

# more@TURCK

The Magazine for Customers of the Turck Group



## User-friendly

"Multiprotocol gateways and I/O modules reduce complexity," says Jörg Kuhlmann

**A WORLD FIRST**



## Transparent

Magna uses Turck's BL ident RFID system to optimize bumper production in Meerane



## Reliable

Turck's uprox+ sensors reliably detect copper and aluminum targets in the Europa Park



# Encoder 2.0

The world's first inductive encoder with non-contact and wear-free operation

## “Innovation” Caution



Dear readers, I have been told that the word ‘innovation’ is on the black list of many marketing specialists. It is apparently empty of content, its use is inflated, and it has almost completely lost meaning. When I really think about it, that really is the case. How often have I read about supposedly innovative products, solutions or companies and have then searched in vain for what the word ‘innovation’ was actually intended to convey.

The word literally means “making new”. If something is praised as being innovative, you as a customer therefore have the right to expect something that previously did not exist. But more than that: A product is only really innovative if it helps you to solve problems that you are confronted with in your daily work. In this respect, this issue of our more@TURCK customer magazine is presenting a genuine innovation: the **QR24 encoder**.

The QR24 is the world’s first encoder to offer absolutely non-contact operation – not only in the conversion of the rotary movement into a signal like optical or magnetic encoders, but also with regard to the measuring of the rotary movement. With its inductive operating principle, the QR24 is the first encoder that does not require a mechanical connection to the shaft and therefore operates without contact. This has multiple benefits including the following: The QR24 does not require any seals which may sooner or later wear out. In other words: This device runs and runs and runs...

Not only this: The IO-Link interface enables you to “create” in no time precisely the encoder you need – in over one hundred different configurations. One for all, so to speak. All the features of our innovation are described in the title story on page 8.

The fact that experts in the field have recognized the innovative character of the QR24 is indicated by the fact that it was one of the top 20 nominations for the HERMES Award 2013 of the Deutsche Messe AG.

Yours sincerely,

A handwritten signature in black ink that reads "Oliver Marks".

**Oliver Marks, Vice President Business Unit Automation Products**

more@**TURCK**



**NEWS**

**Innovations for automation specialists** 04

**COVER STORY**

**SENSOR TECHNOLOGY: Encoder 2.0** 08

World's first inductive encoder with non-contact and wear-free operation – even at the highest resolutions

**INSIDE**

**INTERVIEW: "The Chance to Effectively Reduce Complexity"** 12

Kai Binder, chief editor of the SPS-Magazin, spoke to Jörg Kuhlmann, director product management, fieldbus division, factory automation, about Turck's new multiprotocol solution

**THE HALVER PLANT: Increased Capacity** 40

At the opening of the new production complex, the Minister President of North Rhine-Westphalia, Hannelore Kraft, praised Turck's commitment to Germany as a place for business

**TREND**

**SENSOR TECHNOLOGY: Automation by Microwave** 14

With the Banner R-Gage series, Turck is supporting the trend towards compact radar sensors in industrial, traffic and logistics applications

**TECHNOLOGY**

**FIELDBUS TECHNOLOGY: Gateway Gives Modbus Wings** 18

Turck's new BL20 gateway even enables the wireless transmission of complex signals in the Modbus RTU protocol

**APPLICATIONS**

**RFID: Heavy Metal** 20

Vallourec & Mannesmann Tubes uses a Turck RFID system to identify roller cages in a tube rolling mill in Düsseldorf-Rath

**RFID: Bumper Transparency** 24

System integrator Sigma uses Turck's BL ident UHF-RFID system and its middleware to ensure complete transparency in bumper production at car parts supplier Magna

**REMOTE I/O: The Chemistry's Right** 28

In close cooperation Yokogawa and Turck developed Profibus DP lines with hot configuration in run (HCIR) functionality

**FIELDBUS TECHNOLOGY: Painting in Extremes** 30

A Chinese car manufacturer uses Turck's BL compact stations, connectivity products and proximity switches in its new paint shop

**VISION SYSTEMS: Wrong Bottles** 32

Ensinger Mineral Heilquellen GmbH uses camera technology from Banner Engineering to identify drink bottles

**SENSOR TECHNOLOGY: Safer Fun Rides** 34

Turck's uprox+ sensors reliably detect copper and aluminum targets on the latest roller coasters at the Europa Park

**SENSOR TECHNOLOGY: Efficient Position Detection** 38

Nook Industries enhances position control applications in their worm gear screw jacks with Turck's BIM-UNT cylinder position sensors

**SERVICE**

**CONTACT: Your fast route to Turck** 42

How, where and when to find us

**CONTACT: Imprint** 42



Compact radar sensors are solving more and more automation tasks – from parking space monitoring to collision protection on cranes. **Page 14**



At the Vallourec & Mannesmann Tubes rolling mill, the Turck BL ident system ensures that only the correct roller cages are used for the batch. **Page 20**



Turck's fully encapsulated BL compact I/O modules withstand the harsh ambient conditions in the paint shop of a Chinese car manufacturer. **Page 30**

## 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 versions. 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 homerun 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 from proximity switches, pushbutton actuators, optical switches or also temperature sensors with a switch output. The use of the junction boxes is 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.

### Info

All the articles in your **more@TURCK** customer magazine and further information can also be obtained on the Internet at **www.turck.de/en/more**. This site provides an overview of all the issues of the last few years. Besides a PDF version and a flippable e-paper version for each issue, each individual article is also available online. The relevant article page takes you directly to the product database and you can either download or send the article as a PDF.

## Factor 1 Sensor in Washdown Housing

► Turck is extending its successful **uprox+ sensor family** with a robust washdown version in a Q80 housing. The non-flush inductive proximity switch detects all metal types with the same switching distance of 75 mm. The sensor can be mounted partially embedded or fully flush – its switching sensitivity adjusts itself to the mounting conditions accordingly. With this degree of flexibility the Q80WD is suitable for use in a wide range of applications, enabling users to reduce the number of versions required. Turck offers the sensor with a four-pin M12 connector and a complementary PNP switch output. The application for the Q80WD are varied, ranging from gap detection in filling beverage cans, switching tasks on materials handling systems in washdown environments, to outdoor applications on railway tracks. The



Q80 washdown is the only 80 mm rectangular sensor that comes with protection to IP68/IP69K, and is suitable for applications in the food and beverage industry. All housing materials are FDA-compliant and are able to withstand high-pressure cleaners and aggressive cleaning agents.

## Non-Contact Inductive Encoders in IP69K

► With the **RI360P-QR24**, Turck is the first manufacturer to offer a non-contact inductive universal encoder that offers high resolution, wear-free operation, and immunity to magnetic fields. The sensor and the positioning element of the encoder are fully encapsulated and designed as two independent sealed units that work together without contact. Therefore any vibration or shock from the shaft is not passed on to the sensor. This makes the RI360P-QR24 a superior sensor compared to both optical and magnetic encoders. Thanks to its high degree of protection to IP69K and over 18-bit resolution, machine downtimes and maintenance times resulting from encoder wear are from now on a thing of the past, even with high-precision and high-speed applications. Turck developed a revolutionary parameterization and mounting concept for the encoder. This turns the RI360P-QR24 into a universal encoder for any standard industrial application. Users can parameterize the device either as an incremental, multi-turn or single-turn encoder. This variant allows the user to also set output signals, switch points and measuring ranges individually via IO Link.

[more on page 8](#) ►



## New Production Complex



► Together with international guests, distinguished figures from the world of politics, business and federations, as well as employees, Turck has inaugurated its new ultramodern production building with a total area of **13,500 square meters** in Halver, Germany. The guests included Hannelore Kraft, the Minister President of North Rhine-Westphalia, and Friedhelm Loh, Chairman of the German Electrical and Electronic Manufacturers' Association (ZVEI). "Since its founding 47 years ago, Turck has grown rapidly at its Halver site," said company co-founder Werner Turck. "The new building will enable us to create today the space for the needs of the global market in the future." Minister President Hannelore Kraft emphasized the importance of owner-operated companies: "Fam-



ily owned enterprises bring together seemingly different objectives: success in global markets, internationalization and the ability to live according to one's own local values and corporate culture." ZVEI President Friedhelm Loh was also impressed by the new building that makes a clear statement from Turck of its value for Germany as a place for business without losing sight of overseas markets. The new company premises and an investment of over 15 million euros will enable Turck to focus its energies and combine all stages of pre-assembly and final assembly into a single building.

more on page 40 ►



## 24 V Power Supply in IP67

► Customers that require a 24 V power supply directly in the field, will find a new series of switched mode power supply units with IP67 protection in the Turck portfolio. A large amount of expensive cabling is required if the field device and the control cabinet for the plant are long distances apart. The use of power supply units with IP67 protection is particularly suitable here, as they provide a 24 V power supply directly in the field without any voltage drop and can also be fitted directly to the machine without any protective measures. The power supply units offer a high level of failsafe performance, thanks to their no-load and short-circuit protection as well as passive air cooling. The devices also automatically bridge voltage dips of up to 50 ms. The high efficiency of the devices ensures a good energy balance of up to 90%. The AC/DC wide range input and an ambient temperature range from -25 to +60 °C make the power supply units suitable for worldwide use. They feature a voltage output with a 4-pin 7/8 inch connector. LEDs indicate the actual operating state to the user. Turck is offering the PSU67 series switched-mode power supply units in four variants with one: A 2 A, 4 A and an 8 A variant, each with one output, and a variant with two 4 A outputs.

## Illuminated Emergency Stop Button

► Turck is introducing new **illuminated E-Stop buttons** developed by Banner Engineering. The new U.S. patent-pending 30 mm mount Emergency Stop pushbutton combines safety operation and high visibility status indication in one housing for the first time. With no assembly, individual wiring or additional enclosure required, the E-Stop enhances productivity as well as safety. The button base is illuminated in yellow when the button is armed and the machine is running or enabled to run. When the button is pushed, the steady yellow turns to flashing red, allowing quick identification of the actuated button to reduce downtime. The button can be connected with M12 connectors and for connecting multiple buttons Turck is offering the CSS Series Hookup Cordsets.



## New Building in Detmold



► In a few weeks Turck will be opening the new **Development center for fieldbus technology and RFID** at its site Detmold, Germany, with a total workspace of more than 1,000 square meters. Up to now the development team was housed near the center of Gilde, however, requirements of personnel and equipment, also of office and laboratory space grew over time. In the future the new site will shorten all routes for employees and the new technical facilities and space will meet the new requirements. This clears the way for any further expansion of the activities at the Detmold.

## 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.

**Webcode** more11310e

## BL20 Gateway for Modbus Communication

► Turck has expanded its **BL20 I/O system** with a new gateway for serial Modbus communication. The gateway supports both the Modbus RTU as well as the ASCII protocol. The user can also choose between either RS485 or RS232 for the physical interface. Push-in terminals for connecting the fieldbus and power supply cables quickly and directly eliminate the need for any time consuming preparation of the typical 9-pin SUB-D connectors. The most important parameters, such as baud rate, address assignment, bus termination and RS232/RS485 can be set easily on the gateway using the DIP switches. Other functions such as ASCII mode and other baud rates can be configured using FDT/DTM with Pactware. A Mini-USB port can be used as a service interface. Embedded in the Banner DX80 wireless system from the Turck portfolio, the new gateway makes it possible to implement cable-free Modbus RTU communication. Thanks to the extended temperature range from -25...+60 °C, the gateway can also be used in outdoor control cabinets. The electronics are coated with a protective lacquer to provide protection from condensation. Up to 32 I/O modules can be connected to the compact IP20 gateways, and the BL modules can also be used for connecting RFID read/write heads. [more on page 18](#) ►



## Addition to Temperature Sensors

► Turck has expanded its existing temperature sensor portfolio with the **TS-516** and **TS-530** variants. While the modular TS-400 and TS-500 temperature sensors with temperature probes optimized for the application are provided with an M12x1 thread, the new family members have permanently attached probes. A ½" thread without any additional compression ring fitting or protective tubes enables these sensors to be inserted directly into the process. These IP67/69K variants of the TS series are suitable for a wide range of hydraulic applications even in the harshest environments. Temperatures are measured with a platinum measuring element and passed on to the fully encapsulated signal processor. The head with the display can be rotated 340° as standard and the display can be swiveled 180°. This makes the display readable in any position. The sensors are available with a switch contact and analogue current output, but also support the IO-Link communication standard. Metal-reinforced sealing rings ensure a safe process connection.

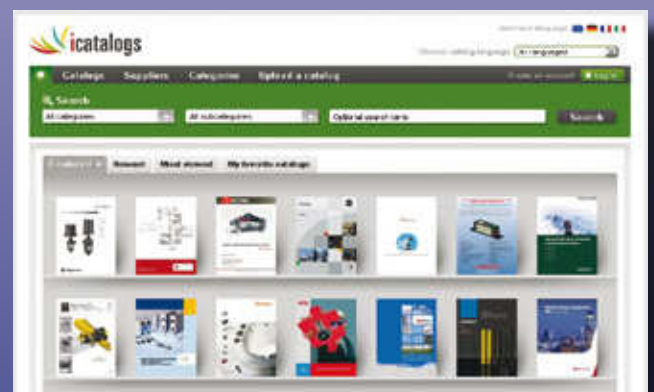
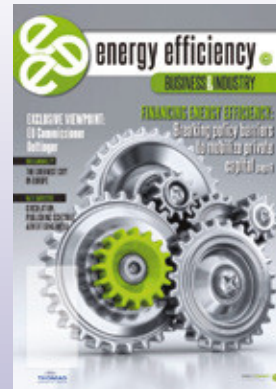




# THOMAS

---

## Industrial Media



[www.tim-europe.com](http://www.tim-europe.com)

One For All: Turck's inductive encoder can be parameterized via IO-Link with 100 different characteristics and configurations



**Webcode** more11300e

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



# Encoder 2.0

The world's first inductive encoder with non-contact and wear-free operation – even at the highest resolutions

**T**he world of rotary encoders is divided. On the one side are the advocates of optical and potentiometric encoders, and on the other, the proponents of magnetic systems. Optical encoders are used as absolute or incremental encoders. They measure angles or rotations by transferring the rotational movement of a shaft onto an optically-coded pulse disk which is typically made from glass or plastic. An optical system inside the sensor scans this disk. The strengths of optical encoders include their ability to measure high resolutions and speeds, as well as their resistance to magnetic fields. On the other hand, in order to measure high resolutions, a large housing is needed due to the necessary size of the disk.

