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Smart Switches

New technology of the uprox3 series enables the largest switching distances of all inductive sensors worldwide – including factor 1



IO-Link for more Efficiency

IO-Link has arrived: The new communication standard offers measurable production advantages for numerous applications

Ready for the Islands

Automotive supplier EuWe identifies workpiece carriers on manufacturing islands with the BL ident RFID system

Precise Slide Travel

Li-Q7 compact linear position sensors precisely measure the travel of tool slides in the CNC rotary transfer machines of Precitrame

Your Automation Partner



It's really something special when as a manufacturer you can present a product with a performance that cannot be achieved by anyone else. Not only because of the performance data, but because this performance opens up new possibilities for you the user. One example of this is the third generation of our uprox factor 1 inductive sensor series, which we are presenting on page 8. With the currently highest switching distances and the first factor 1 sensors in the 4 mm and M5 mini designs, you can now implement applications that were previously impossible.

Whether uprox3, inductive couplers for the contactless transfer of data and power, or ultracompact I/O modules with Turck multi-protocol technology, allowing use in Profinet, EtherNet/IP and

Modbus-TCP networks – the aim of our development activities are solutions that meet your increasing requirements and offer you or your customers real added value. In order to continue to achieve this aim, and sustainably strengthen our mission to be your global automation partner, we are not only investing continuously in people and infrastructure but also in the communication with you. If we know your needs and you know our capabilities, that is the basis for joint success.

After updating our fair stand and website, we are currently updating our corporate design in order to be also fit here for the challenges of the future. A first result of this modernization is what you are holding in your hands, a freshly updated customer magazine. Over the coming months other communication media, from the business card to brochures right through to catalogs, will be undergoing some fresh cell therapy. We will be presenting you with the result in autumn.

First of all, however, I wish you some informative reading in your new customer magazine.

Yours sincerely

Christian Wolf, Managing Director

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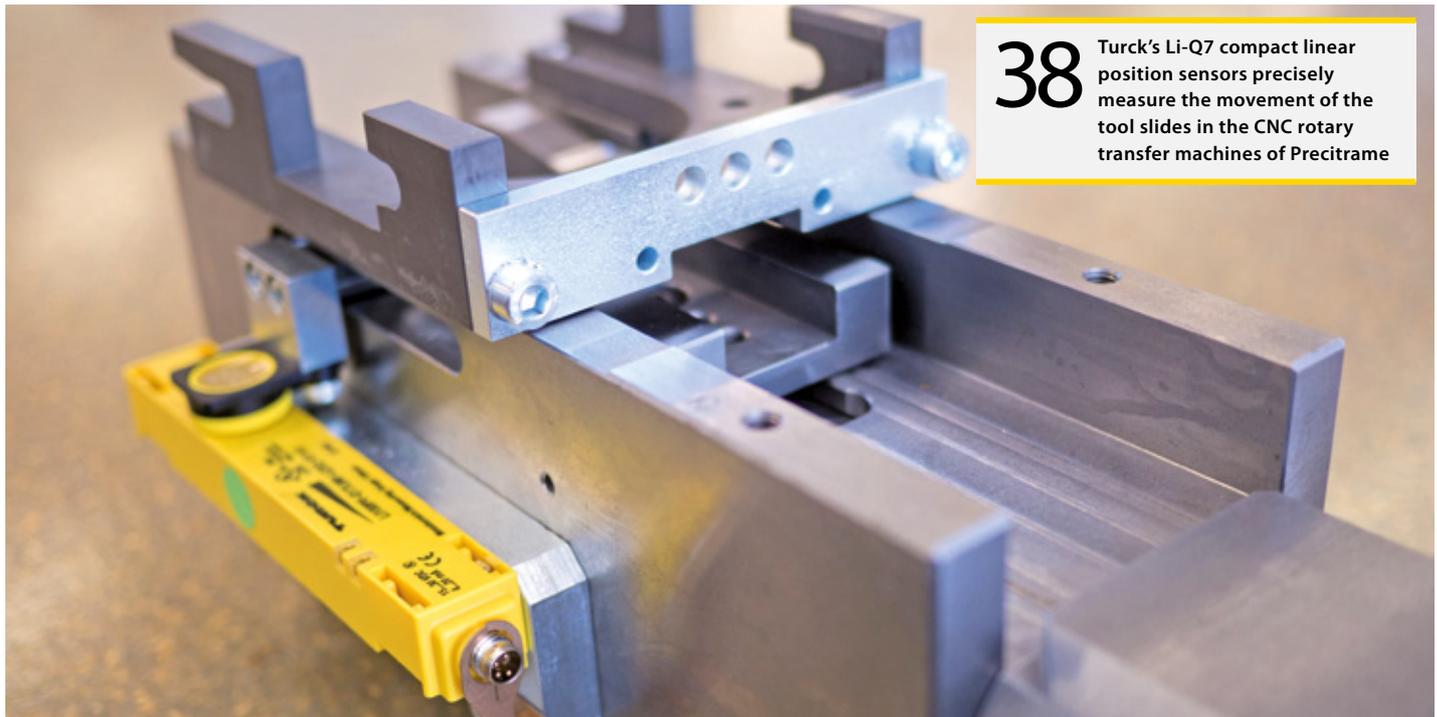
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New Sales and Marketing Headquarters



Turck expands its sales and marketing headquarters. With a symbolic ground-breaking ceremony, Turck's managing directors Ulrich Turck and Christian Wolf gave the go-ahead for the new building in Mülheim an der Ruhr in the presence of Dagmar Mühlenfeld, the Mayor of Mülheim, and the architect Erasmus Eller. On the approximately 15,000 square meter plot adjacent to the existing headquarters at the Witzlebenstraße, an architecturally ambitious building will be built until the spring of 2016, which will offer approximately 4,500 square meters of office and space for employees and customers. The building design offers a spacious reception and conference area on the ground floor



and is surrounded by a campus-like park. "In recent years the Turck group has invested around 40 million euros in new manufacturing and development centers at its German plants in Halver, Beierfeld and Detmold, as well as in the United States and Mexico. The new building of our sales and marketing headquarters in Mülheim will cost 12 million euros", says Ulrich Turck. "With this investment in the future we create the conditions for further strengthening of our competitiveness and sustained growth of the Turck group."

more info
about uprox3
on page 8

Factor 1 Sensors of the Third Generation

Turck is presenting uprox3 as the third generation of its range of uprox factor 1 sensor, which has the same switching distance for all metals. The electronic platform of the uprox3 series has been completely redeveloped, and is a world first that enables the creation of factor 1 sensors in the compact 4 mm smooth barrel and M5 designs with a 1 mm switching distance, even for flush mounting. Turck's uprox3 series currently offers the largest switching distances of all inductive sensors on the market.

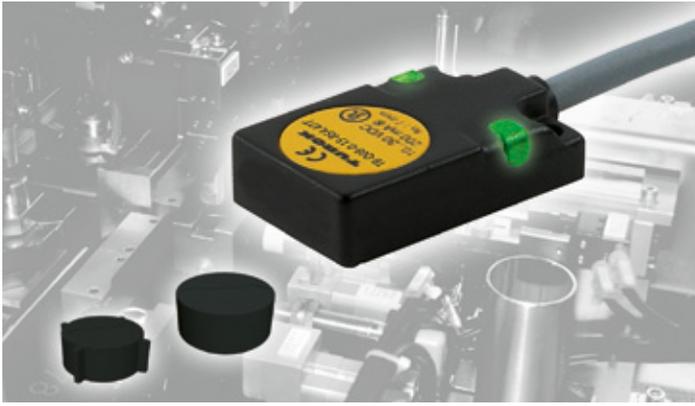


I/O Hub with 16 Universal Inputs/Outputs



Each port of the new I/O Hub TBIL-M1-16DXP with 16 digital I/Os can be used as an input or output without any configuration required. The hub connects up to 16 digital signals and brings them to the controller via the IO-Link protocol. This makes the hub particularly suitable for applications which have to link many digital actuators and sensors in a restricted space, such as in pick-to-light systems. In combination with Turck's NIC inductive coupler, which can provide contactless data and energy transmission, the I/O hub is also ideal for the wear-free connection of tool changers to sensors and actuators. The I/O hub even enables the unique identification of the tool without the use of RFID or barcodes. The devices function as an IO-Link device (specification v1.1) and can thus be connected to all IO-Link masters.

more info
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RFID Read/Write Head

With the TB-Q08, Turck is now presenting the smallest ISO15693 compliant RFID read/write head on the market with protection to IP67. In spite of its compact dimensions of 32 x 20 x 8 mm, both the antenna and the electronics are integrated in a housing. Two LEDs visible from all directions indicate a functioning power supply as well as active read/write operations to the user. Thanks to its compact rectangular design and the 15 cm long connection cable with an M12 connector, the TB-Q08 is particularly suitable for use in restricted mounting conditions, such as in small assembly and transport lines. Combined with Turck's new R10 and R12 tags in particular, the TB-Q08 can fully play to its strengths in the identification of metal objects, even with password functionality.

LED Indicator Lights with a Larger Illuminated Surface

Two new product series with a larger illuminated surface extend Turck's range of LED indicators. The K90, developed by Turck's partner Banner Engineering, adds another domed indicator to the range. The dome-shaped indicator light is 90 mm in diameter. This makes it also suitable for indication that has to be visible from a long distance. Compared to its TL50 and TL50C sibling product lines, the TL70 machine status indicator offers a 20 mm larger diameter and a modular design. The resulting increased illuminated area also makes the TL70 particularly suitable for large-scale applications. The number of color segments and their order can be set to individual requirements.



Expandable Safety Controller

Turck introduces an expandable programmable safety controller featuring small footprint and Boolean logic for high efficiency and flexibility developed by Turck's Partner Banner Engineering. The new XS26-2 controller monitors numerous input devices including e-stop buttons, rope pulls, enabling devices, protective safety stops, interlocked guards or gates, optical sensors, two-hand controls, and safety mats. A wide variety of options and configurations allows users to purchase only the capabilities they need, with ability to add on in the future. The base controller already offers 26 inputs and two dual safety outputs, allowing users to connect safety devices to a single controller instead of multiple relay modules. Eight of its 26 inputs can be configured as outputs for efficient terminal utilization. The base controller can handle up to 8 optional expansion modules to monitor up to 128 I/O devices. Ease of use features include real-time live display feedback and intuitive functional diagram configuration. Its compact DIN rail housing, only 45mm wide x 110mm tall, conserves control panel space. The controller is certified to Safety Category 4, Performance Level e.

Programmable Ethernet Gateways



The new generation of programmable gateways for Turck's modular I/O solutions, BL20 and BL67, can be programmed with Codesys 3 and with Turck's multiprotocol technology the devices can be used in any of the three Ethernet protocols – Profinet, Ethernet/IP and Modbus TCP. The new devices now provide a programmable gateway for Profinet applications for the first time. Turck has been offering programmable gateways in IP20 and IP67 for different fieldbuses for several years. That devices operated with Codesys 2.3 and have been tried and tested in several applications in which decentralized intelligence in the field can be used effectively. Programmable gateways are not only suitable for general control tasks, but also as a protocol converter, such as for converting Ethernet to serial communication, or for communication in RFID applications.

