turck.com)

#### Contributors to this issue

Holger Anders, Dr. Patrick Bosselmann, André Brauers,  
Lars Franke, Paul Gilbertson, Inka Kruschke, Jörg Kuhlmann,  
Evelyn Märtin, Holger Spies, Frank Urell, Achim Weber,  
Zukui Zhang

#### Art Direction / Graphic Design

Arno Kraemer, Britta Fehr (Art design)

#### Printing

Medienhaus Ortmeier, Saerbeck, Germany

All rights reserved. We reserve the right to make technical changes or correct errors. Reprint and electronic processing permitted with written approval from the publisher.

**Webcode** more21280e

# Turck on Site

With 27 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

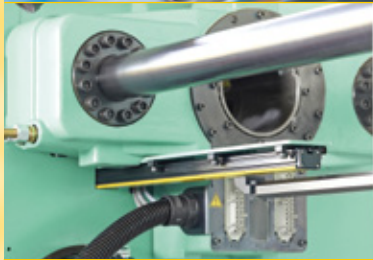
Headquarters HANSTURCK GmbH & Co. KG

Witzlebenstraße 7 | Mülheim an der Ruhr | + 49 208 4952-0 | more@turck.com

<p><b>ARGENTINA</b>   Aumecon S.A. (+54) (11) 47561251   aumeco@amecon.com.ar</p> <p><b>AUSTRALIA</b>   TURCK Australia Pty. Ltd. (+61) 3 95609066   australia@turck.com</p> <p><b>AUSTRIA</b>   TURCK GmbH (+43) (1) 4861587   austria@turck.com</p>	<p><b>KUWAIT</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>LATVIA</b>   Will Sensors (+37) (1) 67718678   info@willsensors.lv</p> <p><b>LEBANON</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p>
<p><b>BAHRAIN</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>BELARUS</b>   FEK Company (+375) (17) 2102189   turck@fek.by</p> <p><b>BELGIUM</b>   Multiprox N. V. (TURCK) (+32) (53) 766566   mail@multiprox.be</p> <p><b>BOLIVIA</b>   Control Experto (+591) 4 4315262   conexturck@controlexperto.com</p> <p><b>BRAZIL</b>   TURCK do Brasil Ltda. (+55) (11) 26712464   brazil@turck.com</p> <p><b>BRUNEI</b>   TURCK Singapore (+65) 65628716   singapore@turck.com</p> <p><b>BULGARIA</b>   Sensomat Ltd. (+359) (58) 603023   info@sensomat.info</p>	<p><b>LIBYA</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>LITHUANIA</b>   Hidroteka (+370) (37) 352195   hidroteka@hidroteka.lt</p> <p><b>LUXEMBOURG</b>   Sogel S.A. (+352) 4005051   sogel@sogel.lu</p> <p><b>MALAYSIA</b>   TURCK Singapore Pte. Ltd. (+65) 65628716   singapore@turck.com</p> <p><b>MACEDONIA</b>   Tipteh d.o.o. Skopje (+389) 70399474   tipteh@on.net.mk</p> <p><b>MEXICO</b>   TURCK Mexico S. DE R.L. DE C.V. (+52) 844 4116650   mexico@turck.com</p> <p><b>NEW ZEALAND</b>   CSE-W Arthur Fisher Ltd. (+64) (9) 2713810   sales@cse-waf.co.nz</p> <p><b>NETHERLANDS</b>   TURCK B. V. (+31) (38) 4227750   netherlands@turck.com</p> <p><b>NIGERIA</b>   Milat Nigeria Ltd. (+234) (80) 37236262   commercial@milat.net</p> <p><b>NORWAY</b>   HF Danyko A/S (+47) 37090940   danyko@hfnet</p>
<p><b>CANADA</b>   Chartwell Automation Inc. (+1) (905) 5137100   sales@chartwell.ca</p> <p><b>CHILE</b>   Seiman S.A. (+56) (32) 2699310   ventas@seiman.cl</p> <p><b>CHILE</b>   Intech Analytica E.I.R.L. (+56) (2) 2037700   ricardo.aspe@intechil.cl</p> <p><b>CHINA</b>   TURCK (Tianjin) Sensor Co. Ltd. (+86) (22) 83988188   china@turck.com</p> <p><b>COLOMBIA</b>   Dakora S.A.S. (+571) 8630669   ventas@dakora.com.co</p> <p><b>COSTA RICA</b>   TURCK USA (+1) (763) 5539224   usa@turck.com</p> <p><b>CROATIA</b>   Tipteh Zagreb d.o.o. (+385) (1) 3816574   tipteh@tiptehr.hr</p> <p><b>CYPRUS</b>   AGF Trading &amp; Engineering Ltd. (+357) (22) 313900   agf@agfelect.com</p> <p><b>CZECH REPUBLIC</b>   TURCK s.r.o. (+420) 495 518 766   czech@turck.com</p>	<p><b>OMAN</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>PANAMA</b>   TURCK USA (+1) (763) 5539224   usa@turck.com</p> <p><b>PERU</b>   NPI Peru S.A.C. (+51) (1) 2731166   npiperu@npiperu.com</p> <p><b>PHILIPPINES</b>   TURCK Singapore Pte. Ltd. (+65) 65628716   singapore@turck.com</p> <p><b>POLAND</b>   TURCK sp.z o.o. (+48) (77) 4434800   poland@turck.com</p> <p><b>PORTUGAL</b>   Bresimar Automação S.A. (+351) 234303320   bresimar@bresimar.pt</p> <p><b>PUERTO RICO</b>   TURCK USA (+1) (763) 5539224   usa@turck.com</p> <p><b>QATAR</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>ROMANIA</b>   TURCK Automation Romania SRL (+40) (21) 2300279   romania@turck.com</p> <p><b>RUSSIA</b>   O.O.O. TURCK Rus (+7) (495) 2342661   russia@turck.com</p> <p><b>SAUDI-ARABIA</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>SERBIA AND MONTENEGRO</b>   Tipteh d.o.o. Beograd (+381) (11) 3131057   damir.vecerka@tipteh.rs</p> <p><b>SINGAPORE</b>   TURCK Singapore Pte. Ltd. (+65) 65628716   singapore@turck.com</p> <p><b>SLOVAKIA</b>   Marpex s.r.o. (+421) (42) 4440010   marpex@marpex.sk</p> <p><b>SLOWENIA</b>   Tipteh d.o.o. (+386) (1) 2005150   info@tipteh.si</p> <p><b>SPAIN</b>   Elion S.A. (+34) 932982000   elion@elion.es</p> <p><b>SOUTH AFRICA</b>   R.E.T. Automation Controls (Pty.) Ltd. (+27) (11) 4532468   sales@retautomation.com</p> <p><b>SWEDEN</b>   TURCK Office Sweden (+46) 10 4471600   sweden@turck.com</p> <p><b>SWITZERLAND</b>   Bachofen AG (+41) (44) 9441111   info@bachofen.ch</p> <p><b>SYRIA</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p>
<p><b>DENMARK</b>   Hans Folsgaard A/S (+45) (43) 208600   hf@hf.dk</p> <p><b>ECUADOR</b>   Bracero &amp; Bracero Ingenieros (+593) (9) 7707610   bracero@bracero-ingenieros.com</p> <p><b>EL SALVADOR</b>   Elektro S.A. de C.V. (+502) 7952-5640   info@elektroelsalvador.com</p> <p><b>ESTONIA</b>   Osauhing "System Test" (+37) (2) 6405423   systemtest@systemtest.ee</p> <p><b>EGYPT</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>FINLAND</b>   Oy E. Sarlin AB (+358) (9) 504441   info@sarlin.com</p> <p><b>FRANCE</b>   TURCK BANNER S.A.S. (+33) (1) 60436070   info@turckbanner.fr</p> <p><b>GREAT BRITAIN</b>   TURCK BANNER LIMITED (+44) (1268) 578888   enquiries@turckbanner.com</p> <p><b>GREECE</b>   Athanassios Greg. Manias (+30) (210) 9349903   info@manias.gr</p> <p><b>GUATEMALA</b>   Prysas (+502) 2268-2800   info@prysaguatemala.com</p> <p><b>HONDURAS</b>   TURCK USA (+1) (763) 5539224   usa@turck.com</p> <p><b>HONG KONG</b>   Hilford Trading Ltd. (+852) 26245956   hilford@netvigitor.com</p> <p><b>HUNGARY</b>   TURCK Hungary Kft. (+36) (1) 4770740   hungary@turck.com</p> <p><b>ICELAND</b>   Km Stal HF (+352) 5678939   kallik@kmstal.is</p> <p><b>INDIA</b>   TURCK India Automation Pvt. Ltd. (+91) (20) 25630039   india@turck.com</p> <p><b>INDONESIA</b>   TURCK Singapore Pte. Ltd. (+65) 65628716   singapore@turck.com</p> <p><b>IRELAND</b>   Tektron Electrical (+353) (21) 4313331   webenquiry@tektron.ie</p> <p><b>ISRAEL</b>   Robkon Industrial Control &amp; Automation Ltd. (+972) (3) 6732821   robkonfr@inter.net.il</p> <p><b>ISRAEL</b>   Nisko Electrical Engineering &amp; System Ltd. (+972) (8) 9257355   joseph.shapira@niskoeng.com</p> <p><b>ITALY</b>   TURCK BANNER S.R.L. (+39) 2 90364291   info@turckbanner.it</p> <p><b>JAPAN</b>   TURCK Japan Office (+81) (3) 5722820   japan@turck.com</p> <p><b>JORDAN</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>KOREA (SOUTH)</b>   TURCK Korea Co. Ltd. (+82) (31) 5004555   korea@turck.com</p>	<p><b>TAIWAN</b>   Taiwan R.O.C. E-Sensors &amp; Automation Int'l Corp. (+886) (7) 7220371   ez-corp@umail.hinet.net</p> <p><b>THAILAND</b>   TURCK Singapore Pte. Ltd. (+65) 65628716   singapore@turck.com</p> <p><b>TURKEY</b>   TURCK Otomasyon Tic. Ltd. Şti. (+90) (216) 5722177   turkey@turck.com</p> <p><b>UKRAINE</b>   SKIF Control Ltd. (+380) (44) 5685237   d.startsew@skifcontrol.com.ua</p> <p><b>UNITED ARAB EMIRATES</b>   TURCK Middle East S.P.C. (+973) 13 638288   middleeast@turck.com</p> <p><b>URUGUAY</b>   Dreghal S.A. (+598) (2) 9031616   cratti@dreghal.com.uy</p> <p><b>USA</b>   TURCK Inc. (+1) (763) 553-7300   usa@turck.com</p> <p><b>VENEZUELA</b>   CADECI C.A. (+58) (241) 8345667   cadeci@cantv.net</p> <p><b>VIETNAM</b>   TURCK Korea Pte. Ltd. (+65) 65628716   singapore@turck.com</p>