The greatest disadvantage, however, is that direct mechanical connection is required by their design. Any blows to the shaft may destroy the pulse disk which is connected directly to the shaft. Vibrating shafts alone can have an effect on the sensitive design over time. Although the electrical system operates wear-free, this is little use if the mechanical system wears out prematurely. Manufacturers recognize the Achilles heel of optical encoders and try to minimize vibrations. Mounting accessories such as couplings or spring elements have been designed to dampen the mechanical load. Other manufacturers are fitting their encoders with paired ball bearings or are relying on gearless variants.

## Wear on conventional encoders

All these measures, however, can only mitigate the basic design weakness of these devices. Sooner or later, the mechanical connection between the machine shaft and the encoder will produce wear – either at the spring elements, seals or at the encoder itself. The same issues apply to potentiometric encoders: They achieve high resolutions at the expense of a robust design. Potentiometer manufacturers make no secret that a potentiometer is a wear part.

The seal of the encoder housing is often the central weakness. Eventually it becomes brittle, cracked and then leaks and can crack due to the permanent load caused by the rotating shafts. Penetrating water or dirt damage to the sensitive sensor circuit can cause failure. Optical and potentiometric encoders only comply with high degrees of protection under optimal conditions.



**All-round protection: The aluminum ring surrounds the positioning element that is fixed between the gear wall and the sensor on the shaft**

With magnetic systems, the issues are quite the opposite as their strengths lie in a relatively high mechanical load capacity. The measuring principle involves the use of a rotating magnet which forms and discharges a magnetic field. This produces a sine-cosine curve and is evaluated as a rotation signal. Magnetic encoders are non-contact measuring devices. Their electronics can be completely enclosed and encapsulated. The weakness of the magnetic encoders available in the market, however, is their susceptibility to electrical or magnetic interference and their intolerance to the offset of the positioning element, which means they have to be operated in a housing which precisely positions the encoder. The resolution of the magnetic devices depends on the speed of the shaft to which they are connected.

For users who cannot ignore the weaknesses of either the optical or magnetic systems in their installations, Turck has developed a new class of encoder that operates on the inductive resonant circuit measuring principle. Automation specialists have been successfully using this technology in their position and angle applications for the past two years. The RI360 inductive

## Quick read

The RI360P-QR24 inductive encoder developed by Turck is the world's first encoder for the non-contact measurement of rotary movement, even with a high resolution. This is the only encoder type that offers absolutely wear-free operation and stays permanently sealed – so that it can never end up as electrical waste.

encoder series combine the benefits of the previous solutions while eliminating their disadvantages at the same time. They are wear-free, offer high resolution, high speed operation, are unaffected by vibration or magnetic fields, and meet the requirements of IP69K.

### Fully encapsulated electronics

The resonant circuit measuring principle makes it possible to design a fully encapsulated sensor housing without seals, separate from the positioning element, eliminating the possibility of dust or water penetrating into the electronics. The non-contact measuring principle of the device enables it to compensate for vibration as well as an offset up to 4 mm. Magnetic fields cannot disturb the measuring process since the positioning element is not based on a magnet but on an inductive coil system.

The first customers, including a solar panel tower in Spain, are already waiting for the new device. Previously they used encoders in these heliostat power stations for aligning the mirrors to the central tower, but they had reached the limits of their capabilities. As the mirrors are positioned up to a kilometer away from the tower, changes of inclination have to be made in the millirad range (1 millirad = approx. 0.06 °) in order to project the light precisely onto the tower. Magnetic encoders do not have high enough resolution and optical encoders cannot withstand the extreme temperature swings of a desert climate. Hot days and cold nights cause a build-up of condensation which can't be prevented in an unencapsulated system. Water affects the electronic circuit and optical components, thus causing the sensor to fail. As the solar tower power stations are often located in remote areas stretched out over several square kilometers, replacing failed encoders incurs a major expense.

The maintenance-free RI encoder will provide great cost savings. Around 20,000 optical encoders are installed in the power station. The operators had to replace around a third each year due to faults or impending failures. At a unit price of 100 euros, this meant replacement costs of around 700,000 euros a year. Added to this are the costs for service technicians and the loss of power generation. The overall cost for this project alone was around 1 million euros a year.



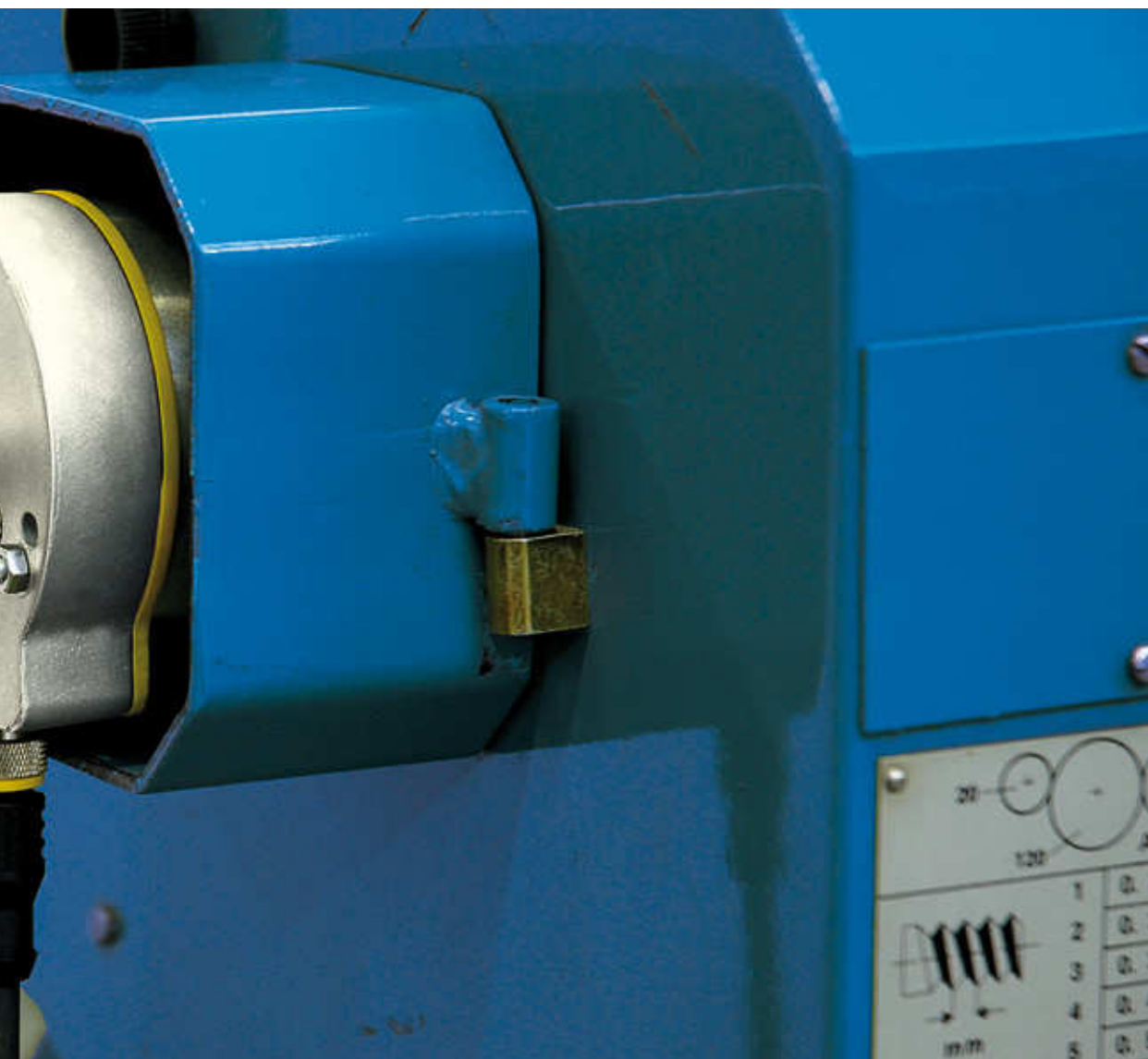
**Permanently sealed: The sensor element (left) and the positioning element (right) are fully encapsulated so that water cannot penetrate**



### Universal encoder replaces several 100 types

Turck's new encoder means that the user no longer has to choose between resolution and robust design. All the measures required to protect encoders from mechanical stress using springs or double bearings are no longer necessary. In addition to the interference immunity and wear-free design of the system, the user also benefits from the parameter and installation concept that allows a single encoder model to become a universal encoder for a countless number of applications. This single model can replace several different encoder types. The mounting concept also keeps this universal approach: Adapter rings make it possible for the user to fit the positioning element to shafts of different diameters. The user only has to keep a single encoder in stock which they can use for all applications on shafts up to 20 mm in diameter.





The well thought-out mounting concept and the non-contact measuring process offer several possibilities of installing the encoder with optimum protection

Turck is also launching a parameterizable IO-Link version on the market. The user can adjust the characteristics of the encoder and all its parameters individually to the application at hand via the IO-Link parameter interface. This way, the device can be parameterized as a multi-turn, single-turn or incremental encoder. The encoder can be set to resolutions up to 18 bits, even for the highest speeds. The customer can also parameterize the output signals to individual requirements: as an SSI, gray code or binary signal in 24, 25 or 26-bit resolutions, and as an incremental as well as a voltage or current output. Other variants will follow the IO-Link version in the coming months; one with a Modbus RTU connection and a variant designed to e1 specifications for use in mobile machines with a 0.5...4.5 V voltage output.

The mounting concept of the sensor is just as flexible as its parameter concept. Shaft adapters enable the encoder to be used on all standard solid and hollow shaft thicknesses up to 20 mm. The sensor is designed in the shape of a donut and can be placed over the shaft via its center hole, with the positioning element fitted either behind or in front of it – depending on the permissible mounting conditions in the field.

The requirements of a customer from the machine tool sector illustrates how Turck's new encoder model is unlike anything on the market. This application is totally different from the one in the solar power station: While the measuring on solar panels is in the single-turn range, is very slow, and requires a high level of accuracy, the application on the CNC machine is in the multi-turn range, and requires measuring at up to 25,000 rpm. The speed is not a problem for the RI360P-QR24 since, unlike all other devices on the market, the encoder is not limited to a maximum speed.

### Tremendous potential

The applications for the new encoder class are as varied as its possible configurations. Turck sees an enormous potential in several areas, including mobile machines, renewable energies, packaging machines, machine tools, as well as logistics systems and plants. However, the concept of the new Turck encoder class makes it an ideal solution for all sales markets and virtually all application fields, from which customers can benefit in the long-term. ■

Jörg Kuhlmann: "Turck's multiprotocol devices provide fully automated communication in Profinet IO, Modbus TCP or Ethernet/IP networks."



## **"The Chance to Effectively Reduce Complexity"**

Kai Binder, chief editor of the SPS-Magazin, spoke to Jörg Kuhlmann, director of product management, fieldbus division, factory automation, about Turck's new multiprotocol solution

**Mr Kuhlmann, Turck presented the new multiprotocol technology to the public at the SPS IPC Drives fair 2012 in Nuremberg and announced the first devices. Are your plans on schedule?**

Yes, they most certainly are. Turck has first equipped its FGEN block I/O module with this technology to enable the devices to be used in Profinet IO, Modbus TCP or Ethernet/IP networks. These modules have been available since December. Now for the Hannover Messe, we are able to supply our customers with the first multiprotocol gateways for the BL20 modular I/O systems for mounting in control cabinets and BL67 modules for mounting in the field. All gateways and I/O modules are naturally provided with internal switches that enable in line installation.

**What was behind this new development?**

Unfortunately, with the transition from conventional fieldbus technology to Ethernet, it has not been possible to reduce the number of protocols and systems. Instead, the number of Ethernet-based protocols available on the market has increased. This is not only disadvantageous for users on account of the need to keep different devices available to meet end customer specifications; manufacturers are also faced with a difficult task due to the logistical challenges presented by the large number of device variants required for international sales. We originally tackled the multiprotocol issue in order to simplify logistics problems and increase batch sizes in production. However, we soon noticed that this also brings benefits for the user.

**Where exactly do you see the benefits for the user?**

The Ethernet IP, Modbus TCP and Profinet IO protocols are combined here in a single device firmware. In spite of the gateways' slim design, the protocol stacks contain all the relevant protocols for this market. In the future, users just have to keep a single device type in stock irrespective of the Ethernet protocol in use. This presents the opportunity to effectively reduce inventory costs and complexity. The multiprotocol devices also make it possible to keep the design of machines and plants largely identical and to simply

replace the controller according to end customer specifications. This considerably simplifies the engineering and thus saves time and costs for the user.

**Do you offer an engineering tool for parameter setting?**

This is not necessary since the devices automatically determine during startup which Ethernet protocol is being used on the line. The devices then automatically switch to the detected protocol. The protocols implemented cover everything: In Profinet mode, topology detection and address allocation are supported with LLDP, and Ethernet/IP with QuickConnect and Device Level Ring (DLR media redundancy).

**What do you mean when you talk about fast starters?**

In Profinet operation all IP67 devices support fast startup and offer QuickConnect operation in Ethernet/IP mode – with startup times that are unbeatable: The block type fast startup modules (FGEN series) achieve startup times of less than 150 milliseconds for Profinet as well as 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 was 500 milliseconds. To achieve this we have optimized the electronic architecture so that processors are operational considerably faster, largely irrespective of any protocol modifications, resulting in faster startup times. To my knowledge, there is currently no other supplier of fast startup I/O modules that can even approach the times of the FGEN series.

**Does 100 ms make that much of a difference?**

The demand for short startup times came primarily from the automotive industry 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 of even only 100 ms means either more output per unit of time or fewer robots for a particular operation – both significant alternatives from a financial standpoint. ■



“In future, users just have to keep a single device type in stock irrespective of the Ethernet protocol in use. This presents the opportunity to effectively reduce inventory costs and complexity.”

**Jörg Kuhlmann**



“The multiprotocol devices make it possible to keep the design of machines and plants largely identical and to just replace the controller according to customer specifications.”

**Jörg Kuhlmann**



**Author** Kai Binder is chief editor of the technical journal SPS-Magazin  
**Web** [www.sps-magazin.de](http://www.sps-magazin.de)  
**Webcode** more11330e

# Automation by Microwave

With the Banner R-Gage series, Turck is supporting the trend towards compact radar sensors in industrial, traffic and logistics applications

In 1886, Heinrich Hertz discovered that electromagnetic waves are reflected on metallic objects. His discovery was initially forgotten about until 1904, when the engineer Christian Hülsmeyer used radio waves to detect ships for the first time, developing the forerunner of today's radar systems.