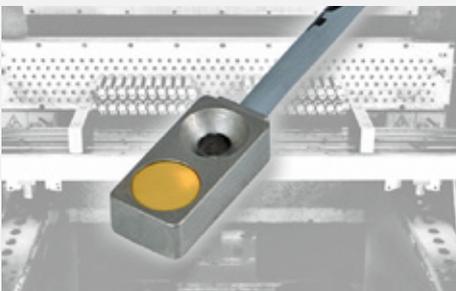
Werner Turck Receives Federal Cross of Merit



Photo: ©Yvonne Fannschmidt

Werner Turck, co-founder of the Turck Group, has been awarded the Federal Cross of Merit First Class. On behalf of North Rhine-Westphalia's Economics Minister Garrelt Duin, Dr. Günther Horzetzky held the laudation in Düsseldorf. He praised Werner Turck's entrepreneurial commitment and the decades of volunteering in his hometown Halver – with the assistance of his wife Inge Turck. Both form the basis for awarding recognized achievements of individual citizens in political, economic, cultural, voluntary or intellectual field, so the Secretary of State. The Federal Cross of Merit was founded in 1951 and is the only general merit award in the Federal Republic of Germany.

Miniature Sensors



The Q4,7 series of rectangular inductive sensors (16 x 8 x 4.7 mm) have been specially developed for applications in which they have to be fully embedded in metal, such as in pressing tools for example. The Q4,7 meets all the requirements with a 2 mm switching distance, a robust metal housing, a highly flexible connection cordset with an oil-resistant sheath and the possibility of a fully flush mounting.

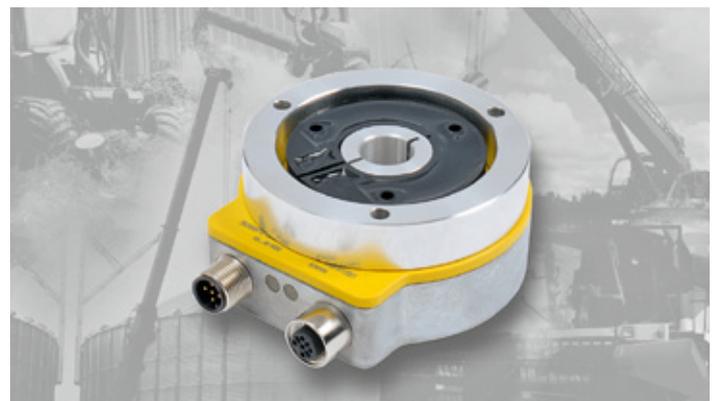
Multi-functional Vision Sensor

A new generation of vision and barcode sensors offering multiple tools and resolution options in each unit has been introduced by Turck. The iVu Plus Gen2 line includes integral and remote screen models for use in a wide range of inspection, machine vision and quality control applications. The vision sensors with built-in illumination are designed to solve applications that would typically require multiple photoelectric or proximity sensors. They now include a full resolution option to detect small features, and capability to use multiple sensor tools in the same inspection. Bar code readers validate twelve 1D and 2D barcode formats. They offer a coarse mode resolution setting that can provide significantly faster read rates, especially for 2D barcodes.



QR24 CANopen Encoder

The contactless QR24 encoder series has been expanded by a new version with CANopen interface. The wear-free QR24-CANopen variant is ideally equipped for use in mobile machines and industrial applications. These applications include crane and lifting technology, transport systems, construction machinery and also special machine building. As with other QR24 models, the sensor and the positioning element of the encoder are fully potted and designed as two independent and fully sealed units that withstand vibration or shocks on the shaft. Wear-intensive ball bearings or seals, that lead to machine downtimes or long maintenance times are not required. The QR24 series has the edge over both optical and magnetic encoders.





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Smart Switches

New technology of the uprox3 series enables the largest switching distances of all inductive sensors worldwide – including factor 1

When Turck presented the first uprox factor 1 sensor in 1994, conventional inductive proximity switches had already been in use for around 40 years. Then and now, uprox can claim to be a sensor that considerably reduces the wide range of different sensor types required; one proximity switch with the same switching distance for all metals – hence the term factor 1 – large operating temperature ranges and suitability for different mounting requirements.

At that time, the new air coil system was superior to the conventional ferrite core in virtually every situation. Besides the factor 1 features, it also provided such a high magnetic field immunity that the uprox sensor could be operated fault-free in the proximity of electric welding plants, induction ovens or linear drives.

PCB coils instead of ferrite core

The classical uprox principle consists of a transmitter coil and two receiver coils, and is considered as the forefather of all differential transformer sensor systems. The developers of the uprox+, which Turck presented in 2004, furthered this idea and used two pairs of transmitter and receiver coils directly on the

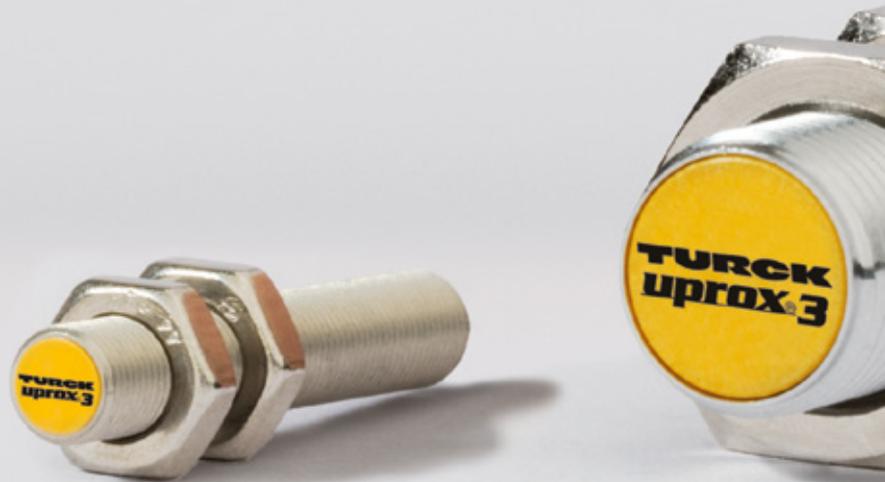
chip in order to increase the effective signal. This second generation offered the benefits of larger switching distances together with designs and mounting options that were previously unheard of.

Another ten years further on, Turck is once more setting a milestone at the Hannover Messe 2015 with the development of inductive proximity switches and is presenting uprox3, the third generation of its long-standing product. Although the existing uprox+ sensors offered large switching distances for all metals, these can be increased in the new series by up to 50 percent.

Nothing of the basic operating principle of the uprox sensor, which has been proven in millions of applications, had to be altered. A modified electronics architecture and the use of the latest chip and production technologies enable the third generation of the uprox sensors to achieve the largest switching distances of all inductive sensors on the market, including factor 1 sensors. For flush mounting, this is an as yet unattained 3 millimeters for the M8 design, 6 millimeters for M12 and 10 millimeters for M18. Thanks to the consistent further development of its

QUICK READ

Turck's uprox factor 1 sensor has been the standard in the automotive sector for twenty years. The same large switching distances for all metals, weld field immunity and a large degree of mounting flexibility are the key benefits of these inductive sensors without a ferrite core. The recently developed third generation of the uprox series enabled the automation specialist to increase the already large switching distances by up to 50 percent and launch the world's first ultracompact factor 1 sensors with Ø 4 millimeter smooth and M5 barrels. The new "mini sensors" create previously inconceivable options, particularly for designers in special machine building.





The third generation uprox sensors stand out on account of their shorter designs and larger switching distances

uprox technology, Turck has been able to achieve these larger switching distances without any compromises in terms of performance and mounting requirements.

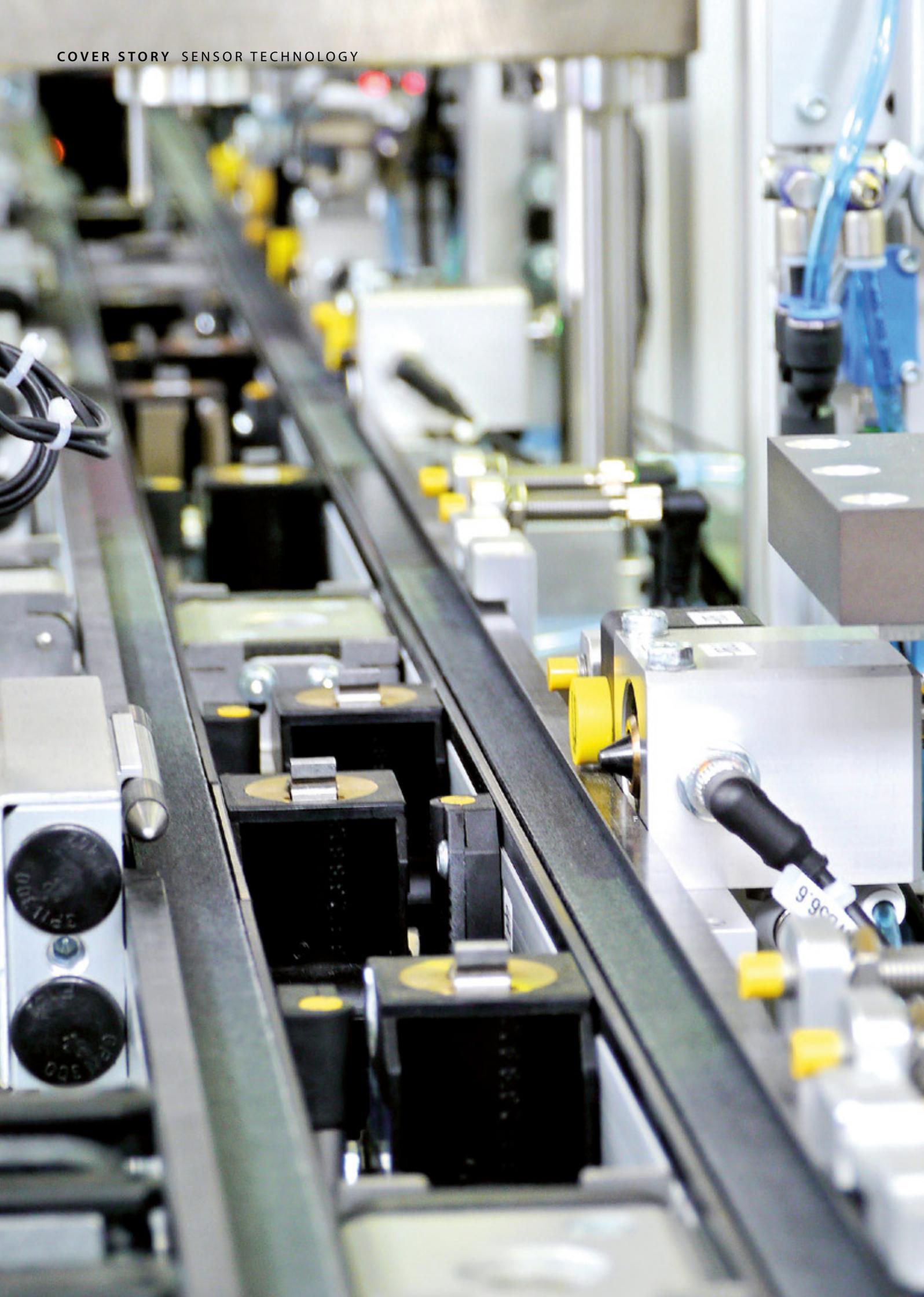
uprox3 for restricted mounting conditions

With this new version of the uprox series, the automation specialists are launching two particularly interesting designs for industrial sectors that are characterized

by a notorious shortage of mounting space. The extremely compact Ø4 millimeter smooth barrel and M5 threaded barrel sensors are now available as factor 1 sensors – a world first.