Page 14



Page 18



Page 22



Page 24



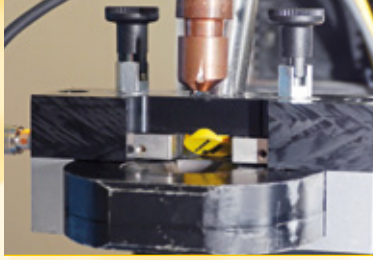
Page 26



Page 28



Page 30



Page 36

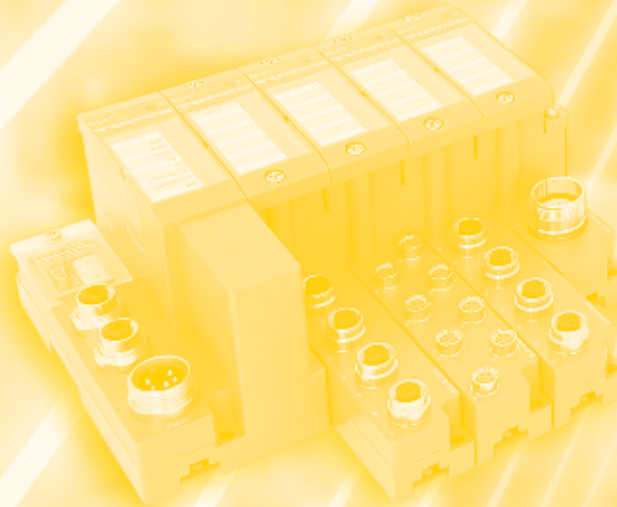
# TURCK

## Industrial Automation

### PROFINET

### EtherNet/IP

### Modbus



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



D900901 1112