The abbreviation 'Radar' stands for 'Radio Detection and Ranging'. For a long time, radars and radar applications were reserved for national defense, air safety and for meteorological services. However, new radar technologies have recently been increasingly used in other application fields. Ultra-wideband technology (UWB) in particular allowed the manufacture of compact and rel-

atively inexpensive radars for a number of new applications. UWB is a radio frequency modulation technology that is based on the transfer of pulses with a very short duration of often less than one nanosecond, and a very large bandwidth. Americans developed the technology in the sixties, however, it was subject to military secrecy orders for a long time and was not released for civilian use until the beginning of 2000.

Radar radiation normally covers the frequency range from 3 to 300 GHz, in which the range from 3 to 30 GHz is called super high frequency (SHF) and the higher frequency range from 30 to 300 GHz is called extremely high frequency (EHF). Based on the propaga-

Banner R-Gage radar sensors are to be used to ensure the availability of several thousand power poles in France. The first power poles have recently been installed in Paris



**Webcode** more11305e

**Author** Markus Bregulla is product manager optical and ultrasonic sensors at Turck



**R-Gage radar sensors offer efficient collision protection for crane systems or container bridges**

tion speed of a wave in a vacuum, the wavelength in the SHF range is 1 to 10 cm and 1 to 10 mm in the EHF range, and these waves also fall within the microwave band. As well as these frequency ranges, there are two radar technologies: impulse radar and the continuous wave radar.

### Continuous wave radar

Unlike impulse radar, continuous wave radar does not produce an image. Continuous wave radars cannot evaluate any information about the location of the reflecting object, i.e. cannot determine any distances such as with radars used for flight control or shipping. They are primarily suitable for the detection of well reflecting moving objects. These include media with high dielectric values such as objects containing metals or water.

The most well-known continuous wave radar sensor is the Doppler radar used for speed limit enforcement. It uses the phase shift between the emitted and reflected wave to calculate the relative velocity of objects. This very simple measuring of a continuous wave or CW radar is used, for example, for the presence detection of moving objects around the automatic roller shutters in warehouses. The sensor detects trans-



**R-Gage sensors ensure in the Netherlands that trains in tunnels can be located at any time**

port devices such as fork lift trucks or driverless transport vehicles and then initiates the automatic opening of the shutters. The disadvantage of this type of object detection is that static objects are not detected due to the absence of a phase shift.

A further development of the continuous wave radar rectifies this disadvantage: The frequency modulated continuous wave radar (FMCW radar) continuously shifts the frequency within a narrow frequency band. In this way it simulates the phase shift and therefore also detects static objects. The technology is already used in the automotive industry: Driver assistance systems with Adaptive Cruise Control (ACC) monitor the distance from vehicles in front, and depending on type, output warning signals to the driver or even initiate emergency braking.

### 24 GHz radar sensors for industrial and traffic applications

For a long time, radar sensors have had little use in industrial automation. The systems in the 76-77 GHz frequency range were too big and too expensive. Around five years ago, Turck's partner Banner Engineering developed the first 24 GHz radar sensors under the

#### ▶ Quick read

For a long time, radar technology was only used in special applications in the field of defence technology and road traffic applications. However, modern radar sensors are mastering an increasing number of application fields in industry, from position detection to collision avoidance. Turck's partner Banner developed a compact sensor series with frequency modulated continuous wave radar that has had proven use in many applications over recent years. The new family member is the Q120R with a range of up to 40 m.



**Turck offers the R-Gage radar sensors from Banner in different housing styles**

name R-Gage. The compact R-Gage sensors are considerably more affordable than the conventional solutions and are suitable for indoor and outdoor applications. Turck therefore offers the radar sensor series with FCMW technology for industrial automation, logistics and traffic safety systems.

The latest R-Gage generation that Banner Engineering presented is excellently suited with its detection range of up to 40 m to reliably protect container cranes in shipping terminals from collisions. The detection field can be focused by means of a tube adapter in order to avoid interference signals from neighboring objects in the direction of detection. With an optimized distance detection, Banner minimized the blind zones so that the new R-Gage sensors can now also detect objects that are very near or far away. The sensors can also be set to a warning and an additional protection field. The sensor outputs warning and protection signals via two separate outputs.

Another application example is the collision avoidance solution for fork lift trucks with a large stopping distance. The R-Gage sensors protect the fork from colliding with the warehouse roof by monitoring the distance between the fork and the warehouse roof.

Other application fields for R-Gage radar sensors are the permanent position control of trailer loads or the detection of vehicles at toll booths or drive-thru counters. R-Gage sensors are also being used in the streets of Paris: As part of a major project, over 300 power poles were installed here for charging electric vehicles.

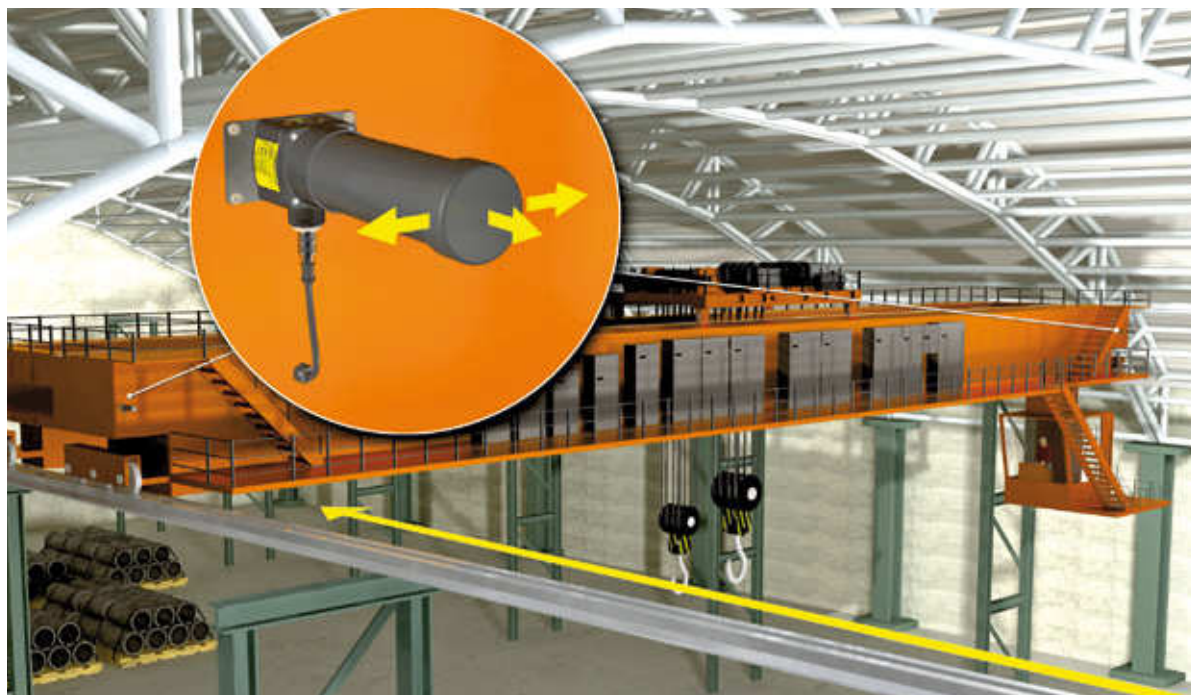
### ► Radar and health

The applications described here do not emit radiation that is harmful to health, as the output power of only a few Watts is far below the levels present in the imaging systems used in military applications in the 1980s. At that time, the harmful ionizing radiation was not emitted from the actual radar microwave radiation, but from the high-voltage electronics in the vacuum tubes that were not sufficiently shielded against the inevitable X-ray radiation emitted. Modern devices operate without vacuum tubes and with considerably less transmitter output so that the radiation of X-rays cannot occur at all.

As the power poles require a free parking bay for the vehicle to be charged, this parking bay is monitored for non-charging and therefore illegally parked vehicles. This is implemented using an R-Gage radar sensor in the power pole. The radar beam penetrates unhindered through the plastic covering and reliably detects any suitably large object inside a defined detection range. If a vehicle is detected without charging taking place, an alarm is automatically sent to a towing service.

### Benefit: high availability

The key benefit of radar sensors is their high availability. Compared to other sensor technologies with long detection ranges such as optical or ultra-sonic sensors, they offer clear benefits. Unlike optical sensors, the function of R-Gage sensors cannot be impaired by dirt, which is a critical advantage in industrial and traffic environments. Unlike ultrasonic sensors that are dependent on air as the propagation medium, radar measuring cannot be corrupted through the effect of the wind. Radar sensors thus exclude the disadvantages of ultrasonic and optical sensor technology. ■



**The tube adapter of the QT50R sensors focuses the radar beam and masks out potential interference**



# MDA Technologies

Motion, Drive and Automation



Reach international markets.  
New business is just **one click\*** away.



MDA SOUTH AMERICA	MDA RUSSIA	MDA NORTH AMERICA
PTC MDA ASIA	MDA INDIA	Hydraulic & Pneumatic EURASIA

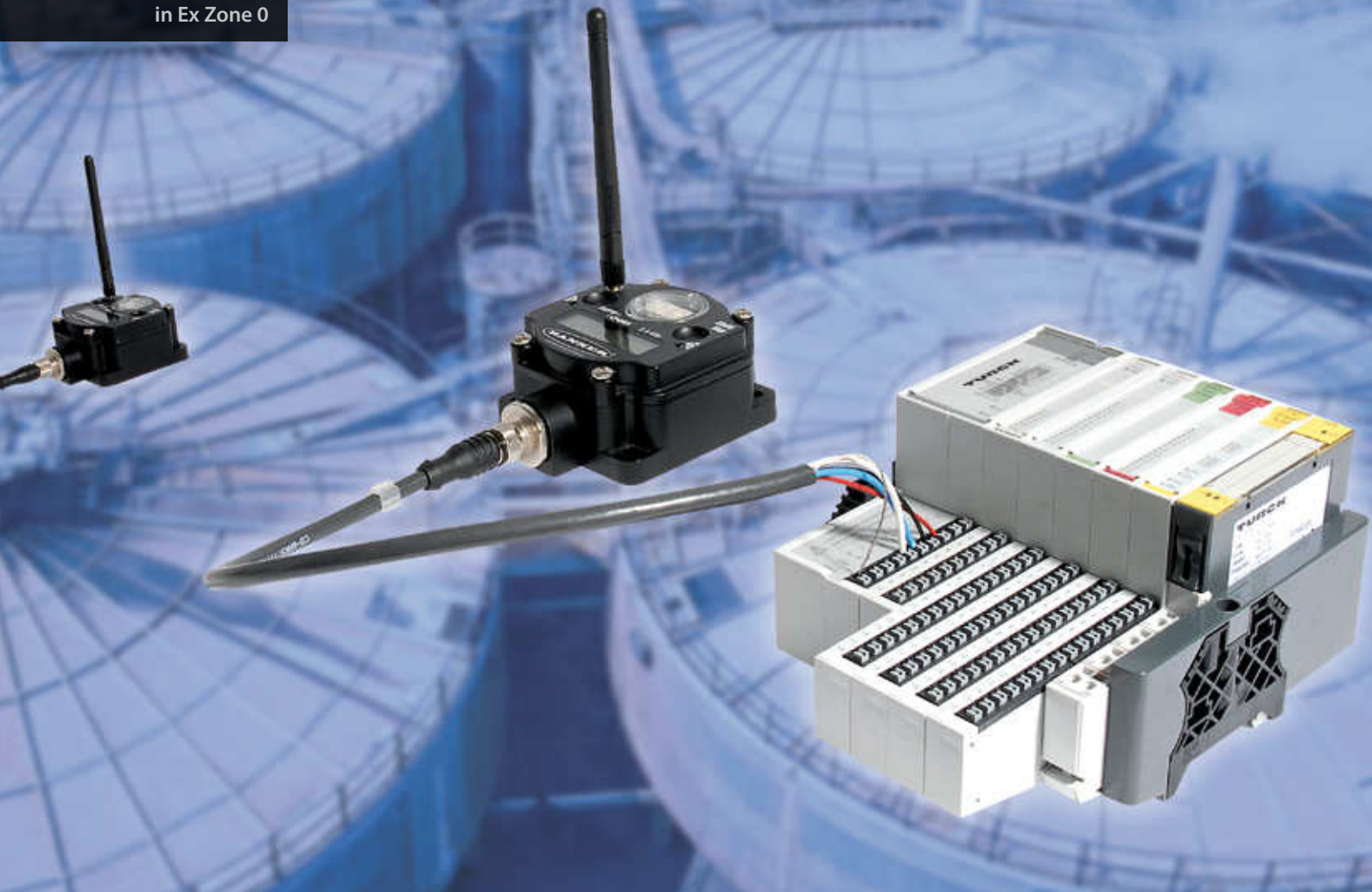
\*For more information please have a look at:  
[www.mda-technologies.com](http://www.mda-technologies.com)



In cooperation with:  
Deutsche Messe AG  
Hannover - Germany

Supported by:  
VDMA

Dream team: Turck's new Modbus RTU gateway works closely with the DX80 wireless system, and with the DX99 even in Ex Zone 0



**Webcode** more11370e

**Author** Markus Ingener is product manager for factory automation systems at Turck

# Gateway Gives Modbus Wings

Turck's new BL20 gateway enables the wireless transmission of complex signals in the Modbus RTU protocol

**W**hile Industrial Ethernet is increasingly gaining ground in the fieldbus world and is becoming the de facto standard, a conventional fieldbus protocol in the automation world has been steadily and quietly giving service for decades: Modbus RTU. Widely used on the market, it is recognized for its reliable technology even though it is no high flyer. Modbus RTU is often also used as a sub-bus to the field devices though a more sophisticated

and faster bus like Profibus or even Profinet is usually used on higher levels. Modbus is primarily used due to its simplicity. It precisely fills the gap between the analogue or digital signals of simple field devices and the more complex bus protocols like Profibus, Devicenet and Ethernet variants. A bus is unnecessary for a simple switch, but is worthwhile for more complex field devices such as barcode readers, barcode printers, measuring light screens or measuring

sensors. However, interfaces for Profibus and other higher class buses are too complex and too expensive to be equipped on each field device. The relatively simple and inexpensive Modbus RTU optimally meets those requirements.