The “smart mini sensors” have a 1 millimeter switching distance – also naturally for flush mounting in all metals. These miniature uprox models are particularly suited to detecting small parts made of non-ferrous metal or stainless steel. The mini uprox3





World premier: Turck launches the first factor 1 sensors with Ø 4 millimeter smooth and M5 barrels



will be able to simplify several applications in the special machine building sector. As a factor 1 sensor it switches just as well with aluminum targets, such as are frequently used in lightweight construction, as with steel targets. The other designs of the third generation also stand out on account of their shorter housing designs as well as the larger switching distances. As the trend towards miniaturization in machine building continues, this meets the requirements of many designers and planners.

Finding typical applications for the uprox in factory automation is just as easy as naming regions of Germany where they like to drink beer: actually everywhere. In the automotive industry, particularly in body construction, the previous generations of uprox have become the sector standard, and this will not be any different with the uprox3, as has been confirmed by the field tests to date.

Field test in automobile production

In field tests at automobile manufacturers, where the previous 8 millimeter switching distance of the M18 uprox+ was reaching its limits, the new factor 1 sensor proved to be a perfect further development. In the automotive industry vacuum grippers are frequently used for picking up and moving sheet metal. Suction cups are applied to the sheets and a negative pressure is generated. An inductive sensor close to one of the suction cups detects whether the gripper was able to grip metal or not. However, the sensor cannot be mounted too close to the detected target, otherwise it may be damaged when a sheet is picked up. A safety

Efficient sensor program

Virtually all applications for all target metals are covered with only the few sensors of the uprox3 series. The small range of types reduces the maintenance required and the antivalent sensors in standard lengths, which can be used as NC and NO contacts, also do not require any compromises in terms of their electrical design. In the first step, Turck is launching the Ø 4 millimeter smooth barrel and M5-, M8-, M12- and M18 threaded barrel designs at the Hannover Messe 2015. PTFE-coated variants of the last three types will also be launched. Besides the PNP variants, NPN variants are also available for markets such as the North American market.

distance of 1 to 2 millimeters must be ensured. When the gripper then moves with the held sheet, the rubber suction cups are expanded by the weight and the inertia of the sheet. Depending on the acceleration and weight of the sheet, the suction cups may be extended so much that the proximity switch can no longer detect the target, resulting in a switching error. As a slower process is out of the question, the larger switching distance of the uprox3 solves a critical problem here. The larger switching distance of the uprox3 will make a critical contribution to more reliable and efficient production processes as the cycle times will continue to increase in future.

The welding spark resistant M8-, M12- and M18 variants with PTFE-coated housings will be used for welding applications in the automotive sector in particular. As with previous generations, the design of all uprox3 sensors provides them with an extremely good EMC performance and immunity to magnetic fields. The coating reliably prevents welding spatter from sticking.

Author | Sander Makkinga is product manager for position and proximity sensors at Turck

Info | www.turck.de/uprox3

Webcode | more11500e

The small sizes and large switching distances with aluminum are especially required for the special machine building sector – the uprox3 is a frontrunner for both these requirements.



Mr. Rohn, when it comes to replacing outdated control systems what are the main critical factors involved?

Apart from the choice of control system supplier, the most important issue for many users is choosing the right technology for connecting the field devices. Shall I use the fieldbus technology, remote I/Os or interface or system I/O solutions? We can recognize a clear trend here: More and more users are becoming interested in system or remote I/O solutions on account of their performance. We can identify here a significantly faster growth than in fieldbus technology.

What in your view are the arguments against the use of fieldbus solutions?

Besides the use of special transmitters, fieldbus technology also requires specially trained maintenance personnel with fieldbus know-how. With I/O solutions, it is only necessary to measure 4-20 mA. Furthermore, with the right I/O systems, you can also use Hart and implement efficient asset management. You have

almost the same functionality as with the fieldbus, but have no problems when incorporating new field devices. With I/O systems you can send hundreds of signals to the control system via one connection. With a fieldbus, a maximum of ten signals per segment is possible. A new segment must then be sent to the system. This can only be achieved with a complex topology. Parallel wiring is often also required since the fieldbus technology does not allow for simple signal types.

What is the difference between system I/O and remote I/O?

With conventional remote I/O technology, point-to-bus, you reach the installation via Profibus in order to access the remote I/O to which the signals of the field devices are sent. By system I/O we understand our solution for positioning I/O systems including the Ex isolation directly in the control cabinet and connecting them with control systems. Here we replace the control systems own I/O level and if necessary the separate Ex isolation.

What is the reaction of the control system manufacturers to this concept?

The control system manufacturers also benefit from our approach since they have lost some projects with their own I/O cards, because the overall solution simply became too expensive, too large or too slow. They became more competitive when they used excom as the I/O level.

And how can the user benefit by this solution?

A system I/O solution is not only more attractive than the I/O levels of control systems in terms of price. The user also saves space and can always use the same cards with our excom system, regardless of which control system is connected and whether excom is used as a system or remote I/O. This means simple engineering, also with standard 4-20 mA technology. The system is easy to expand and we can bring Hart signals right up to the control system. You then also have a diagnostics function for the transmitters already locat-

»When replacing legacy control systems together with an I/O level, users benefit from our clever migration concept.«

Frank Rohn | Vice president sales process automation | Turck

The replacement of older control systems and the associated updating of the I/O level are issues currently facing many process automation engineers. Frank Rohn, vice president sales process automation at Turck, promises that with the right migration concept and the portfolio required for this, users can retrofit their plants without any major mechanical effort.

ed in the field. The high speed backplane bus enables us to achieve very good cycle times.

You promise a very clever migration concept. What do you mean by this?

Firstly, we offer excom as a universal I/O solution that can be used both in the non-Ex area as well as in zones 2 and 1. The user can thus deploy the same system in the field as remote I/O or in the control cabinet directly at the control system. This is the success of excom, it is an all-round complete system that has everything: Racks, power supply units, standard I/O modules – with or without intrinsic safety – identical engineering, and last but not least all approvals, since recently even for use on ships. excom is the latest state of the art, and there is currently no better system on the market. In migration projects there are also two more points to be considered: Our solution is compact in the 19" format so that old technology can be replaced without any major mechanical effort required. Furthermore, we offer if necessary com-

plete pre-wired control cabinet solutions via our subsidiary Turck mechatec.

What do you mean by major mechanical effort?

Where previously around 150 control system I/Os could be installed in one cabinet, excom allows up to 720. As the excom racks are based on the 19" format, the user can simply remove his own I/O cards in 19" racks and mount the excom stations. This saves three or four cabinets and enables both the I/O card of the control system and also the I/O level to be installed in one cabinet. We have been successful in many branches in the process industry with this concept – from the pharmaceutical sector right through to the oil and gas industry. There are now over 10,000 excom stations in operation worldwide in completely different application fields, connected to all sorts of different control systems. Naturally many customers also fit excom in new installations but the major business currently involves migration. Our BL20 I/O system can also be an interesting alterna-

tive to excom here if the features of intrinsic safety and continuous availability with redundant systems are not so important in a process plant.

As BL20 comes from the field of factory automation, does the system also meet the requirements of process automation?

You are right. BL20 was originally developed for manufacturing automation. However, unlike our competitors in this sector, we have further developed this solution with our process technology know-how and now offer a Hart card, for example, or the possibility of hot plugging, i.e. removable or pluggable modules. This enables a card to be replaced quickly without any effort. Last but not least, BL20 ensures optimum integration in control systems since we also use a DTM – exactly as with excom.

Author | Dr. Ulla Reutner, chief editor at trade magazine P&A, conducted this interview

Web | www.pua24.de

Webcode | more11530e



Authentic

FAKE

TURCK BL ident.

QUICK READ

Mechanical engineering companies in Germany are increasingly having to tackle the problem of counterfeit spare parts. Besides the use of legal protection, technical measures for preventing the use of unauthorized spare parts are also available. In the industrial environment, robust RFID systems are particularly suitable for the identification of spares and wear parts. Radio technology also brings greater transparency and production reliability to the machine, as well as the product protection provided.

Brand Protection with RFID

Turck's BL ident RFID system is enabling machine builders to prevent the use of counterfeit spare parts

Each year, flagrant imitators in Germany are awarded a special prize of notoriety: the Plagiarius Award. Of the top three winners of the Plagiarius Award 2015, two of the counterfeit products come from China and one from Germany. Two things are worth noting here: Firstly the cliché of fake products from Chinese companies seems to be confirmed. However, the result also shows that the fake products are not restricted to China or Asia alone. Companies worldwide must deal with this problem and take measures where necessary.

The German mechanical engineering sector also has to deal with counterfeit products, as a recent study by the VDMA, the German Engineering Association, makes clear: Machines and the spare parts of machines in particular are being counterfeited. The VDMA Study Product Piracy 2014 shows that on average 71 percent of mechanical engineering companies in Germany are affected by product piracy. The figure for companies with over 500 employees is even more serious: In this group as much as 90 percent of the companies are affected. According to the study, the estimated loss in sales of companies affected by counterfeit products was 7.9 billion euros in 2013. This does not include the costs arising from unsubstantiated claims arising from the use of counterfeit spares – which affected 25 percent of the companies surveyed – let alone the resulting damage to a company's reputation.

Germany no. 2 counterfeit producer

Germany comes in second place behind the People's Republic of China among the countries of origin of counterfeit products, with an estimated 23 percent originating here. While Chinese counterfeits are often assumed to have lower quality and more limited functions, the VDMA considers products imitated in Germany as "high-tech counterfeits." "Considering the type of counterfeits made in Germany, the assumption in the past few years was that these were always "soft" counterfeits. By this is meant the illicit copying of the collaterals that come with original products, e.g. user manuals, product images, catalogs etc." says Steffen Zimmermann, managing director of the VDMA Working Group Product and Know-How Protection. "The new data forces us to completely rethink this assumption. Mechanical engineers are speaking of entire machines, components, and parts copied in Germany. These high-tech copies show that the native-bred danger needs to be taken very seriously indeed." As a result of the study, the VDMA is offering interested companies the Product and Know-How Protection Guidelines, which provide advice in finding the right

protection measures against product piracy and the loss and theft of know-how.