The suitability of Modbus as a field device bus meets the trend for increasingly more complex measuring field devices with an appropriate bus interface. From the Turck portfolio this includes the measuring EZ-Array light screens, the LI inductive linear position sensors and the recently launched RI360-Q24 inductive encoders. On these devices, parameter assignment, diagnostics and signal communication are often carried out via the Modbus interface. Turck is meeting the needs of this new trend with a new BL20 Modbus RTU gateway and is also making other field devices fit for Modbus communication – from simple sensors right through to RFID systems.

## Wireless Modbus networks

Turck's Modbus gateway is not only suitable for the wired connection of these field devices, it also literally provides the "good old fieldbus protocol" with wings: When connected to the DX80 MultiHop data radios from Turck's partner Banner Engineering, the user can now combine cable-based Modbus networks with wireless networks.

This is useful, to connect remotely located machine sections or field devices to the central controller of a plant. Difficult terrain can often make cable routing extremely complicated or even impossible. The combination of BL20 Modbus gateway and DX80 now provides a solution. Although the IP20 rated gateway has to be installed in control cabinets when used outdoors, Turck has optimized its solution for this kind of application: The electronic circuit is firstly protected from condensation with conformal coating and secondly, the gateway is designed for an extended temperature range from -25 to +60 °C.

Networks based solely on wireless technology only have a limited suitability for the above task – at least when the remote plant section requires the use of many inputs and outputs. A DX80 wireless network node has a maximum of six inputs in addition to the bus input. A purely wireless solution involving several inputs or outputs would therefore be very expensive. The combination of DX80 data radios and BL20 Modbus gateways now also enables a number of signals to be connected wirelessly in the field – only the last meters between the gateway and field devices have to be connected by cable.

The BL20 gateway can be fitted with up to 32 electronic modules processing a wide range of different signal forms. The combination of the DX80 and the BL20 can be used to bring signals that cannot be processed by wireless nodes, such as SSI, counters, and RFID, to a wireless application. These signal forms are not inherently able to be processed by the wireless nodes. A typical application of field of wireless solutions are also moving applications, where signal transmission is conventionally implemented with slip rings, which

## Quick read

Of all the fieldbus protocols, Modbus RTU can be regarded as something like the 'work horse'. In spite of its lack of speed, it is reliable and can be used almost anywhere. Turck's new Modbus gateway, which in conjunction with Banner's DX80 wireless system allows a flexible combination of wireless and wired Modbus communication, shows that Modbus can be given unimagined possibilities in spite of its age.

are very wear-intensive. The BL20 gateways can also be used here as a logical extension of wireless networks.

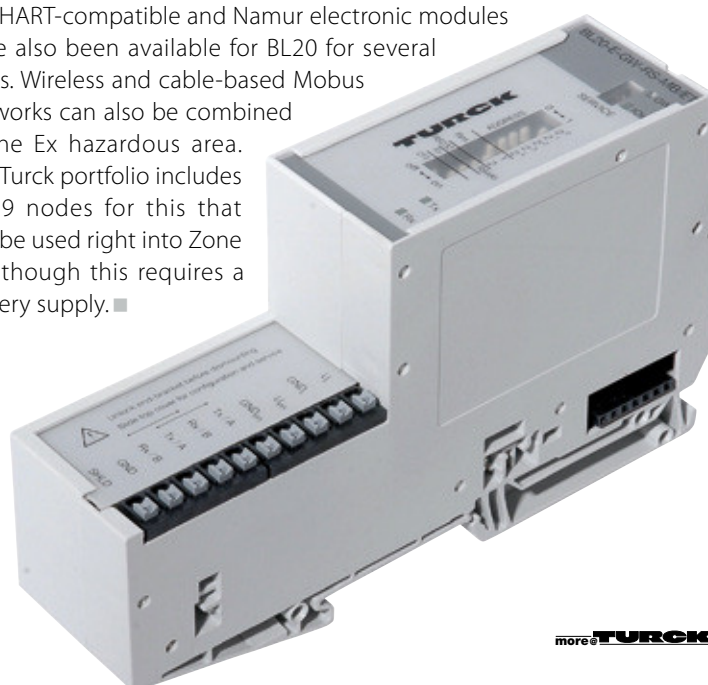
## Universal concept

The gateway is designed as a universal Modbus IO station. The user can choose between the Modbus RTU protocols and ASCII. In RTU mode, it is possible to choose between the RS485 and the less commonly used RS232 standards. The most important parameters, such as baud rate, address assignment, bus termination and RS485/RS232 can be set directly on the gateway using the DIP switches. All other parameters are set via FDT/DTM software such as Pactware. The bus connection to the Modbus master is implemented with push-in terminals which eliminates the need for any preparation of Sub-D connectors. Turck has designed the gateway as a universal gateway for serial Modbus communication. This enables the user to reduce the number of different Modbus gateways required in stock.

## Modbus RTU in process automation

Modbus is also widely used in process automation for new installations. Applications in process automation are seldom time-critical and so electrical planners can manage without realtime fieldbuses. The BL20 Modbus gateway is approved for use in Zone 2. The gateway has become part of a number of Turck developments that make the BL20 system attractive for use in process automation. In order to provide the supply redundancy often required in this environment, all BL20 gateways can be powered redundantly with an expansion module. HART-compatible and Namur electronic modules have also been available for BL20 for several years. Wireless and cable-based Modbus networks can also be combined in the Ex hazardous area. The Turck portfolio includes DX99 nodes for this that can be used right into Zone 0, although this requires a battery supply. ■

**The most important parameters can be set directly on the gateway via DIP switches**



# Heavy Metal

Vallourec & Mannesmann Tubes uses a Turck RFID system to identify roller cages in a tube rolling mill in Düsseldorf-Rath

**W**hen a new rolling batch is set up at the tube rolling mill of V & M Tubes in Düsseldorf-Rath, employees at the sizing mill want to know precisely if the correct rolling stands are being used in the stand locations. The sizing mill is the last stage of the tube rolling process. If the incorrect stands are used during installation, this causes considerable problems in rolling, deviations in the tube diameter outside of the specified tolerance, and in extreme cases, even a break of the roll.

## Previous solution in need of improvement

Workers at the Rath mill push different roller cages for different tube diameters and thicknesses into the ten rolling stand locations of the sizing mill. In order to achieve the required result, all roller cages must be designed for the required tube dimensions. With around 400 roller cages, it was becoming increasingly complicated to manage the rolling stand plans manu-

Harsh conditions: The sizing mill of the plugging line at the V&M Düsseldorf-Rath rolling mill places demanding requirements on the electronics used



ally using ID numbers and various lists. Even with the utmost care there was always a risk of causing considerable financial loss by using the wrong roller cage. As a result, V&M Tubes developed the idea of automating the identification of the roller cages at the stand locations. A robust RFID identification system was required to enable production control to scan and monitor after a change of tube dimension whether all roller cages have the correct parameters for producing the next roll batch.

In their search for an automated identification system for the roller cages at the rolling stands, the responsible employees at V & M Tubes approached Salzgitter Mannesmann Forschung GmbH (SZMF) in Duisburg. At SZMF, the main System engineering department, or Automation department to be precise, builds customized systems for nondestructive testing and optical measuring which are used in several plants

in Germany and overseas. Dieter Geller and Dr. Gerd-Joachim Deppe, both researchers in the Automation department, dealt with the inquiry for an automated identification solution at V & M Tubes.

### Extreme conditions

In 2008, employees in the Automation department had gathered extensive information about the possibilities of identification technology at an RFID congress. It was known that RFID is well suited for use as an identification solution in harsh and contaminated production environments in industrial processes. However, the conditions at the rolling line in the Rath mill are more than just harsh and dirty: Besides the dust, dirt and surrounding metal environment, the glowing hot steel tubes and moisture from the spraying equipment take many systems to their limits. A combination of these unfavorable operating conditions presents a challenge to any RFID system.

Geller: "As a result of our research we came to the conclusion that no other supplier apart from Turck could offer such an extensive range of robust RFID system components. The selection of read/write heads with large read/write distances and the choice of suitable tags particularly impressed us." At this stage it was already clear that only an HF system could be used in the conditions at hand. The team put together a test system from the Turck portfolio consisting of a Q80 read/write head (TNLR-Q80-H1147) with encapsulated 2 Kbyte tags (TW-R80-M-K2) for mounting on metal. In 2009, the read/write head and the tags underwent an initial durability test and were permanently exposed to the temperatures and contamination conditions on site. After three weeks of continuous testing, the components had demonstrated their reliability.

Temperature measuring strips on the read/write head and at the stand location indicated temperatures here of up to 75 °C. The Q80 read/write head and the tags used are designed for maximum continuous operating temperatures of 70 °C and 85 °C (tags) and operated trouble-free in the prevailing conditions. Previously it was not possible to determine the offset of the roller cages when pushed into the stand locations. However, with the large write/read distance and a relatively broad sensing range of the read/write head used, there was no doubt that the system would function correctly. The tag used is encapsulated in plastic and is suitable for mounting directly on metal or in metal environments. The clearance to the metal produced



“As a result of our research we came to the conclusion that no other supplier apart from Turck could offer such an extensive range of robust RFID system components. The selection of read/write heads with large read/write distances and the choice of suitable tags particularly impressed us.”

**Dieter Geller,**  
Salzgitter Mannesmann  
Forschung GmbH, SZMF



**Turck's TNLR-Q80 read/write head didn't have any problems with the harsh environmental conditions**



**The gateway of the BL ident programmed in Codesys communicates with the operating computer**

### Quick read

In its Düsseldorf-Rath mill, Vallourec & Mannesmann Tubes (V & M Tubes), a company belonging to the Vallourec Group, rolls seamless steel tubes in various diameters and thicknesses. For this the world market leader in hot rolled seamless steel tubes uses around 400 rolling stands with different rollers which are now identified with Turck's BL ident RFID system. In spite of the metal environment, dust, heat and occasional moisture, the system reliably ensures that the correct rollers are used.



The cages are pushed into the rails of the rolling stand. The read/write head (center) identifies the tag on the rolling stand



The tag is embedded in a steel ring and is nevertheless read reliably

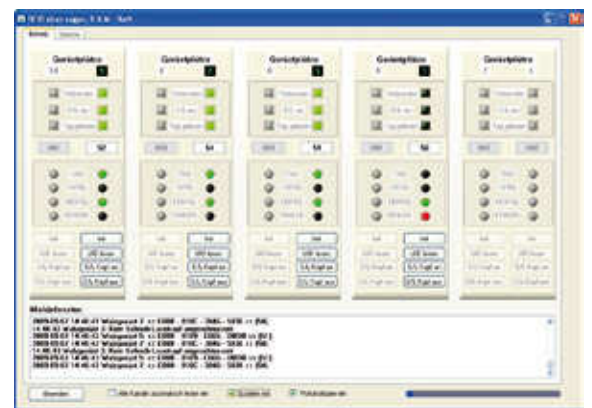
by the surrounding plastic ensures that the tag can be reached reliably.

After the successful completion of the durability test, SZMF started an extended viability study in the Rath mill using additional BL ident components. For this, the Rath mill installed read/write heads on four rolling stands and initially fitted 50 cages with tags in order to test the system in continuous operation. The four read/write heads were connected to a programmable BL67 gateway via Modbus TCP.

Geller developed a Codesys-based controller program for the gateway which establishes a data connection with a higher-level control computer. The telegram designed for this contains the status and the ID of the individual stand locations and cages. The operating computer reads the telegram and communicates via a TCP/IP connection with the gateway. Already in this test phase, a visualization of the stand locations programmed by SZMF in Labwindows CVI was running on the user computer. The user interface shows the status of all stand locations on a screen overview.

The entire system was successfully tested in continuous operation over three months. The read/write heads on the stand locations reliably read the data of the tags in the inserted roller cages. The plant regularly checked the data during the test phase and could thus confirm the reliability of the system. The subsequent final expansion stage of the system with ten read/write heads was implemented in 2010. For this the automation specialists simply added three more RFID modules to the BL67 I/O system for every two read/write heads.

The remaining channels were activated in the user interface and an RFID tag management was added to the system, in which the authorized user could edit the roller cage allocation and data. Tags were then added to the remaining 350 rolling stands. The rolling stands have a symmetrical design and can also therefore be rotated 180 degrees into the stand locations. In order to also provide the required RFID data, more RFID tags were gradually fitted on the opposite side of the cages.



SZMF developed the visualization for tag detection in Labwindows CVI

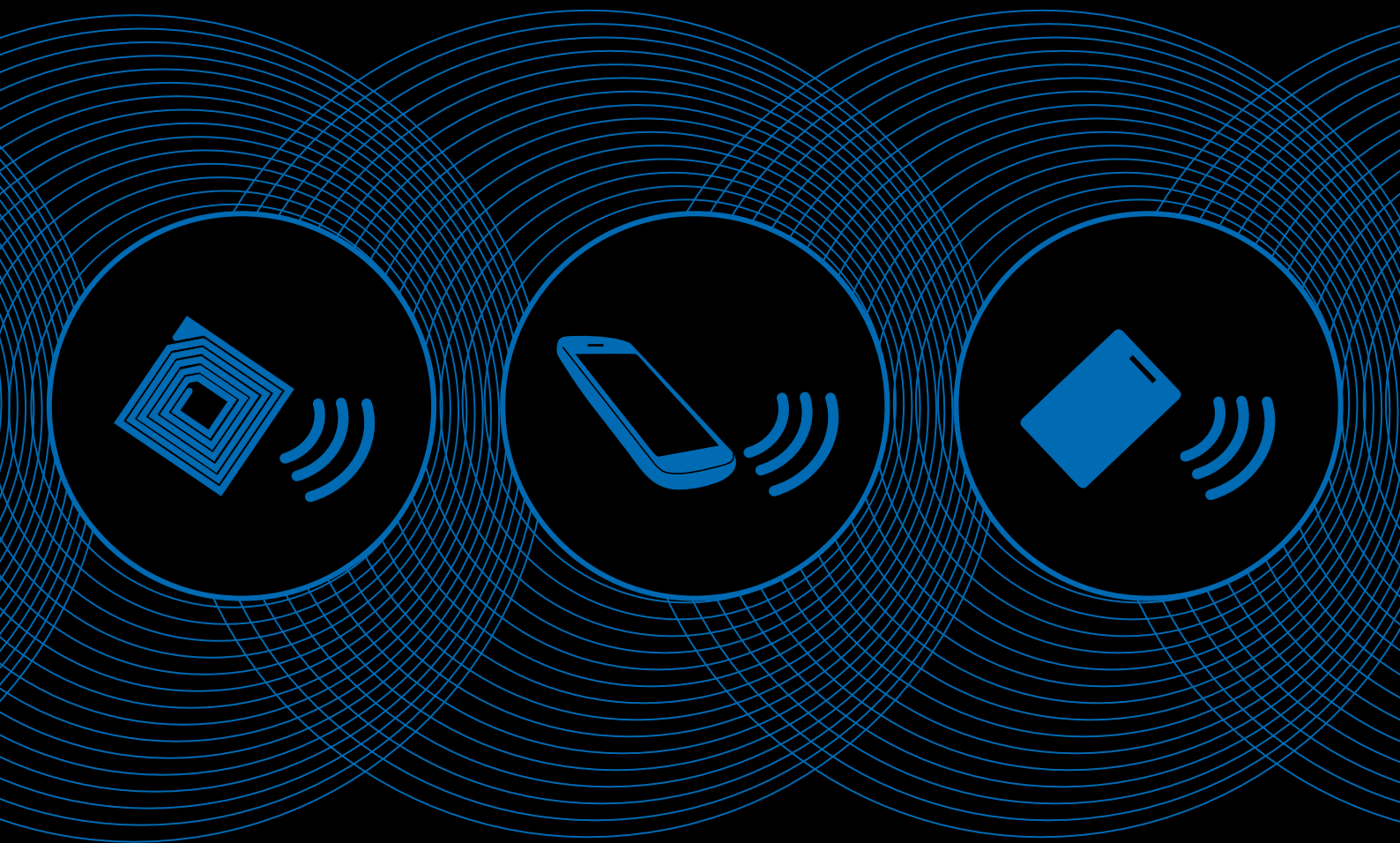
The final 10-channel stage of the RFID system for controlling the roller cage allocation has now been in operation for around two years. A network connection between the operating computer and the material management database (MV) has been in place for 1.5 years. The database queries the data of the ten roller cages using a TCP/IP telegram and compares this with the stored rolling stand plan. RFID information was also added to the control desk. The operator also has the ten stand locations in view here so that it is possible to check the proper state of the stand locations before the rolling of a specific batch is started.