In order to protect oneself from counterfeiters, it must be clear what type of counterfeit is involved. A design imitation or the unauthorized copy of a patented design solution have to be dealt with differently to the use of counterfeit spare parts.

»The machine and plant builders are reporting the presence of counterfeits for entire machines, components and spares. These high-tech counterfeits show that the risk in Germany must be taken very seriously.«

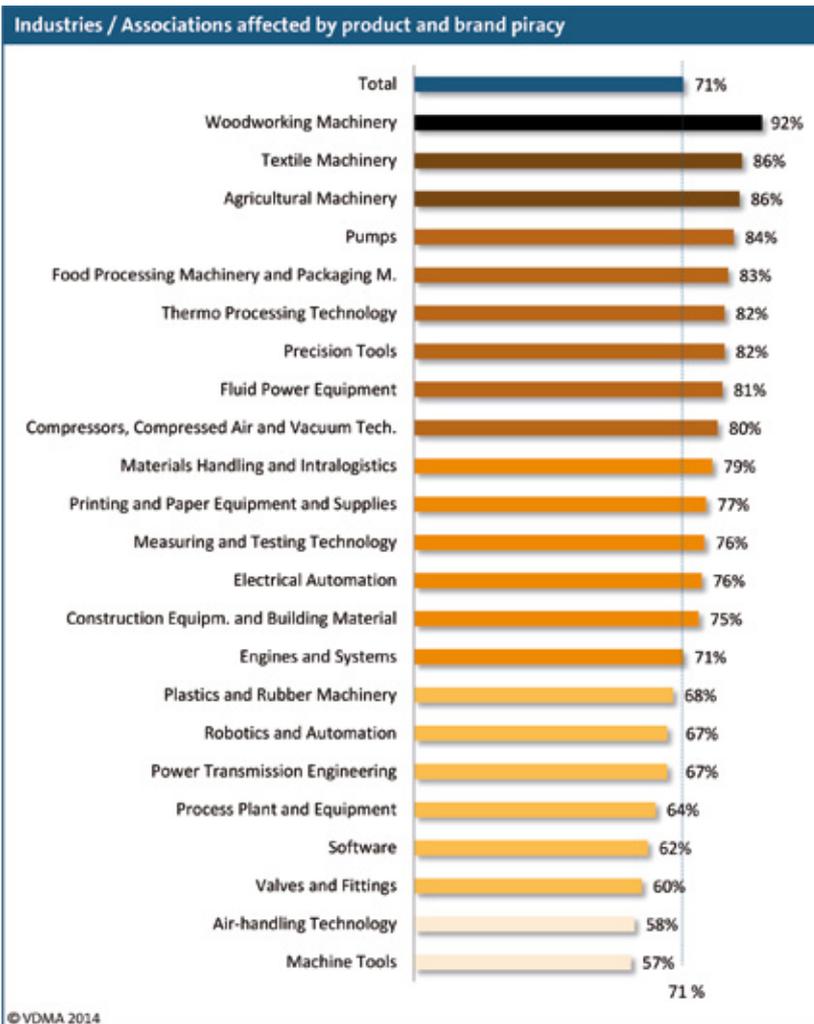
Steffen Zimmermann | VDMA

Machine builders can implement technical measures to protect themselves. For several years, printer manufacturers have led the way by enabling the identification of the printer cartridges in use. In this way, it has been possible to prevent the use of third-party cartridges to a certain degree.

Product protection through RFID

An increasing number of machine builders are taking similar measures when it comes to preventing the use of counterfeit spare parts. One method that is particularly suitable for industrial machinery is the identification of components with RFID. The great benefit of this technology compared to others is the fact that RFID solutions comply with industrial standards and usually operate trouble-free in harsh industrial environments. Unlike other identification methods, RFID tags can also be embedded in a tool, a workpiece holder or other relevant components so that they cannot be replaced easily. This considerably prevents the illicit use of counterfeit products.

As specialists in RFID, Turck not only offers customers application know-how, but also individual and space-saving identification solutions based on its



According to the VDMA study, manufacturers of woodworking machines have to deal with counterfeit products most of all

modular BL ident RFID system. From its extensive portfolio, users can select precisely those components that fit ideally in their application, regardless of whether these are solutions for the switch cabinet or for use directly on the machine. As Turck's RFID solution is based on the company's I/O systems, block I/O modules with IP67 protection are also available in addition to the modular BL20 systems with IP20 protection and BL67 for direct mounting on the machine. Turck's modular systems offer the user the benefit of greater flexibility, since modules for several other signal types as well as the RFID components can be connected to the gateways in order to create a complete I/O system with RFID functionality.

The integration in the customer's existing automation infrastructure also couldn't be easier, since the BL ident system can run on commonly available industrial fieldbuses and Ethernet systems. Read/write heads for different frequency bands (HF and UHF) can be used here on the same gateway and even the same modules. If required, Codesys programmable gateways or the supplied function blocks simplify the integration of data into existing systems and controllers.

BL ident also offers a wide range of read/write heads for many different applications and distances. A brand new example here is the TB-Q08, which is

currently the smallest ISO15693 conform RFID read/write head with IP67 protection on the market. Thanks to its compact rectangular design of 32 x 20 x 8 mm and 15 cm long connection cable with an M12 connector, the TB-Q08 is particularly suitable for use in restricted mounting conditions, such as for mold identification – as required in injection molding.

Combined with Turck's new R10 and R12 tags in particular, the TB-Q08 can fully play to its strengths in the identification of metal objects. The new 10 and 12 mm diameter tags can be mounted directly in metal and are equipped with a chip which supports password functions. BL ident enables the user to easily implement simple brand protection, access protection and access rights management etc.

Band filter plant example

The example of a Turck customer shows how efficient brand protection can be implemented in practice: The manufacturer of belt filter systems uses RFID to identify whether the correct filter fleeces are used in his machines. The fleeces filter oils, emulsions, synthetic solutions and other liquids. They vary in the size of their pores and the materials used (e.g. polyester, viscose etc.). The machine uses RFID to not only check whether an original fleece is being used, but to also check whether the correct fleece material and pore size are being used for the specific application. Besides brand protection, the customer is thus also able to ensure production and product quality. This virtually excludes the possibility of the wrong fleece being selected and the resulting production faults. By documenting the service life of the individual fleeces as well as the entire machine, maintenance times can also be planned precisely to meet the actual need.

Taking it one step further, the original use of the identification solution for brand protection can also give rise to new business models: The customer can now lease machinery instead of purchasing it. The OEM is then able to ensure the continuous availability of the machine.

Risk caused by counterfeit products

The damage caused by the use of counterfeit spares can be enormous. If the production results do not meet the required standards, the customer may risk damage to the company's reputation and loss of competitive advantage. The machine builder is exposed to the same risk of damage if the customer identifies the machine as the cause of the problems in quality. The fact that counterfeit spares are the cause is often difficult to prove in practice. The safety aspect also must not be underestimated: Counterfeit spares, particularly on machines with blades and other cutting tools, can represent a safety risk for employees. The risks and the resulting costs increase enormously when personal injury is involved.



Turck's modular RFID portfolio allows exactly the right design for identification solutions, not only for brand protection

Potential benefits for OEM and end customer

With these benefits, the question arises as to why RFID has not been used more frequently for protection against counterfeit spares. One reason for this is the fact that the machine builders can only estimate the risk of counterfeit products. And as is normally the case with all risks, these may or may not occur. The costs for a brand protection system on the other hand are guaranteed.

The new transparency achieved with RFID can be beneficial to both parties when complaints or claims occur. On the one hand it protects the OEM from unsubstantiated claims resulting from counterfeit products. On the other hand, it also supports the end customer when claims are substantiated. This is the case, for example, with claims arising from the reduced service life of original parts, since the warranty period for spare parts begins from when they are fitted in the machine. How long a component has been used in the machine is documented in the controller or on the tag of the component.

Both parties also benefit from the possibility to set parameters automatically. It is an innovative tool for the OEM and at the same time protects the customer from operating errors. Lastly, RFID solutions also contribute to the efficient operation of a machine together with spares management. If it is detected that a spare part is approaching the end of its service life,

the machine builder can be notified automatically in order to supply a new spare part. The machine builder thus has an automated spare parts business, whilst the end customer can considerably reduce unscheduled downtimes caused by missing or poor quality spares.

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Compact brand protection with password function: R10 and R12 in-metal tags and TB-Q08 compact read/write head from Turck

IO-Link for more Production Efficiency

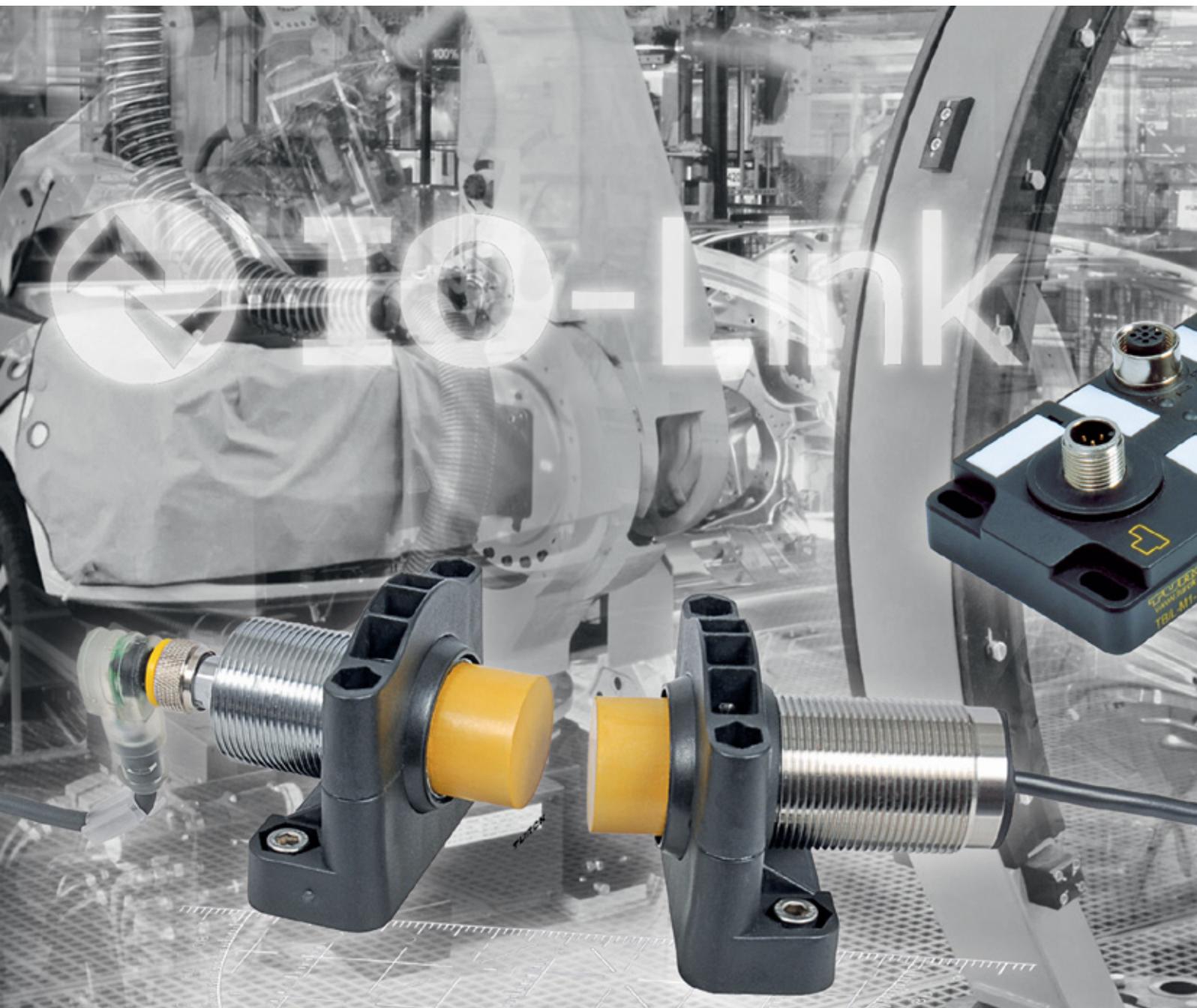
IO-Link has arrived: The new communication standard offers measurable production advantages and added efficiency for numerous applications