## Outlook

After the experience gained in continuous operation, SZMF is already planning identification solutions for similar uses in similar application areas. It is very likely that Turck's RFID technology will be used again: "I was very pleased with the service provided by Turck. Regardless of whether information or test devices were needed, we always received a fast response to all our inquiries. The application also enabled Turck to test new ground and learn much from the extreme environmental conditions involved," Geller explained. ■

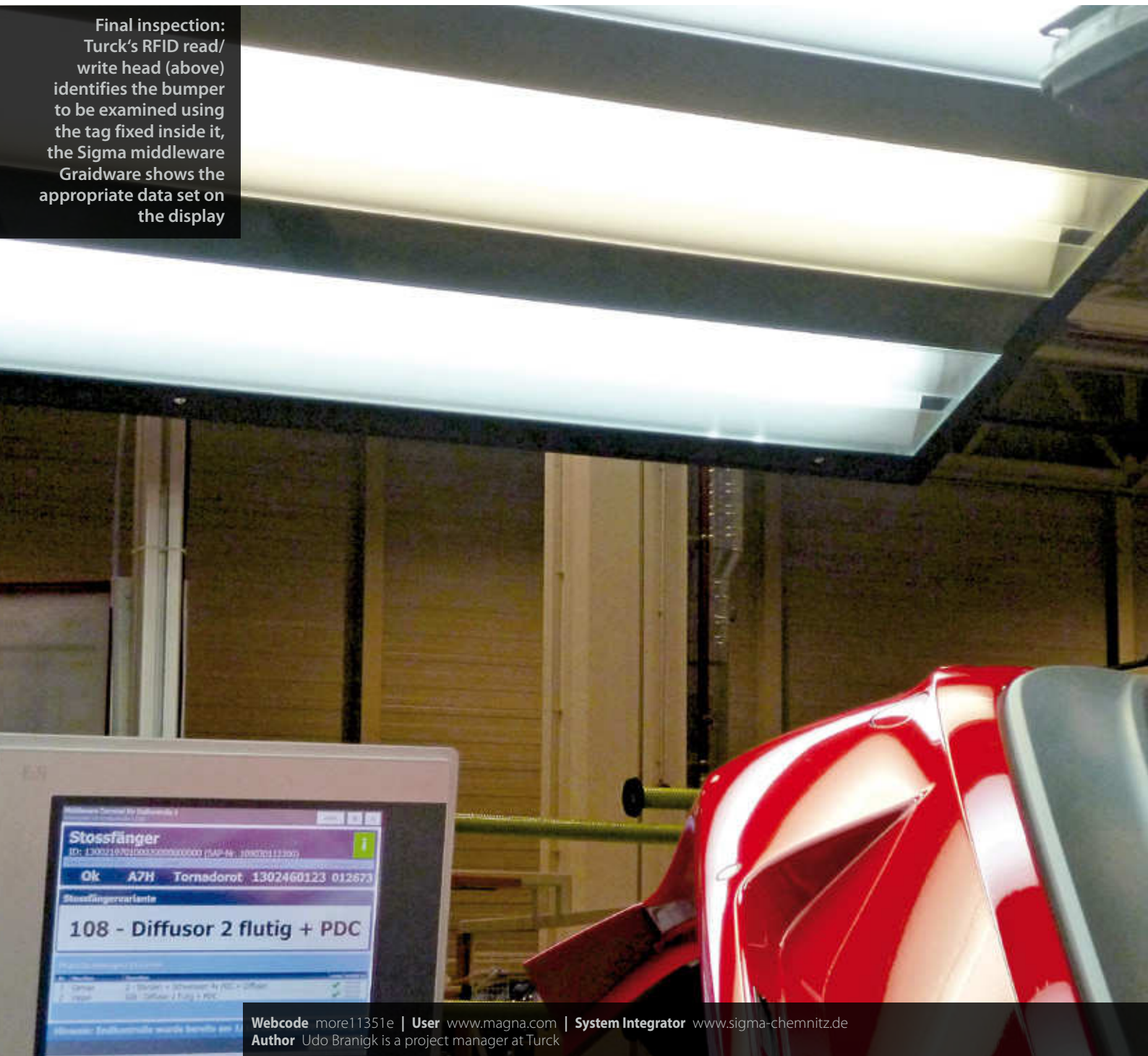
# rfid ready®

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



Your Source for RFID Technology News

Final inspection: Turck's RFID read/write head (above) identifies the bumper to be examined using the tag fixed inside it, the Sigma middleware Graidware shows the appropriate data set on the display



**Webcode** more11351e | **User** www.magna.com | **System Integrator** www.sigma-chemnitz.de  
**Author** Udo Branigk is a project manager at Turck

# Bumper Transparency

System integrator Sigma uses Turck's BL ident UHF-RFID system and its Graidware middleware to ensure complete transparency in bumper production at car parts supplier Magna

In marketing psychology, consumers that make use of new technical innovations at an early stage are called early adopters. The early adopter is the first to use a cell phone, the first to switch from a cell phone to a smartphone, and is the person who has

already been using an e-book reader for several years. Without doubt, the most important early adopters in industry can be found in the automotive sector. They made use of new materials like carbon for standard products early on and have always been trailblazers in





have no relevance for the position concerned. Together with Turck's RFID specialists, the experts at Sigma were able to solve all of the challenges of this pioneer project and fully exploit the benefits of an RFID system for the customer's production plant.

Magna Exteriors and Interiors (MEI), a wholly-owned operating unit of Magna International has capabilities including design and engineering, styling, tooling, manufacturing, assembly and sequencing, testing, continuous improvement, consumer and market research, benchmarking, and electrical/electronic system integration, among others. The products include front and rear fascia systems, sealing systems, exterior trim & lighting, class A composite panels, modular systems, engineered glass, under hood & underbody components, and structural components for automotive, commercial truck, renewable energy, consumer, and industrial markets. With its new location in Meerane, West Saxony, Germany, Magna International Inc. expands its net-work of manufacturing sites in Europe. Since August 2012 MEI Meerane has produced front and rear bumpers for the VW Golf VII and delivers these "just-in-sequence" to Volkswagen Saxony at the site in Mosel.

### Decision for RFID and UHF Technology

The management of MEI Meerane decided during the planning and development phase of the new site to use RFID technology for automated manufacturing and logistics management. The use of barcodes at other Magna production sites, has been assessed and discarded since the RFID solution is more flexible. In addition, scan operations with RFID compared to Barcodes are much faster and less error prone.

At the beginning of the project, due to the longer reading range, UHF RFID was determined to be the standard. Filters that are built in to the Graidware AutoID software, developed by Sigma Chemnitz GmbH, eliminate unwanted or unusable signals that result from confined space use of UHF RFID.

### Transparent process

When the raw bumper leaves the injection machine it is immediately equipped with a RFID tag which is registe-



“A major benefit of the Turck solution was the fact that the triggers, such as light sensors, or as in this case, a foot switch, could be connected directly to the gateway of the BL67 I/O system to which the modules for the readers are also connected – regardless of whether they are sensors from Turck or not.”

**Frank Pyritz,**  
Sigma

production automation. Car manufacturers were some of the first people to use fieldbuses – and today belong to the pioneers of the transition to Industrial Ethernet. Order lists and work pieces have been identified automatically for a long time – firstly using a barcode and increasingly by RFID.

It was a major car parts supplier, Magna Exteriors and Interiors (MEI), for whom the Saxony-based system integrator Sigma implemented a seamless RFID-based production control system last year. Utilizing UHF RFID allows for long sensing ranges. However, these long ranges presented the integrators with considerable challenges. Often the read/write heads detect tags that

#### Quick read

In collaboration with Turck, the Saxony-based system integrator Sigma proved at car parts supplier Magna that, with the right technology and clever software solutions, fully automated UHF-RFID identification solutions can be mastered without having to install inconvenient shielding measures due to the long sensing ranges involved. Today the customer is able to fully exclude the possibility of false reads in its bumper production plant using intelligent software logic.

The quality assurance and polishing workstations are also fitted with UHF readers such as the Turck TN865-Q150L170-V1147



red and managed by the software. This allows tracking and tracing the bumpers during the entire production and logistical process. Prior to lacquering, the position of the bumper inside the skid is detected by a reader, and captured by the middleware. This is used to track the production quality. After the lacquering process the entire paint shop data is automatically linked to the bumper.

Then the bumpers are placed into storage containers according to product type. Multiple RFID readers monitor the correct storage of the bumpers into containers. The AutoID middleware Graidware not only captures the signals, but also checks the signals for plausibility using sophisticated algorithms. Interference signals from neighboring transportation routes or passing forklifts are recognized as false signals and filtered out. The inspected storage containers are stored temporarily until the next request is being recorded. The location of the container is also captured and managed.

After the final production call the painted bumpers are equipped with harnesses, distance sensors, fog lamps, etc. depending on the configuration. The RFID tag controls the machine via an OPC server, displays the next production step, the configuration of the bumper and loads the appropriate machine program for the welding and punching operations. In case of incorrect

placement of the bumper or the wrong machine the operator of the machine receives an alert. Only after explicit confirmation by the operator will the machine start executing the program. Thus operating errors and scrap will be reduced. Upon completion of the production step, and after completion of quality inspection, the bumpers are placed on the appropriate frame for the just-in-sequence delivery for the customer. Finally, the position of the bumper on the frame is checked, since the position on the frame is essential for the further production at the customer site.

### Benefits of the Solution

The data captured during the production process is forwarded via Graidware to 3rd-Party-Applications such as ERP and WMS systems. This enables the customer to monitor the production in realtime. By applying the tags to the parts (bumpers) the customer will be enabled to completely track and identify the parts on the shop floor and the warehouse until the part leaves the site. In addition, statistical data can also be analyzed to improve the production quality, avoid complaints and thus optimize costs. Faulty manual barcode scans are prevented and training of new employees is less time consuming. This leads to a significant reduction



**The UHF read/write heads (above) monitor the storage of the bumpers in the containers**

in process time and costs. Sigma Chemnitz GmbH was selected by MEI as partner for implementing the RFID UHF solution in Meerane. Turck was selected as the supplier of the RFID hardware because its hardware met the requirements for an industrial production environment.

### The full range

Sigma utilized Turck's full range of automation products for the project, and this started with the UHF read/write heads in three housing styles. Sigma used the Q150 readers for the shorter ranges of up to 1.5 meters. Longer sensing ranges were required at other positions, which were implemented by the customer with Q240 read/write heads. For some special process steps, the largest type Q280 UHF readers were required which have maximum ranges of 5 meters. Many read operations per unit of time were required for this project, as well as the long sensing range. Sigma chose robust BL67 gateways with the appropriate I/O modules, which Turck also supplied in addition to the connection cables, power supply units and sensors.