IO-Link is quickly becoming an increasingly interesting option for users to create more transparency for the processes between the controller to the sensor. The communication standard offers many benefits, most importantly: reduced machine costs, more efficient production processes, and significantly improved machine and system availability. Turck offers users, who want to make the most of IO-Link, one of the

most comprehensive IO-Link portfolio worldwide – beginning with a broad selection of sensors, to cables, inductive couplers and I/O hubs, all the way to programmable field bus and Ethernet solutions.

Less inventory requirements

IO-Link leads the way to countless new all-in-one solutions. A number of sensor output variations can be



mapped via a single IO-Link device. These are only in rare cases more costly than standard sensors. That is because firstly, many sensor types already operate on the basis of microprocessors, and IO-Link simply creates an interface for the communication with these sensors. And secondly, manufacturers and customers save costs for displays and buttons on the sensor itself, as they are then configurable via IO-Link. A number of different fieldbus modules for digital and analogue inputs and outputs or other types of signals can be replaced with a standardised IO-Link module. This will reduce warehousing costs, and is a significantly less cost-intensive solution for analogue I/Os than the traditional one.

Less machine costs

IO-Link also decreases costs for the user's connection technology. Standard three-core cables replace the much more expensive multi-pole or special shielded cables for analogue signals. IO-Link-capable signal distributors for digital inputs and outputs, the so-

called I/O hubs, are well worth implementing even for a small number of I/Os. These signal distributors transmit up to 16 switching signals in a bundle via an IO-Link signal to the controller. This capability allows the quick and easy connection of existing digital field devices to an IO-Link master. Despite these options, IO-Link is not a replacement of field bus solutions, but in many cases it can be a meaningful addition.

Simple engineering

IO-Link will also save machine manufacturers time and money otherwise invested in engineering and installation. Where multi-pole cables and passive distributors are used for the connection of several sensors and actuators, users must carefully plan and monitor which sensor will be connected via which cable. A work step that is not only time consuming, but also error-prone. Since IO-Link connects every sensor or actuator – both analogue and digital – via a standard three-core cable, documentation and ePlanning will be significantly simplified. The I/O hub by Turck also offers this advantage for non-IO-Link-capable digital sensors and actuators.

Proactive maintenance

The more comprehensive information provided via IO-Link will furthermore allow proactive maintenance and asset management. The additional access to previously only internal sensor data, e.g. temperature data of linear or ultrasound sensors, acts as an early warning system for sensor faults and even cable breaks. Component replacements can be planned in advance, before a machine or system can go offline due to an unforeseen device failure. Alternatively, the system operator can wait until an actual defect occurs on a device that has been working at its limit for some time, and use this system downtime for the replacement of other devices that have signalled their impending end of life via transmitted diagnostics data. The actual device replacement can then be carried out by lesser qualified employees, as the controller will automatically assign the correct parameter set to the new sensors. The inductive linear position sensors by Turck, for example, allow the call-up of advanced diagnostics data on the status of the position encoder. A warning signal can then be issued if the position encoder is not in measuring or limit range.

Parametrisation and maintenance in the production process

The ability to communicate with sensors compensates for possible dirt deposits on optical sensors during a running production process. Should the switching threshold no longer be accurate at any point, then the controller will be able to adjust the setting via IO-Link. A sensor signal weakened by dirt deposits can therefore be easily parametrised again.

And should a sensor or other device have to be replaced due to a defect at some point, the procedure will be significantly less work-intensive, particularly for parametrisable devices. The PLC will have all the parameter data stored, and can simply upload it to the

IO-Link users benefit from reduced machine costs, simplified engineering processes and proactive maintenance

QUICK READ

There are not many topics on which automation manufacturers and users agree as they do on the topic of IO-Link. The new communication standard is set to make the transparent mapping of processes from the controller to the sensor a matter of course. The growing interest in IO-Link has been boosted significantly by the scenario Industry 4.0 and the media attention it has invoked to date. In contrast with the quite abstract vision of deserted factories devoid of a human workforce, the advantages of IO-Link have proven themselves very useful even today.



new sensor. This option is also very useful in case of production changes, where entire rows of sensors have to receive new parameters for the new production run. Instead of teaching every individual sensor locally, switching thresholds, sensor enhancements, sensitivity, and other parameters can be adjusted centrally, and for the entire sensor group simultaneously. These processes will then be clearly documented in the PLC.

Increased production safety

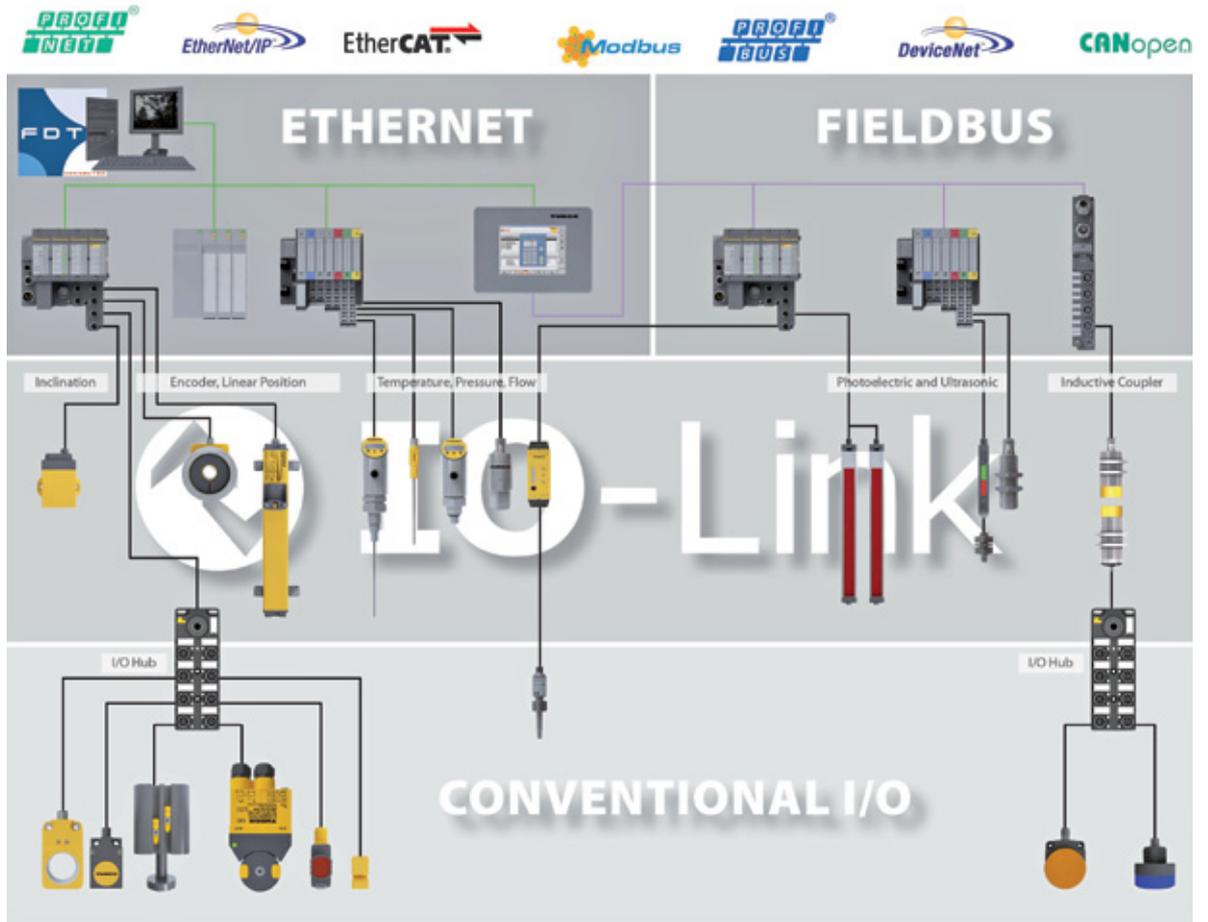
IO-Link improves the safety and efficiency of production processes during tool changes at presses or robots. In addition to the automatic modification of the sensor parameters during tool changes, the exchanged tools can also be identified, which will make the additional installation of an RFID or barcode solution superfluous. This is made possible via IO-Link-capable passive distributors like the Turck I/O hub, as

Turck offers a standardized IO-Link portfolio from the sensor to the master

the devices come equipped with an application-specific tag, to which the user can add a custom description depending on the relevant tool. The controller will read the tag and identifies the tool by its unique ID number.

Example: Automotive pressing plant

Many of the advantages of I/O-Link are already being taken advantage of by industrial users. Turck inductive couplers provide contactless energy and data transfers between the press and pressing tools in automotive pressing plants. The data transfer between the coupler elements occurs via IO-Link. And since the pressing tool is equipped with controllable sensors as well as actuators, the IO-Link advantage of providing a bidirectional connection comes to the fore. Without IO-Link, digital input and output signals would have to be collected locally at the tool, a task previously



What is IO-Link?

IO-Link unifies the communication between machine and system controls on the one hand, and sensors and actuators on the other. The standard has been compared to the USB connection on a PC. Both interfaces are serial and manufacturer-independent.

USB and IO-Link can both transmit energy and signals. Both standards are bidirectional, which means that sensors and actuators can both send and receive information via IO-Link. The key advantage of IO-Link is its communication capability. The one-

sided transmission of information becomes bidirectional communication. It allows access to parameters and data previously inaccessible to controllers, or which could previously only be accessed via proprietary systems or directly at the sensor.