"A major benefit of the Turck solution was the fact that the triggers, such as light sensors, or as in this case, a foot switch, could be connected directly to the gate-

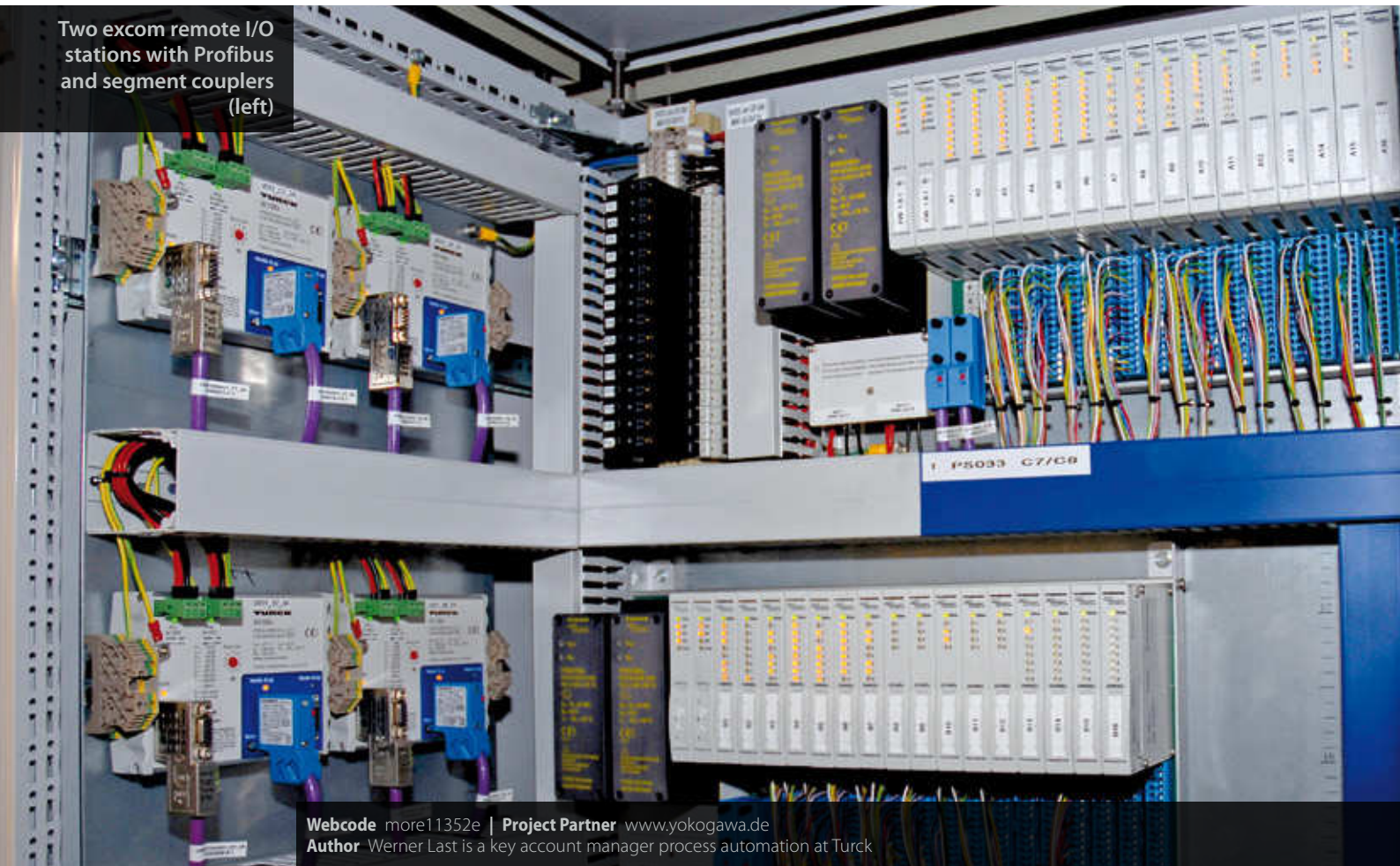
way of the BL67 I/O system to which the modules for the readers are also connected – regardless of whether they are sensors from Turck or not," Frank Pyritz, Sigma managing director, as he describes one of the benefits of the Turck system.

### Production start on schedule

The first request for quotation was in May 2011, just 15 months later MEI could start production on the shop floor on schedule. "It's quite remarkable if such a complex project is on time. We were able to start production at our facility ahead of schedule" commented Jens Turschner, Project Manager at Magna Exteriors & Interiors Meerane. He added: "For those kind of projects it will only work if all parties cooperate. In Sigma we have found a partner that not only has implemented what we wanted, but suggested valuable improvements in many areas."

Hendrik Rothe, managing director of Magna Exteriors & Interiors (Meerane), didn't regret the decision for Sigma and Turck, too: "We are very satisfied with the solution. We could start production on time and our processes run without errors. By eliminating time consuming steps we have achieved a significant improvement in processing times", he summarizes. ■

Two excom remote I/O stations with Profibus and segment couplers (left)



**Webcode** more11352e | **Project Partner** www.yokogawa.de  
**Author** Werner Last is a key account manager process automation at Turck

# The Chemistry's Right

In close cooperation Yokogawa and Turck developed Profibus DP lines with hot configuration in run (HCIR) functionality

**C**ustomer focus and solutions orientation are terms that are used primarily in the marketing departments. When customers really ask for a tailor-made product, the wheat separates from the chaff. Although special solutions demand higher costs, they can pay off for the manufacturer as well as for the customer. A collaboration-project between Yokogawa and Turck gives proof; together with their customer the companies developed a redundant connection of Turck's Remote-I/O-Systems, excom, and Yokogawa's process control system Centum VP.

## Continuous process optimization

The former process control system was already showing its age and could no longer meet the latest technical requirements, such as in relation to interfaces like Profibus or OPC. When the regular overhaul of the plant was due, Sasol decided to make use of the downtime and replace the existing process control system. Turck's

excom remote I/O system, which was already installed in other plant areas, was to be used to connect the field devices in zone 1. At that time, the customer had chosen excom because it was the only remote I/O solution on the market that could be operated in zone 1 at 230 volts. Due to the long cable runs involved, alternative solutions based on 24 volts required large cable cross sections in order to compensate for the voltage drop.

The team responsible for connecting the new control system drew up a clearly defined specification profile: A redundant Profibus connection to the remote I/Os which must offer the ability to be expanded by card and also by station during ongoing operation. This online expansion function is known in specialist circles by the term 'hot configuration in run' or HCIR.

"At the time of the configuration, this standard had not yet been described in the Profibus user organization. This meant that solutions between the control system and I/O system supplier had to be developed individually," says Holger Schneider, sales specialist at



**The redundant Profibus connection of the Yokogawa Centum VP control system increases availability**

Yokogawa. After the initial talks between the customer, Yokogawa and Turck one thing was clear: Neither party could meet the customer's requirements on their own, so both companies worked in close cooperation to develop a configuration for their devices.

### Tested by specialists

The product specialists of both companies adapted the software of the Yokogawa Centum VP control system and the excom firmware accordingly. After some internal tests, the interaction between the adapted systems was put to the test for the first time at the customer's site in 2010. The process control engineers prepared a test environment in which an independent system generates a signal that reaches the Yokogawa system via the excom station and Profibus. There the signal is acquired by a software module, visualized, stored in a trend and then sent back as an output signal via the excom station. The trend function of the independent system enables the sent value to be compared with the received value in real time.

This test configuration enabled sawtooth signals (slowly rising and falling analog signals) and square wave signals (digital on and off signals) to be monitored during a HCIR operation. The test setup and the alternating signal provided a more detailed insight into the interaction between the control system and the remote I/O. Schneider describes the challenge when fitting a new module:

"You have to load the modified bus configuration in order to include new stations or additional cards on the bus. During loading, the bus is initialized for approximately two seconds. In this time all stations are disconnected momentarily. The stations must be able to detect this operation and distinguish it from a cable break. If this type of situation is detected, all input and output values of the system are held for this time. The operation therefore has no effect on the installation."

### Solution through close collaboration

The first test dampened hopes of a speedy solution to the task as the team noticed an unwanted response: When a new module was added, the control system did not retain the last known process value as required. Instead the technicians noticed a momentary dropping off of the signal value. During the ongoing operation of the plant, this change in signal could have affected the production process or even caused a plant shutdown. The specialists from Turck and Yokogawa adapted the firmware once more, and were able to fine tune the system so that further test runs finally satisfied all the participants in the project.

After a total of 15 months of testing and implementation, the work had paid off for all involved: The customer is benefiting today from a solution that was not previously available on the market. Yokogawa and Turck have expanded their range of devices for these functions and have created additional value from the application. As Yokogawa sales specialist Schneider sums up, it was not just due to the specialist and product knowledge of employees: "The smooth and constructive cooperation between the specialists on site and the application engineers at Turck and Yokogawa enabled optimum solutions to be developed quickly. The chemistry here was just right."

Today, a so-called tokushu – the name given by Yokogawa to special software solutions that mature into standard products – now provides the Centum VP with an official software version for the control system, enabling Yokogawa customers to run their process control system together with excom in a redundant and HCIR-capable system. At Turck, the adapted firmware has now become part of the standard for the excom remote I/O system. Redundant communication and HCIR via Profibus-DP are now possible between Centum VP and excom without any problems. ■



“We wanted a redundant Profibus connection to the remote I/Os which must offer the ability to be expanded by card and also by station during ongoing operation.”

**Holger Schneider,**  
Yokogawa

### ▶ Quick read

When the replacement of a process control system was due in a chemical plant, the owners wanted a fail-safe and redundant solution with HCIR functionality. To meet this requirement, Yokogawa and Turck worked closely with the customer's specialists and developed a custom solution from which not only the customer benefits. The original special implementation has now been developed into a standard product by both manufacturers.

# Painting in Extremes

A Chinese car manufacturer uses Turck's BL compact stations, connectivity products and proximity switches in its new paint shop

In recent years, China has grown to become the world's most important automotive market next to the USA. This is benefiting Chinese manufacturers. The production complex of a Chinese car manufacturer – and Turck customer – managed to achieve sales of around 2.4 billion euros. The upstream and downstream industrial sectors, such as the supplier industry or logistics also benefit from this economic strength.

The car manufacturer has belonged to the premier league of the Chinese automotive industry for several years. In order to increase its annual production to 300,000 cars, the manufacturer added a production line to its production plant. The investment for the paint line alone was almost 40 million euros. Today 150,000 car bodies are painted here each year. As well as the construction of the paint shop, the project involved a press shop, the body construction section, as well as an assembly line including engine production. With BL Compact fieldbus stations and connectivity products, Turck ensures that the signals of the field devices of the paint line are sent to the controller reliably and cost effectively.

## Harsh ambient conditions in the paint line

The car body parts are first pressed, welded to form the chassis and then painted. Oil and grease are first removed in the paint line at high temperature from the surface of the chassis using high pressure jets. The subsequent cathodic immersion painting process and a phosphating process protect the car body from oxidation and corrosion, i.e. rust. After thorough pre-treatment, the chassis is primed, painted and then dried.

This multi-stage painting process, the high level of automation in the plant, and the different process steps coordinated in the extremely harsh conditions present the automation components used and the integrator with a particular challenge. The restricted space and the combination of factory automation and industrial process requirements made the search for a solution even more difficult.

The central task of the project was to automate the transport system of the paint line. It is based on an

**Robust:** The fully encapsulated BL compact modules are fitted directly on the steel support of the skid conveyor system



**With their large operating distance, the proximity switches guarantee the reliable detection of the switch positions**

**Webcode** more11355e

**Author** Li Tao works in the marketing engineering department at Turck China in Tianjin

automated skid conveyor system. The autonomous and safe control of the skids on the rails requires the use of many position measuring points, sensor signals and motor control signals. The fieldbus stations have to process the corresponding number of inputs and outputs. A central I/O station to collect and process all the inputs of the plant would have been more expensive due to the cabling involved. Troubleshooting in the event of a fault can also be very time consuming, depending on the type of central I/O station used.

## Open standard

The customer's specifications included the alignment and control of the paint robot as well as the flexible integration of the conveyor belt systems – and all this while maintaining a constant level of production efficiency in full operation. The responsible engineers wanted an automation system that was based on an open protocol and which could be implemented with standard cabling.

It was decided to use DeviceNet. This fieldbus standard is an open protocol that provides the level flexibility to optimally meet the requirements of the paint shop. Due to the size of the plant, the installation of compact I/O stations in the field was recommended. This made it unnecessary for every single sensor cable to be routed through the entire plant. Turck's BL compact stations are installed instead, which route all inputs

## Quick read

Paint processes present particularly demanding requirements on automation components. Turck's IP67 BL compact fieldbus stations withstand all the harsh environmental conditions in the plant of a Chinese car manufacturer and transfer the switch signals of the skid conveyor system cost-effectively to the controller. The matching connectivity products and inductive proximity switches from Turck round off the robust solution.

further via the bus cable to the next I/O station, and then on to the master. Turck's BL compact DeviceNet modules with protection to IP67 were able to fully meet the requirements of the application. The compact modules are fitted on the steel support of the transport system along the entire length of the paint line – also directly next to the motor controller which coordinates the entire transport of the skids.

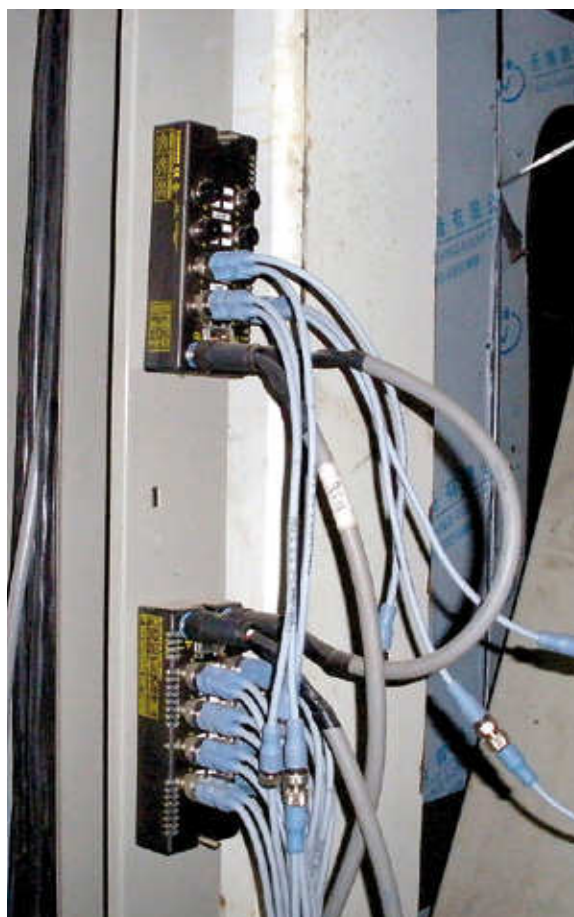
The customer uses BL compact stations with 16 digital inputs (BL CDN-8M12S-8DI-P) and the smaller version with eight digital inputs (BLCDN-4M12S-8DI-PD). They form the backbone of the entire bus system in the paint line. The 16 switch inputs are distributed to only eight M12 female connectors in the highly compact modules. One female connector routes two inputs – the version with four connectors being sufficient for eight inputs.

## Extremely robust

The compact stations are fully encapsulated in epoxy resin in order to achieve their tremendously robust design and IP69K protection. The thermal performance of the block modules is also impressive: They can withstand temperatures from -40 to +70 °C. Despite the high temperatures, the paint line does not effect the modules. The extensive diagnostic functions of the I/O stations enable the customer to increase availability and the required level of reliability. LEDs on the module provide workers with reliable status indication of the inputs locally in the field. The matching Y junction cables as well as the bus cable likewise come from the Turck portfolio.

Turck offers BL compact modules for analog signals, switch signals for connecting RFID read/write heads or other signal types. Individual BL compact stations were fitted with signal processors to meet the customer's special application requirements in order to save costs on stations and cables. The system is perfectly matched to the application, is easy to maintain, and also includes proximity switches from the Turck portfolio as well as the fieldbus stations and connectivity products.