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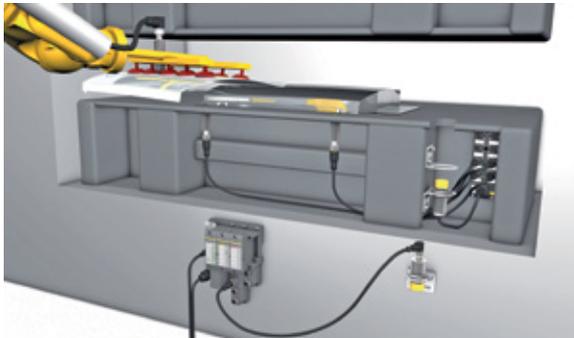


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Turck is one of only very few manufacturers able to deliver complete IO-Link systems from master to sensor from a single source – and that universally also with protection type IP67.



The signals of the pressing tool are communicated contactlessly to the controller via the inductive coupler (yellow caps) and the I/O hub

resolved using passive distributors with multi-pole cables. Mechanical plug connectors on exchangeable tools are an expensive solution that moreover requires customisation. Furthermore, plug connectors tend to wear quickly, which means more costs and could result in unnecessary downtimes. The combination of a Turck contactless inductive coupler and I/O hub provides a low-cost and time-saving connection solution for all sensor and actuator signals.

Skid identification

The automotive industry has also begun using I/O hubs for identification purposes. On a production line, skids carrying automobile bodies are identified via an attached I/O hub. In addition to the identification, in this example all sensor data and energy information is transmitted via the Turck inductive coupler, and contactlessly coupled at each station of the production line.

Carousel ride operation

Li-linear position sensors by Turck monitor the lifting of the lateral arms in the carousel ride "Flying Fish" by Zierer. Here, the operator uses IO-Link for the parametrisation of the measuring range of the analogue output signal, as well as for accessing additional diagnostics information. The sensor transmits an alert via IO-Link when the position encoder is out of range. The carousel ride operator will in this case be prompt-

ed to carry out a safety routine. Other diagnostics information can be accessed via the controller. In this example, IO-Link helps to optimise passenger safety for the carousel ride operator.

IO-Link complete portfolio

A large number of manufacturers are involved in the development of the IO-Link communication standard. Most companies focus on a specific level of the automation pyramid, i.e. either the sensor or the master side. The Turck IO-Link portfolio is characterised by its vertical spectrum: Turck is one of only very few manufacturers able to deliver complete IO-Link systems from master to sensor from a single source – and that universally also with protection type IP67. On the master side, Turck offers the modular field bus and Ethernet IO systems BL20 and BL67, which come with master modules for IO-Link. The systems are available for multi-protocol Ethernet (Profinet, Ethernet/IP, and Modbus TCP) or Profibus. During the course of this year, Turck will be adding more field busses to the product range. The ultra-compact block designs TBEN-S will be available as an IO-Link master variant as of mid-2015.

The I/O hubs, which take over the job of passive distributors, take their place in the automation pyramid mid-way between field bus and connection technology. The connection specialist Turck also provides traditional three-core cable solutions as well as cables for analogue signals or field bus and Ethernet connectivity. The Turck sensor portfolio encompasses numerous variations with an IO-Link interface, e.g. metering sensors (pressure, flow, or temperature). Linear position sensors of the Li product family also come with a variant with IO-Link, as do the Turck ultrasound sensors RU.

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Ready for the Islands

Automotive supplier EuWe identifies workpiece carriers on the manufacturing islands of a production machine for rear vents with Turck's BL ident RFID system

For EuWe, the compact rectangular design is a decisive benefit of the Turck read/write head

The list of reference customers of the EuWe Group reads like the Who's Who of the automotive industry: General Motors, VW, BMW, Mercedes-Benz and Porsche are all listed – and those are only the most illustrious names. Whoever supplies the most demanding customers in such a competitive sector as the automotive industry must have done a few things right over the course of its corporate history. The quality must be right, as must the price. Last but not least, production and other internal processes must be organized so that they meet the requirements of ISO/TS 16949:2009, as stipulated by automotive manufacturers.

The group supplies automotive manufacturers and suppliers worldwide with high-tech plastic products. These include interior trims, central consoles, trunk trims or also functional components. For example, this includes rear vents, which ensure that the pressure produced when a door is closed or an airbag is triggered, can escape from the vehicle in a controlled manner. The components are provided with flaps that

release the air pressure in the event of a pressure increase and remain otherwise closed so as not to let in any outside air.

Rear vents for BMW

In 2014, EuWe started to expand the existing production with another special machine for manufacturing rear vents for BMW. The system was called island manufacturing since it consists of several individual manufacturing islands. An injection molding machine for producing the blanks is located at the beginning of the process. A robot puts four workpieces each onto a workpiece carrier, which moves on a conveyor belt to the first processing station. Here a robot puts four flaps on each of the four workpieces, which are then fixed to the semi-finished product using ultrasonic welding.

A camera at the next station checks for welding faults before the four workpieces are turned. Faulty parts are ejected here directly and replaced with good parts. At the last process step, a robot applies sealing

QUICK READ

Linked production processes in special machines have disadvantages: A stop at one station results almost immediately in the shutdown of the entire machine. Intelligent buffer sections can ensure a continuous flow of production but can mostly only be implemented effectively with the identification of the workpieces. Automotive supplier EuWe Eugen Wexler GmbH & Co. KG has implemented this in a new production plant for rear vents – with Turck's BL ident RFID system.



foam to the turned vents. For this a single-track material carrier guide turns into a twin-track one in order to prevent any jams. The last process step involves a complex visual inspection of the foamed seal. A camera with special lighting on the robot arm checks here the shape, consistency and volume of the sealing foam.

Disadvantages of the linked system

When the plant was planned, the question was also raised as to the most suitable method of identifying the workpiece carriers in the process. Automation technician Robert Ullmann had already gained experience in the identification of workpiece carriers in an existing plant. In the previous plant, EuWe had implemented a linked system using conventional proximity switches. When faults have to be documented, the controller virtually counts along, assigns the information on faulty products to the individual workpiece carriers and discards faulty products. However, the chain of workpiece carriers could not be interrupted. This was the biggest disadvantage of linked systems. A buffer section that can compensate for delays in the process is not possible. If a production step comes to a standstill, the production jams up in front of this station. Production islands behind the jam have to stop as the parts required are missing.

Due to this experience, Ullmann also recommended the implementation of a workpiece carrier identification system with RFID for the second rear vent production plant. "We reflected on what we could do better



Robert Ullmann is convinced of the benefits of RFID: "The new machine has a faster production rate and also requires fewer manual interventions by employees"

than the last time. On the existing machine we saw which benefits an RFID system could bring us. The new machine has a faster production rate and also requires fewer manual interventions by employees."

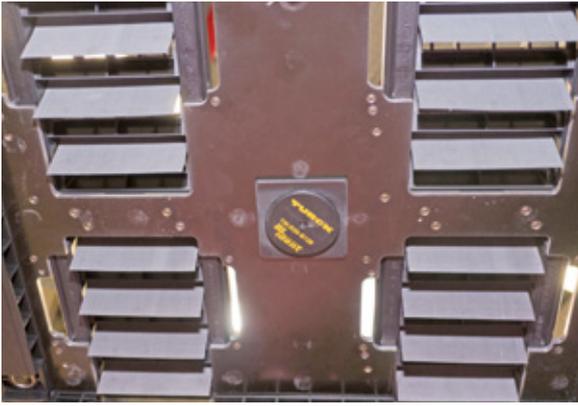
Compact design simplifies mounting

"We looked at another RFID supplier besides Turck. However, this supplier only had RFID read/write heads in a cylindrical design in its range," Ullmann describes one of the reasons for choosing Turck. EuWe uses a

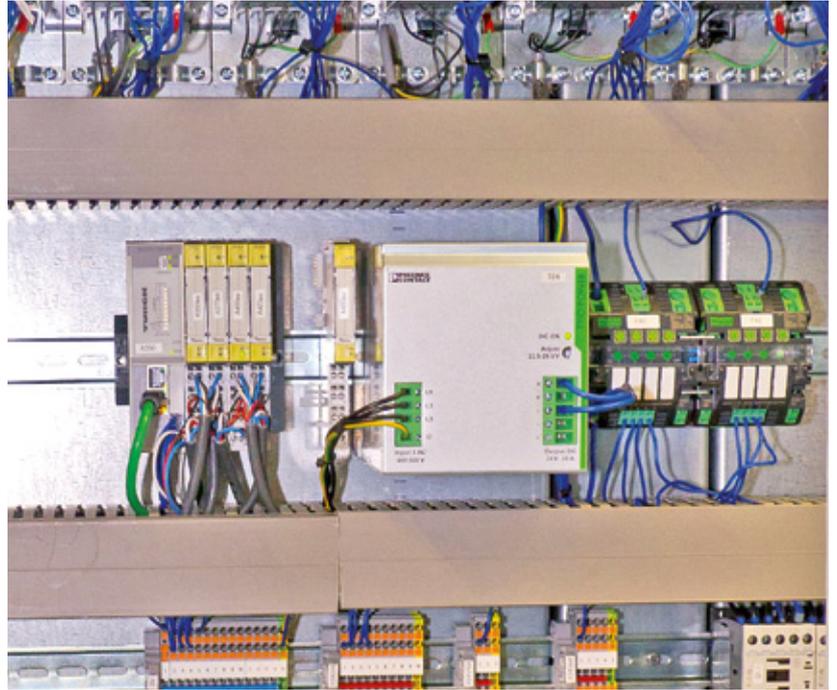


»The integration of the Turck RFID system in the controller was very easy. We didn't need to integrate any special program blocks in the PLC software in order to translate the RFID language into the language of the controller. I could operate the interface of the controller directly.«

Robert Ullmann | EuWe



The view from below onto the workpiece carrier shows the centrally mounted tag and the four rear vents with the flaps



The BL20 gateway in the control cabinet brings the RFID data via Profinet to the controller

very compact RFID read/write head from Turck: The flat rectangular TN-Q14-0.15-RS4.47T read/write head can be mounted optimally in the middle of the fixings at the production islands. A cylinder could not have been used here since a metal cylinder is already located there. The positioning at another location of the material carrier would have been more difficult. The circular TW-R50-B128 tag was mounted centrally on the material carrier.

Simple integration in the controller

“The integration of the Turck RFID system in the controller was very easy. We didn't need to integrate any special program blocks in the PLC software in order to translate the RFID language into the language of the controller. I could operate the interface of the controller directly. The information is simply written to the PLC output and then lands on the workpiece carrier,” Ullmann praises the integration of BL ident RFID in the Siemens S7 controller. The automation engineer knows from previous projects that other systems demand the use of these program blocks.

The RFID system identifies each workpiece carrier in the process eight times. The PLC writes faulty processing steps to a database which links the entry with the corresponding workpiece carrier and the position of the rear vent on the carrier. The data reaches the S7 controller via Turck's BL20 multiprotocol gateway and Profinet.

If a process is running incorrectly, this is detected and documented during the process or in a subsequent check. With ultrasonic welding, for example, the welding machines detect whether the necessary depth for optimum welding was reached. This is followed by a visual check, for which the results are documented in exactly the same way as in the final check after the seal is sprayed on.

More efficient plant with RFID

The result of seamless workpiece carrier identification is a flexible system with a faster production rate and also requiring fewer manual interventions by skilled personnel than with systems without identification. “The new system would also enable us to make variant changes on the fly. This is not planned as yet, but with the appropriate change of tools it would be easy to implement from the RFID system,” Ullmann explains.

All stations and the corresponding workpiece carriers can be displayed on the user interface of the S7 controller. If faults frequently occur at a station, this can be traced via the visualization. EuWe is not tracing at present whether specific workpiece carriers frequently produce faults. However, Robert Ullmann can imagine the integration of this option for the next machine of this kind.

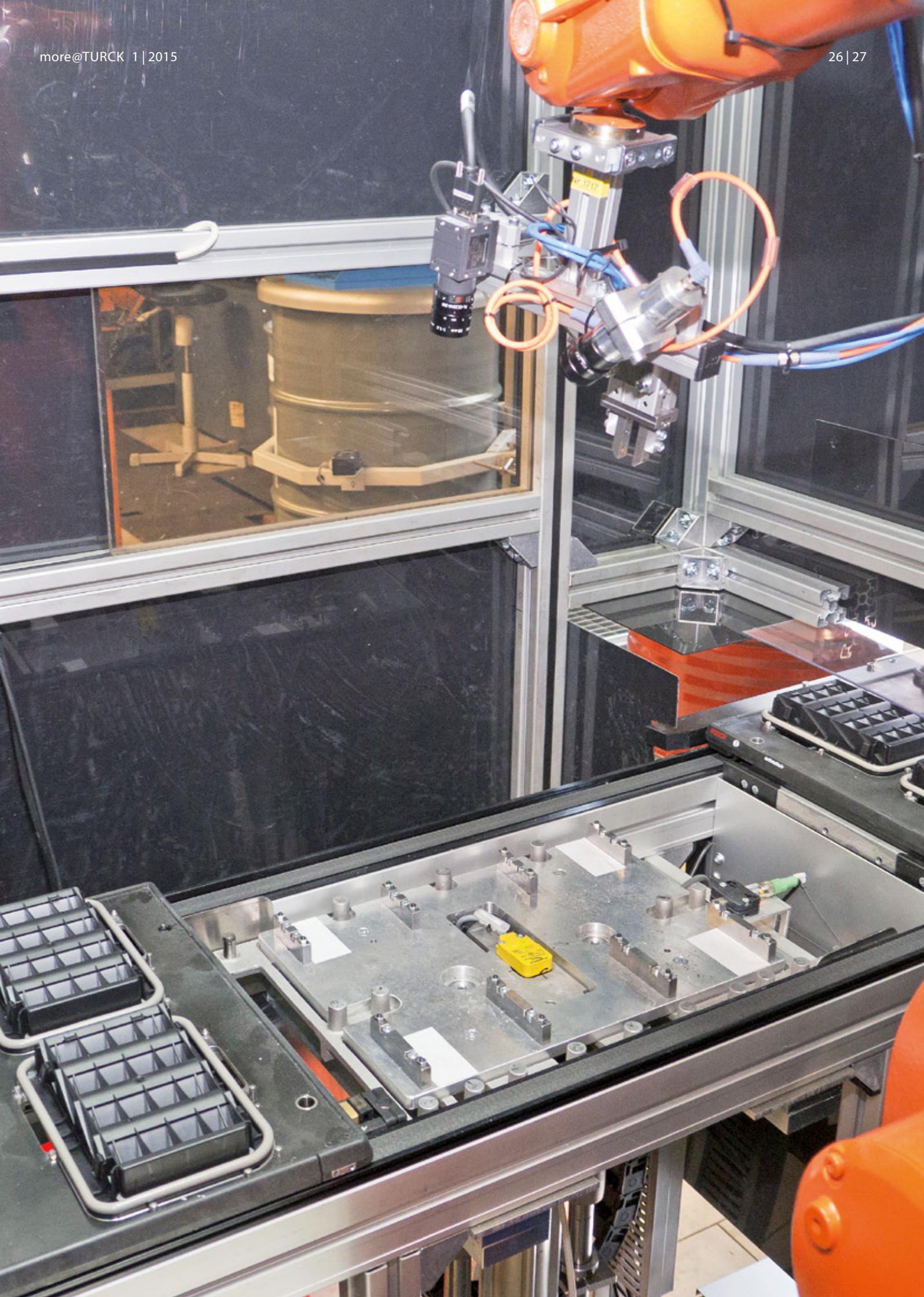
The fact that this kind of island production has to be built next is entirely possible. After all, Lauf an der Pegnitz is ultimately the central special machine manufacturing site for the entire Eugen-Wexler Group. The plants in the Czech Republic, Mexico and from 2017 also the new plant in the USA will benefit from the experience that the colleagues in Lauf have in the construction of special machines.

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The read/write head is mounted in the middle of the workpiece carrier fixing



Robust Solution

In a Chinese steelworks, the Turck RFID system BL ident ensures the reliable position encoding of the coke ladles in the coke drying process



The Chinese environmental and economic authorities recently identified a procedure for the quenching of coke as a key energy saving technology, and promote the process as a major environmental protection measure: The procedure is called coke dry quenching (CDQ). During coke production, coking coal is usually heated under vacuum to over 1,000 to 1,400 degrees Celsius, and baked into coke for 17 to 25 hours. Coke is primarily used as fuel in steel production.

Towards the end of the process, the coke still holds a temperature of around 1,000 degrees. Any contact with oxygen would result in immediate combustion. The coke therefore has to be cooled or "quenched" to prevent it bursting into flame. The traditional and technically unsophisticated procedure was a wet quenching, in which the coke was cooled with water. The energy in the coke in the form of heat simply dissipated without being harnessed.

Energy-saving CDQ

A modern and technically more sophisticated and also energy-saving and more eco-friendly procedure is coke dry quenching. In a cooling chamber of a CDQ plant, coke at around 1,000 degrees Celsius is cooled using an inert gas – mostly nitrogen. The nitrogen heats to 850 to 950 degrees, cooling the coke to below 200 degrees Celsius. The heated inert gas generates process steam via a heat exchanger, which is then conducted to a power generation unit, where it generates electricity via a gas turbine.

After quenching, the cooled coke is transported via a conveyor belt to the coke repository and the screening plant. The CDQ plant consists of a motor, a ladle, a lift, the coke feeder, the CDQ cooling system, the coke storage unit, and the heat exchanger and nitrogen circulation system.

A crane lifts and lowers the coke ladle with the hot coke to feed the CDQ cooling system. The crane must speed up and slow down to prevent accidents with falling coke or the coke ladle. The exact position of the lift must be monitored to allow the dynamic control of the lift system.

Error-prone sensor information

The operator had for a long time used inductive proximity switches located in the groove to capture

The RFID read/write heads mounted on the steel beam monitor the passing coke ladle and decelerate the travel speed of the lift

the vertical position of the coke ladle in the lift. However, the switches often fell out of the groove due to the extreme environmental conditions. Since the plant is an open air facility, severe snowfall or rain, as well as disruptions in the magnetic field were enough to cause process errors. All these problems were solved with the introduction of the HF-RFID system BL ident as a replacement for the sensors. A data medium was mounted at the upper hook of the coke ladle. The read/write head is located on the steel beam of the lifting crane. The solution not only resolved wiring issues, but also the installation problem.

Eight read/write heads monitor the data medium in motion – four at the upper edge and four at the lower end of the travel distance. The first read/write head initiates the delay when the crane lifts, decelerating its speed from 20 to 10 m/min. The second read/write head initiates the braking process from 10 down to 4 m/min. The third signals the crane driver to set down the coke ladle onto the rail-guided coke quenching car with the CDQ unit. The fourth initiates the opening of the coke ladle to allow the hot coke to fall into the antechamber of the CDQ unit. The coke ladle can then be refilled. The exact position of the coke ladle is known during the entire process. RFID technology reliably improves the position encoding of the coke container, and the steel manufacturer effectively prevents accidents due to falling coke ladles.

Robust RFID solution

As the plant is an open air facility, the operator uses IP67 read/write heads coupled with the RFID modules of the Turck IP67 I/O system BL 67. The entire identification solution including the field bus connection can therefore be used in temperatures of -25 to +70 degrees Celsius. The system is furthermore dust and waterproof – it could even operate under water for a short period of time. The IP68 data media used is made of epoxy resin as the operating conditions in the coking plant are extremely rough. Scratches or dirt deposits will not influence the function of the data medium, and do not impede the reading process in any way. The highly robust data medium is ideally suited for closed circuit applications. The eight bytes transmitted during each reading process are completely sufficient for the application.

The BL67/I/O station is very flexible as well: The RFID modules, which capture the signals of two read/write heads at a time, can be coupled with the gateway. Consequently, the customer will use four modules for the eight read/write heads. Adding more read/write heads will simply require the plugging in of another module in the backplane. This will save costs for additional wiring and gateways.

Another criterion for the decision in favour of BL ident was its superior read speed. The Turck system can read the dynamic data in motion without having to reduce the travel speed of the lift. The read/write distance of up to 200 millimetres is sufficient for the application. An LED indicator on the gateway offers clear information regarding the operating status of the read/write heads and the modules, without having to



All data from the read/write heads converges at the BL67 gateway and the RFID-S modules

see the read/write heads mounted far overhead directly. The prefabricated cables have additionally simplified the installation, and ensure reliable data transfer under these harsh conditions.

Conclusion

The steelworks put the Turck RFID solution for precise position encoding into operation in 2011. The system has reliably resisted the very harsh operating conditions ever since. The operator has been particularly impressed with this reliability and the systems accuracy. BL ident furthermore significantly simplifies the process with the 2RFID-S module, as read/write processes can be triggered directly via the I/Os of the controller, and require no separate function components in the controller software.

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At a Chinese steelworks with coking plant, the Turck HF-RFID system BL ident monitors the position of the coke ladle lift in the CDQ unit. The system has been working with 100% reliability for several years despite extremely harsh operating conditions.

Flexible Silencer Production

The automation of a production line for exhaust systems enables Turck to demonstrate the flexibility of its BL20 multiprotocol gateway in conjunction with the IO-Link-capable TBIL hubs

The creation of a new production line for exhaust systems, or more specifically silencers, presents automation engineers with a wide range of different challenges: Firstly, the harsh industrial environment with the presence of welding sparks and electromagnetic interference, and secondly, the production requirement to bring together different individual products harmoniously to form a complete solution. In order to meet these requirements, one of the leading manufacturers of exhaust systems chose Turck's BL20 modular I/O system in order to provide a highly flexible I/O solution. The customer fitted out a completely new factory in Turkey with Turck's multiprotocol gateways, which can operate in Profinet, EtherNet/IP and Modbus TCP networks. The production lines in this factory make large silencers for trucks and buses. The system integrator Teknodrom Robotik ve Otomasyon was responsible for the installation and integration of the entire automation solution. The company has a great deal of experience in the automation of systems in harsh environments, such as those found in the automotive industry.