The customer uses the Turck proximity switches for position monitoring points in the skid rail system. With their large operating distance, they guarantee the reliable detection of the switch positions. The proximity switches have the same EMC performance as the fieldbus stations. A satisfied customer and a fault-free production are the result of the intensive cooperation between the car manufacturer in China with its long-standing partner Turck. ■



The Y junction cables carry two signals via an M12 male connector to the input to the bus

The P3 camera at  
Ensinger detects  
25,000 bottles an hour  
– wrong bottles are  
immediately removed



**Webcode** more11356e | **User** www.ensinger.de | **System Integrator** www.loeffelhardt.de  
**Author** Helmut Röder is a sales specialist at Turck

# Wrong Bottles

Ensinger Mineral Heilquellen GmbH uses camera technology from Banner Engineering to identify drink bottles

It is considered as a classic example of German product design: the mineral water pearl bottle from the Genossenschaft Deutscher Brunnen (GDB – Cooperative of German Wells). When it was launched on the market at the end of the sixties its design was revolutionary. The raised pearls in the top third of the bottle were not only meant to be an attractive feature – they offer extra grip on the tapered bottle. The bottle was also one of the first mineral water bottles to be provided with a screw cap instead of a swing top.

The deposit system of the GDB had proved to be worthwhile. Today, around 450 million of the green and

white glass bottles alone are in circulation. However, not every customer returns the crates of empty bottles correctly sorted to the beverage store. Before manufacturers clean the bottles and refill them, they must first identify any non-brand bottles and remove them.

This is also the case at the plant of drinks manufacturer Ensinger Mineral-Heilquellen GmbH in Vaihingen/Enz-Enzingen, near Stuttgart. A camera is used in the filling plant to check whether each bottle on the conveyor is of the correct bottle type before the bottle caps are unscrewed. Three types of bottles run through the plant: the standard 0.7 liter bottle, the half liter bottle and the green GDB water bottle. The camera has to monitor 25,000 bottles an hour. Any fault that occurs considerably delays the production.

## Quick read

Powerful image processing solutions can very quickly become complex and expensive. As high-end systems exceed the requirements of many applications, Turck also offers solutions for simple applications from the camera portfolio of its partner Banner Engineering. The reliability and the good price-performance ratio of the Banner system, which detects incorrect bottles with the P3 camera and LED lighting, impressed the drinks manufacturer Ensinger.

## Previous solution with weaknesses

The camera used at Ensinger up to 2010 had considerable weaknesses since the measuring lines by which they identified the bottles were fixed. The camera focused on a defined range and measured the distance



of two light-dark transitions that were characteristic features of the bottle. If the bottles came slightly off-set into the viewing range of the camera, it identified it as a wrong bottle even though it had the correct dimensions. "Our service electricians were in action every week when the machine had to be reset for a different container," Siegfried Winkler, head of electrical engineering at Ensinger, describes the situation of the previous solution. "We also had errors if the lighting was poor." In short: Too many weaknesses to ensure the continuous identification of the bottles.

Ensinger looked around for a new solution and came across a camera from Turck at an information event of the automation wholesaler Löffelhardt. The responsible employees at Ensinger were able to bring bottles and directly try out which camera solution was best suited for identifying their bottles. The test impressed the Ensinger employees from the start.

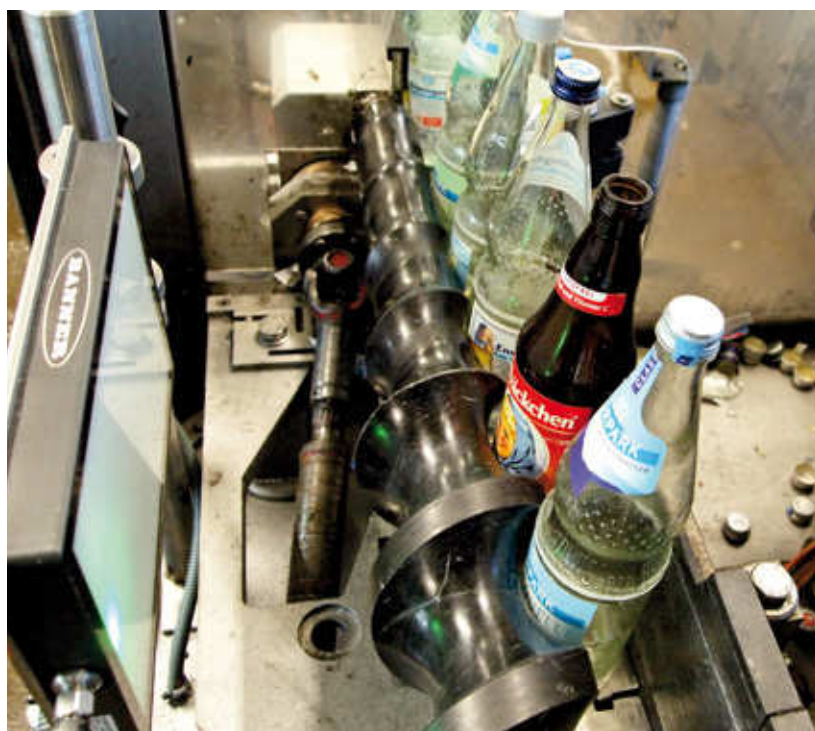
Uwe Binder, camera expert at Löffelhardt put together a suitable camera system for Ensinger. Thanks to his knowledge he hit upon Turck's comprehensive portfolio for optical identification, which is developed by Turck's optical partner Banner Engineering. As the identification needed is relatively simple, a high-end system would exceed requirements and would be too expensive for the customer. Binder was able to put together an attractively priced solution from the Turck range that was exactly tailored to the requirements involved. "For us it is a major benefit that we can find components in the Turck portfolio for complete vision systems. From the camera to lenses, processors and lighting, right through to the required connectivity products, we can get everything from a single source. Turck always provides us with the support that knows every component of the vision system and can offer additional help," Uwe Binder explains his decision.

## Measuring lines adjusted

Compared to the previous solution, today's camera solution has considerable benefits. It does not aim rigidly at two points but searches for a defined reference point, adjusts the measuring lines accordingly and then triggers the appropriate image automatically. Besides the trigger signal that the camera receives from the cam switch mechanism of the screw conveyor, the camera is triggered again almost automatically. It measures the bottle diameter using the distance between two light-dark transitions. The two measurements are enough to identify the bottles unambiguously. This also functions if the bottles are positioned slightly off-set in the screw conveyor.

The present solution also has another advantage: The Ethernet port of the camera enables Siegfried Winkler to fetch the

**The P3-PPROCAM with a 12 mm wide angle lens is positioned with the signal processor in the housing in front of the decapping machine**



**The robust IP67 LED infra-red light is positioned opposite the camera**

camera image directly onto his PC. If a fault message occurs, he can check where the problem is from his desk– or at least where it is not. "The camera and the entire system from Banner particularly impressed us on account of the good price-performance ratio," Winkler says. The P3 is not designed for highly complex identification tasks. It is better suited for reliable bottle identification than more complex and more expensive solutions. With a resolution of 640 x 480 pixels and a 1/3 inch CCD sensor, it can detect 256 gray scale values and produce 48 images a second.

The Banner P3 camera is housed in a watertight metal housing which the customer specially manufactured for the application. The signal processor is also contained in the housing. It evaluates the images and identifies the bottles as correct or wrong. Only the "good/not good" signal is transferred to the controller – and if required, also the camera image for remote diagnostics via the Ethernet port. In the event of a fault, the controller triggers a compressed air valve to remove the wrong bottle. A round plexiglass window is embedded in the housing through which the camera views the conveyor belt.

The LED background lighting that was also supplied by Turck is positioned behind the bottles. The IP67 degree of protection enables the LED infra-red lighting also to be fitted directly in the wet area of the bottle detection. With a lifespan of 50,000 hours, there is now no more risk of poor lighting. "We are very pleased with the new camera. It runs perfectly and saves us the time consuming service operations that were required with the old solution.

The best indication of this is the fact that since commissioning, Turck has no longer heard from us," Winkler concludes. ■



“From the camera to lenses, processors and lighting, right through to the required connectivity products, we can get everything from a single source. Turck always provides us with the support that knows every component of the vision system and can offer additional help.”

**Uwe Binder,  
Emil Löffelhardt GmbH**

# Safer Fun Rides

Turck's uprox+ sensors reliably detect copper and aluminum targets on the latest roller coasters at the Europa Park

Anyone wishing to be a major player in the leisure park world unavoidably has to continuously extend their offering and make new attractions available. This also applies to the Europa Park, one of the key operators in the sector, which was able to welcome over 4.5 million visitors last year. 2012 was also the year in which the family-owned enterprise made the largest investment in its history. This included the new major attraction, the wooden roller coaster – the Wodan Timber Coaster – which is aiming to set new benchmarks.

The safety provision for the wooden roller coaster includes sensor technology from Turck, which was already implemented on the Blue Fire Megacoaster powered by Gazprom, which was opened in 2009. The Megacoaster is the only roller coaster in the Europa Park that is started with a catapult launch system. Roller coasters are normally pulled up to the highest point of the ride in a lift phase and then race down to the station at the bottom driven only by the gravitational potential energy. With the Blue Fire roller coaster, on the other hand, the train is launched along the track from stand-

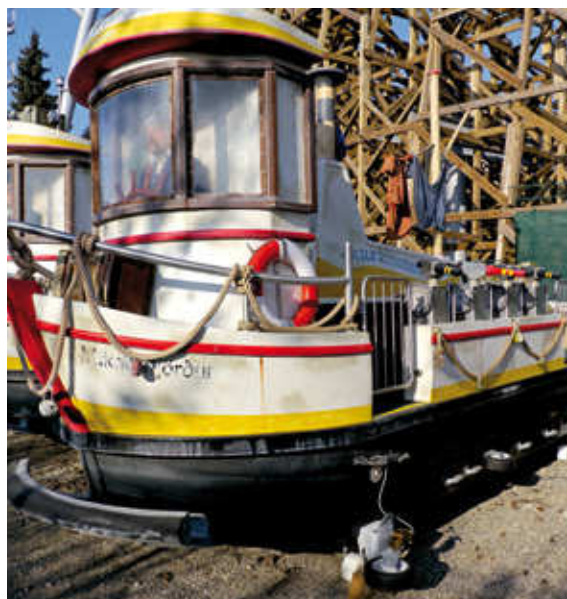
The Wodan Timber Coaster is the first wooden roller coaster in the Europa Park



still within 2.5 seconds at a speed of 100 km/h. A linear induction motor is used to produce the acceleration. An elongated electric motor provides the non-contact acceleration of a static magnetic field generated on the train using a wandering magnetic field – similar to the operating principle of a maglev train.

### Sound system triggered by wheels

A sound arrangement composed for the ride accompanies the passengers and is started regardless of the position of the train. The video camera that films the passengers during the ride is not started until a particular section of the track is reached. These functions are combined in the Oracs onboard system supplied by Emis Electrics GmbH in Waldkirch. The system integrator also develops and produces the electronics and the control system for the roller coasters of the Europa Park. The system requires the position information of



**Turck delivered uprox+ sensors in a watertight housing for the shipping fleet of the Europa park. They detect under water the entry into harbor in order to switch off the water canons in time**



the train along the entire length of the ride. Instead of using trigger points on the track, the controller uses the revolutions of the train's wheels to determine its position. An inductive proximity switch is mounted on an aluminum wheel of each train, and detects the revolutions of the wheel by means of the holes in the alloy wheel.

"Initially we used a different proximity switch. Although this functioned reliably, it had a very short switching distance. During maintenance when the wheels were taken off, even if the mechanic hit the sensor lightly, this would cause the bracket to bend so that we had to readjust it," Oliver Gebhardt, responsible project manager at Emis Electrics, describes the situation. "For a long time we looked for a sensor with a longer switching distance. Although most other sensors had the switching distance we required, they needed more space for resetting than the Turck switch." The metal-free space on the wheel is narrow. The Turck NI10U uprox+ sensor stood out on account of its clean switching performance with a precise switch point. "The Turck sensor has a very good detection beam. This therefore provides us with considerably more availability for the installation," Gebhardt adds. Turck uprox+ sensors also detect the correct closing of the bar restraints on the Blue Fire roller coaster.

The manufacturers of this mega coaster are Mack Rides, who originally founded the Europa Park as an exhibition park for its fairground machinery. The park

#### ▶ Quick read

Even if inductive proximity switches are the bread and butter business in the automation sector, there are still a great deal of differences between sensor suppliers. The latest roller coasters in the Europa Park therefore rely on the sensors of Turck – the larger switching distance, a precise switch point and the clean switch response of the uprox+ sensors were the key factors in the selection.

**Safe enjoyment: The wheels of the Blue Fire Megacoasters powered by Gazprom grip the rails on all sides**



has developed greatly from the original concept of a small amusement park for day visitors. With a total of five 4-star theme hotels of its own, Germany's largest amusement park also attracts several multi-day visitors and short-stay holiday travelers. A major part of the Europa Park's fairground machinery still comes from Mack Rides. The Wodan wooden roller coaster is an exception. The ride is based on Norse mythology for which wood is a much better material than steel. As Mack Rides are specialists in steel fairground machinery, this roller coaster comes from the US manufacturers Great Coasters International (GCI).

Emis Electrics also planned the control system and the electronics concept of the roller coaster. However, the Europa Park operators set the requirements for the controller and the electrical and electronic components used. These specify the use of only two sensor technology manufacturers – one of which is Turck. This enables the amusement park to keep its inventory manageable and the maintenance times short.

### **Block system secures the wooden roller coaster**

The safety requirements placed on passenger rides are extremely high – the standards are even more demanding than for elevators. Roller coasters are normally equipped with a block safety system. A block is a section of the track between two brake points of the ride. The core principle of the system is to enable a section



**The hole in the alloy wheel of the Megacoaster is detected by the uprox+ with its precise switch point**

for the train, i.e. to open the brakes only if the previous train has left the next block. The block system is also used to determine the speed of the train by recording the travel time between the blocks.

### **Factor-1 sensors detect copper brake fins**

The system is normally monitored and controlled with proximity switches. The switches detect the so-called copper brake fins which are fastened to the bottom of



The train is detected by the uprox+ sensors over the entire lift phase

the train 70 cm apart along its entire length. "Copper is a nonmagnetic metal. This is important in order to respond to the magnetic brakes which slow down the ride when required," explains Markus Spoth, electrical engineering manager at the Europa Park. The advantage gained here is a disadvantage for the detection with inductive sensors. Inductive switches with ferrite core technology have the worst response to copper. A factor 1 sensor which guarantees the same switching distance with all metals therefore had to be used at this point. The Turck NI75 was able to stand out from the factor 1 sensors of its competitors. No other comparable switch offers such a highly reliable switching distance of around 6 centimeters. The train can have an offset of up to 2.5 centimeters to the right or left of the rails. "The sensors detect the 12 millimeter thick brake fin on the train from below and from the side. In both cases we need a clean switching performance. The Turck switches made this non-standard design possible. They supply a clean switch point in both mounting positions," explains Gebhardt.

### Silent lift hill

The section of the ride in which the train is pulled up to its descent point is known as the lift. An anti-roll-back rail in the track bed ensures that the train does not uncontrollably roll back to the station if the pulling chain or another component breaks. Normally a safety anchor clatters over the anti-roll-back dogs in the track



The view below the train shows the copper brake fin of the Wodan Timbur Coaster carriage above the robust uprox+ sensor

bed – making a clearly audible sound in the process. In order to prevent this noise, GCI lifts the anchor with an electromagnet. GCI calls this noise-free system a silent lift hill. The train is detected by sensors and its speed monitored by the controller. As soon as the train goes below a defined speed of 1.5 m/s, this indicates that there must be a fault in the chain drive. In this case, the controller reliably switches off the electromagnets, and the anchor falls onto the ratcheted track and engages. In this way, the system also functions in the event of power failure.

The use of Turck sensors used in Germany's largest amusement park will be continued. The use of an NI50U uprox+ sensor in the Whale Adventures Splash Tours water ride shows that it is also sometimes minor details that make the difference. The rectangular Turck switch impressed Emis because it could be ordered directly with a matching protective housing for underwater mounting.

### Outlook

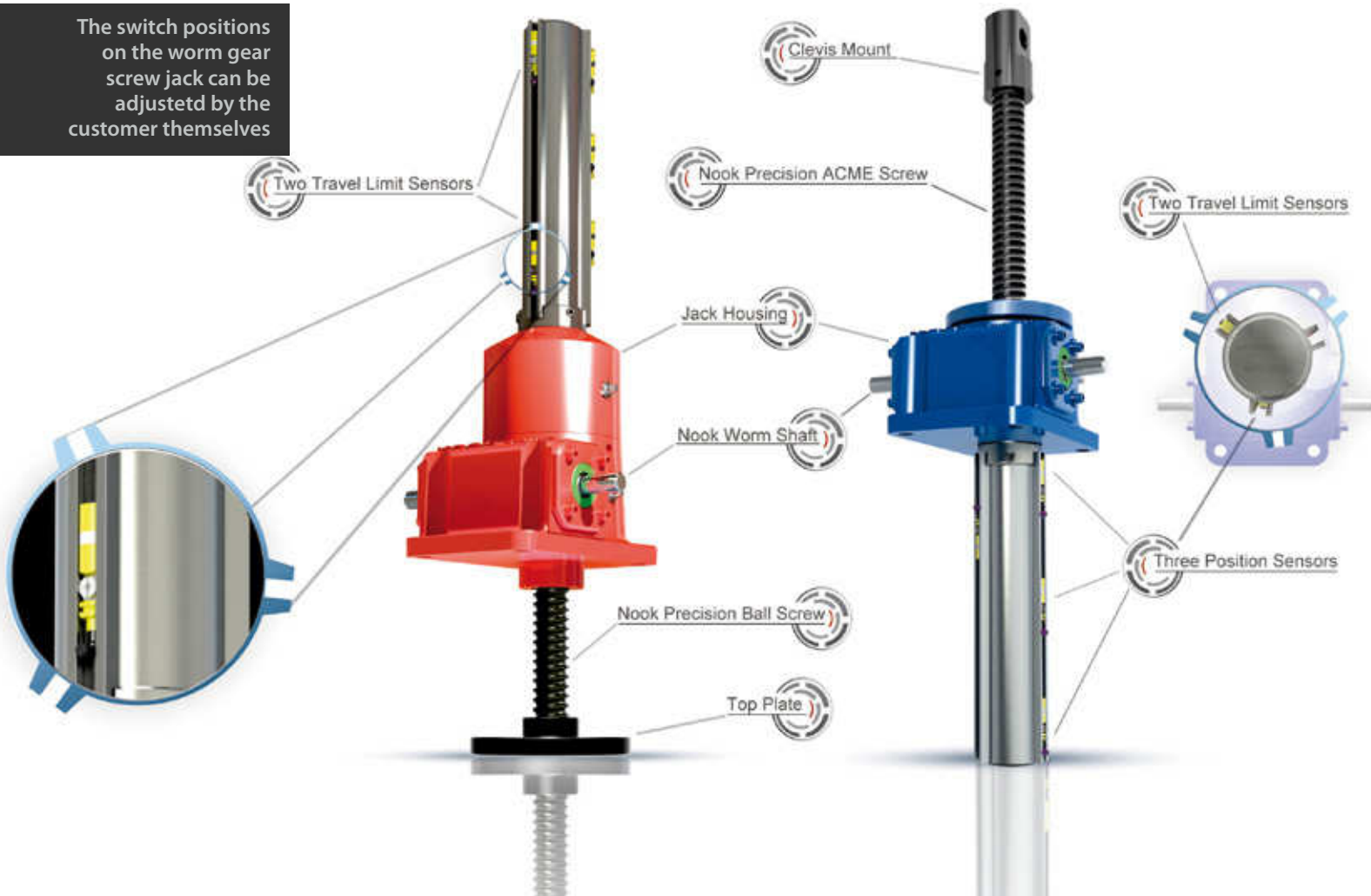
Further applications for Turck sensors in the amusement park are everywhere. For example, inclinometers are going to be used in future for the Windjammer swing ride. A new carousel ride that is partly lowered into water and is controlled and raised by three motors is to be fitted in future with inductive linear position sensors from Turck in order to ensure the concentric running of the ride. ■



“The Turck sensor has a very good detection beam. This provides us with considerably more availability for the installation.”

Oliver Gebhardt,  
Emis Electric

The switch positions on the worm gear screw jack can be adjusted by the customer themselves



**Webcode** more11353e | **User** www.nookind.com  
**Author** John Murphy is product manager for sensor technology at Turck USA in Minneapolis

# Efficient Position Detection

Nook Industries enhances position control applications in their worm gear screw jacks with Turck's BIM-UNT cylinder position sensors

**N**ook Industries, located in Cleveland, Ohio, is a leading linear motion control systems and components manufacturer, developing inch and metric mechanical and electro-mechanical actuators, assemblies and components. Providing a comprehensive selection of integrated linear motion components, Nook offers complete engineering, design, analysis and manufacturing capabilities.

To provide their customers with an alternative to higher cost rotary style limit switches in position control applications, Nook created the Nook Sensor System (NSS). NSS is designed to meet the need for a low-cost position sensing system on worm gear screw jacks,

specifically the company's ActionJac. The screw jacks incorporate position and travel limit sensors, which are mounted with custom profiles and used to detect ring magnets fixed to the translating screw. A patented, state-of-the-art electronic magnetic circuit is the basis of operation for these sensors.

The sensors on the NSS are manufactured using a polypropylene over-molding technology, which allows the sensor to be completely sealed into small sizes without compromising durability. An unlimited number of sensors can be added to meet a wide-range of position sensing requirements, as configurations with ActionJac are only restricted by the stem cover length.

By default the motion control systems are equipped with two BIM-UNT sensors, if required further sensors can be added easily



Remarkably easy:  
The biggest advantage of the Turck magnetic field sensor is its installation concept



## Advantage magnetic field sensor

Upon assessing the various industry choices, Nook selected Turck magnetic cylinder position sensors to indicate position locations on the NSS worm gear screw jacks. The company ultimately chose Turck sensors because of their simple installation, adjustment and integration with a motion control system, in addition to high accuracy capabilities. "Turck sensors accuracy and precision allows control of screw jack systems in ways that have never been possible before," said Matt Wilhelm, Design Engineer at Nook Industry.

Turck cylinder position sensors are used to detect magnet-equipped pistons on pneumatic and other types of cylinders. These non-contact sensors are able to determine the position of the cylinder piston without diminishing the integrity of the cylinder itself. This allows the sensors to operate without intruding upon the cylinder, keeping the system completely intact.

Designed to detect the position of a piston on standard pneumatic cylinders, these sensors are highly immune to EMC and polarity protected, with reliable switching points and a fast response time. Turck cylinder position sensors use magnetoresistive, board level technology that improves performance and housing options. Sensors come with a quick-mount tab that helps seat the sensor in the cylinder's groove – even before the screw is tightened – to facilitate single-handed mounting. The screw is positioned away from the cable-end to provide cable strain relief, while also ensuring the sensor remains in place if the cable is pulled.

Measuring only 28 mm in total length, Turck BIM-UNT cylinder position sensors are compact to fit in tight spaces. The active sensing faces are located directly at the end of the sensor, allowing it to safely detect the piston rod's end position on compact, short-stroke cylinders. Sensors include a broad range of accessories, from precision mounting to wire-strain relief products, to help install the sensors in all T-groove, dovetail, round and tie rod pneumatic cylinders.



“Turck sensors accuracy and precision allows control of screw jack systems in ways that have never been possible before.”

**Matt Wilhelm,**  
**Nook Industries**

## Perfect NSS sensor wanted

In selecting the sensors for the NSS, Nook identified several key features they would need to ensure proper performance and reliability of the NSS. The Turck sensors were lower priced and easier to adjust than rotary limit switches. Customers can even change the sensing locations on their own. Unlike the former sensing solution the Turck sensors can be used in jack sizes with tonnages that previously had no standard sensing solution. NSS applies to ½-Ton through 20-ton versus standard rotary style that cannot be used on jacks lower than 2-ton.

## Conclusion

The NSS, incorporating Turck BIM-UNT, has been successfully implemented in a limited number of customer applications to date. With a low cost and increased functionality, the NSS is ideal for diverse motion control applications. "We are excited about the endless opportunities for the NSS, and the addition of Turck sensors only enhances this," added Wilhelm. "Together, we have the ability to successfully assist and solve our customers' precision position control challenges." ■

### Quick read

Compact BIM-UNT sensors from Turck allow customers of the US motion control manufacturer Nook Industries to change the position switch points in the company's worm gear screw jacks on their own. In the blink of an eye the sensors can be unfixated and refixed at the desired position – even with one hand.

Turck's new production building offers the optimum conditions for efficient production and intralogistics



**Webcode** more11331e  
**Author** Simon Dames is an editor at Turck

# Increased Capacity

At the official opening of the ultramodern production complex in Halver, the Minister President of North Rhine-Westphalia, Hannelore Kraft, and ZVEI President Friedhelm Loh praised Turck's clear commitment to Germany as a place for business

**P**eople can only be innovative when they feel secure," Hannelore Kraft, the Minister President of North Rhine-Westphalia, emphasized in her speech at the opening ceremony of the new building at Turck's Halver plant in the Sauerland. In her speech, the politician highlighted the importance of education and training for the innovation capability of a country and the importance of a company like Turck: "It is family-owned enterprises like Turck that have characterized our concept of a social market economy," said Kraft, who also emphasized the responsibility of the entrepreneur to their employees. After all, in order to establish a leading role on the international market, well-trained young

people are required who must be offered a future. In this respect, Turck has been a shining example.

## 15 million euros for the future

Hannelore Kraft's speech was one of the high points of the official opening of the ultramodern production facility in Halver in November 2012. The newly created company premises and an investment of over 15 million euros will enable Turck to focus its energies and combine all stages of pre-assembly and final assembly, which were previously distributed over three buildings, into a single building. Short routes, additional capacity for research, development and production, as well as highly efficient kanban logistics provide the optimum conditions for further expansion. Besides production, the new building also provides space for a state-of-the-art training center.

"Turck's largest new building provides us with 13,500 square meters of floor space for setting the way ahead for the future. We are creating today the space for the successful business activity of tomorrow," explained company co-founder Werner Turck in his welcome speech. "Without a commitment to the

### Quick read

With an investment of around 15 million euros, Turck has made its development and production facility in Halver, Sauerland, fit for the future. After around 16 months of building, the new ultramodern building complex was inaugurated in November 2012 in an official opening ceremony. This enabled Turck to not only almost double its overall production area in Halver but also ensure more efficient production processes.





area in terms of research, development, and production of core electronics and software systems, our competitive edge will be lost. We live tomorrow from the innovations of today."

The new L-shaped building in Halver is an impressive piece of architecture. It is characterized by a large quantity of steel and glass, an excellent lighting system

and a future-oriented building services management system. The prominent atrium forms an impressive entrance area that houses the 700 square meter hall as well as office, meeting and training areas. Both two-story production areas adjoin the central three-story building structure. Around 300 employees have been taking up their new workplaces here since the middle of September. The final product production stage and the electromechanical preproduction stage have been brought together in this ultramodern building with the latest production facilities and work places from three separate buildings in Halver, and completely restructured according to kanban principles.

### State-of-the-art training center

The new future-oriented training center was set up for trainees and equipped with experimentation stations, measuring equipment, and the latest media communication and planning tools. Getting young people interested in technology is best achieved by providing impressive and transparent training conditions and courses. The center also offers space for training courses and seminars for customers and employees. This area is supplemented with a permanent exhibition in the top floor foyer, which is equipped with the latest automation products.

Friedhelm Loh, President of the German Electrical and Electronic Manufacturers' Association (ZVEI), was also impressed by the new building in the Sauerland. He praised the company for its optimism, which makes clear how important it is to take on responsibility. Turck continues to place its value in Germany as a place for business without losing sight of overseas markets. ■



“It is family-owned enterprises like Turck that have characterized our concept of a social market economy.”

**Hannelore Kraft**  
Minister President of  
North Rhine-Westphalia



During the opening ceremony guests were given an extensive tour of the ultramodern production facilities at the Halver plant

# 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
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
21.05. – 23.05.2013	SPS IPC Drives Italia	Parma, Italy
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
01.10. – 03.10.2013	Smart Automation Austria	Linz, Austria
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

Udo Branigk, André Brauers, Kai Binder, Markus Bregulla,  
Markus Ingenerf, Bert Kinzius, Werner Last, Martin Maurer,  
John Murphy, Helmut Röder, Li Tao

#### Art Direction / Graphic Design

Arno Kraemer, Britta Fehr (Art design)

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** more11380e

# 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>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>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>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. (+57) 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. 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>   Prysa (+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@netvigat.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) 57722820   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 20



Page 24



Page 28



Page 30



Page 32



Page 40

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



D900911 0413