Teknodrom spoke to Turck about the sensor and I/O requirements for the new production line already

in the design phase. With 50 years of experience in sensors, fieldbus and connection technology for harsh industrial plant environments, Turck was not only able to provide the application know-how, but also product solutions that bring the customer several benefits. These include, for example, new technologies like multiprotocol, fast startup and IO-Link.

A special feature of the new production line is the fact that fieldbus systems have to communicate with different controllers – an ideal application field for Turck's BL20 modular IP20 I/O system. The multiprotocol gateways, which speak the three Ethernet protocols and feature the necessary I/O slices, enable the BL20 system to bring different types of signal to the controller and also link different valve blocks of the production line. The end customer particularly appreciates the simplicity of the BL20 modular system, as well as the easy maintenance and diagnostics it allows.

IO-Link ensures efficient production

The user benefits enormously from the flexibility that IO-Link provides for the requirements of this system. For an increasing number of users, this communication standard has become an attractive



Photo: ©rasica - Fotolia.com



way of providing transparent access from the controller to the sensor.

In this project, Teknodrom Robotik ve Otomasyon was able to fully utilize Turck's complete IO-Link portfolio in order to put together a tailored I/O solution for its customer. Turck's BL20-4IOL gateways with IO-Link master modules and the IO-Link-capable IP67-TBIL I/O hubs bring up to 16 switching signals from the field to the control cabinet via a single four-wire cable. The TBIL functions as an IO-Link slave, bringing 16 binary signals to the IO-Link master on the BL20 gateway. This not only considerably reduces the wiring effort required but also the possibility of wiring errors. Passive junctions with large multi-pole cables are often used as an alternative solution. However, as each wire of this type of cable has to be connected at the gateway or controller at its specific terminal, this solution is not only time consuming but also expensive. Finally, the considerable amount of documentation required makes the task more difficult.

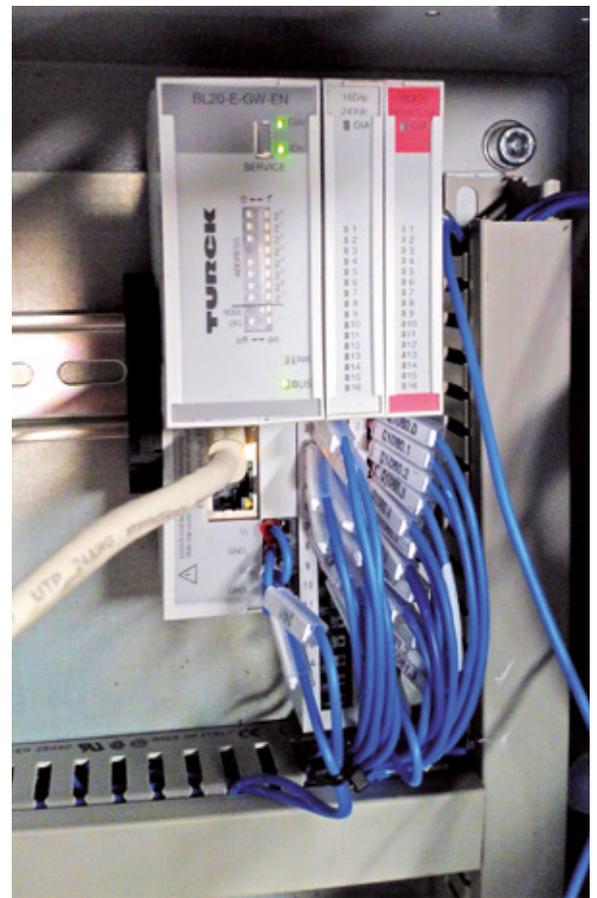
Another benefit of IO-Link in the production line becomes apparent when different tools are changed: "The clamping devices for the products have to be changed frequently in the plant. The IO-Link modules

for BL20 offer here a high level of flexibility. During the installation, we can quite simply adapt the BL20 system and add more signals or reduce them. With every additional expansion or upgrading of the plant we benefit from this flexibility," says Selim Çağatay, the

QUICK READ

The Turkish system integrator Teknodrom Robotik ve Otomasyon is planning and implementing the construction of a production line in Turkey for one of the leading manufacturers of exhaust systems. The greatest challenge in the project was to provide the required level of flexibility for the line, which needed a variable, particularly robust and EMI resistant automation technology due to the welding applications in place. In its search for a supplier, the company came across Turck with its extensive portfolio of sensors, connection technology and I/O systems, which could easily meet the demanding requirements involved, not only due to the I/O-Link functionality provided.

The right Turck offering: With IO-Link, multiprotocol Ethernet and I/Os for a large number of inputs and outputs, the integrator was able to provide the customer with a tailored solution



control technician responsible at the system integrator. Besides the input signals, the actuator signals to the valve blocks also have to be transferred to the BL20 system via IO-Link. A single interface therefore collects all IP20 I/Os, the IP67 sensor signals from the field and the IP67 actuator signals to the valve blocks. The Teknodrom engineers praised this feature in particular: "The ability to connect several different modules (valve blocks and block I/O modules) from a single point is a major benefit of the Turck I/O solution."

Efficiency through decentralized IP67 I/Os

Production lines for MIG (metal inert gas) welding require an extremely robust connection and sensor technology due to the high level of electromagnetic pollution. In view of the fact that errors in the connection technology can be avoided best of all by reducing the number of connection lines, a smart IO-Link solution is significantly simpler, faster and more economical to implement than multiprotocol cable systems. It also makes a major contribution to quality assurance. All signals are collected via Turck's TBIL IP67 IO hubs and then forwarded to the BL20 system via a

»For us it was very important to install a flexible structure. I think we have managed to do this with the Turck solution.«

Selim Çağatay | Teknodrom Robotik ve Otomasyon

single four-wire line. IO-Link master and multiprotocol gateway handle the additional communication with the controllers via Ethernet. Thanks to the digital IO-Link transmission, the user can save on the expense of shielded cables and other EMC measures. The Turck solution also saves considerable installation costs and is also easier to maintain.

"Thanks to this compact and flexible solution with a good price performance ratio, we believe we have found the best solution for the customer," Selim Çağatay explains the decision to choose BL20 with IO-Link as standard for the new silencer production.

Flexible solution for the automotive industry

For users wishing to fully exploit the possibilities of IO-Link, Turck offers one of the most extensive IO-Link portfolios in the world – starting with a host of sensors, cables, inductive couplers and I/O hubs, right through to programmable fieldbus and Ethernet solutions. Turck customers not only benefit from the comprehensive offering for IO-Link and the company's many years of experience in the automation of automotive production lines, but also from a host of application specific sensor and fieldbus solutions for this sector. With Turck multiprotocol, the company has developed a technology that combines the three globally used Ethernet protocols (Profinet, EtherNet/IP and Modbus TCP) in a single device, both with IP20 protection as well as IP67 – as a modular system or also as compact block I/Os.

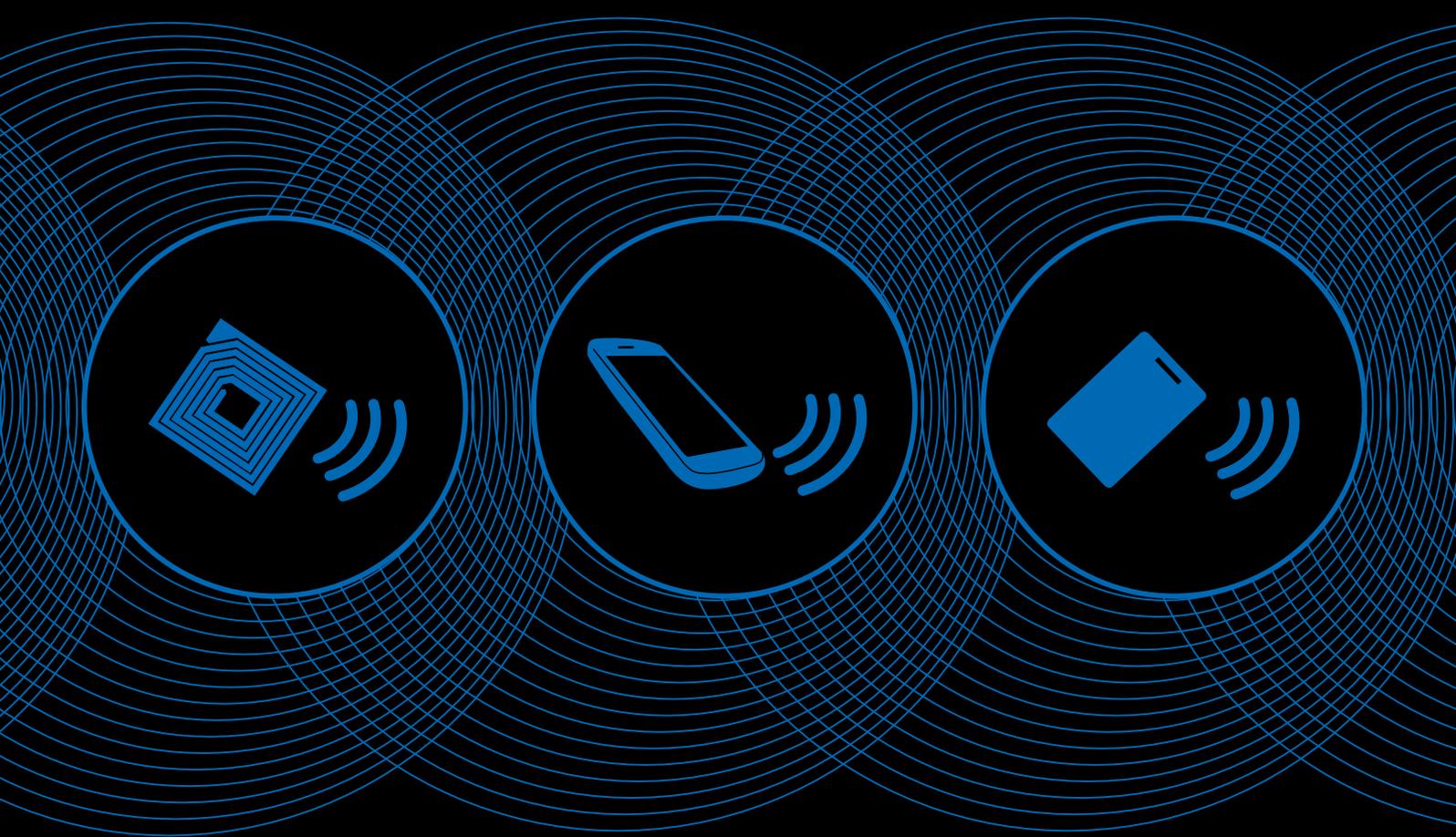
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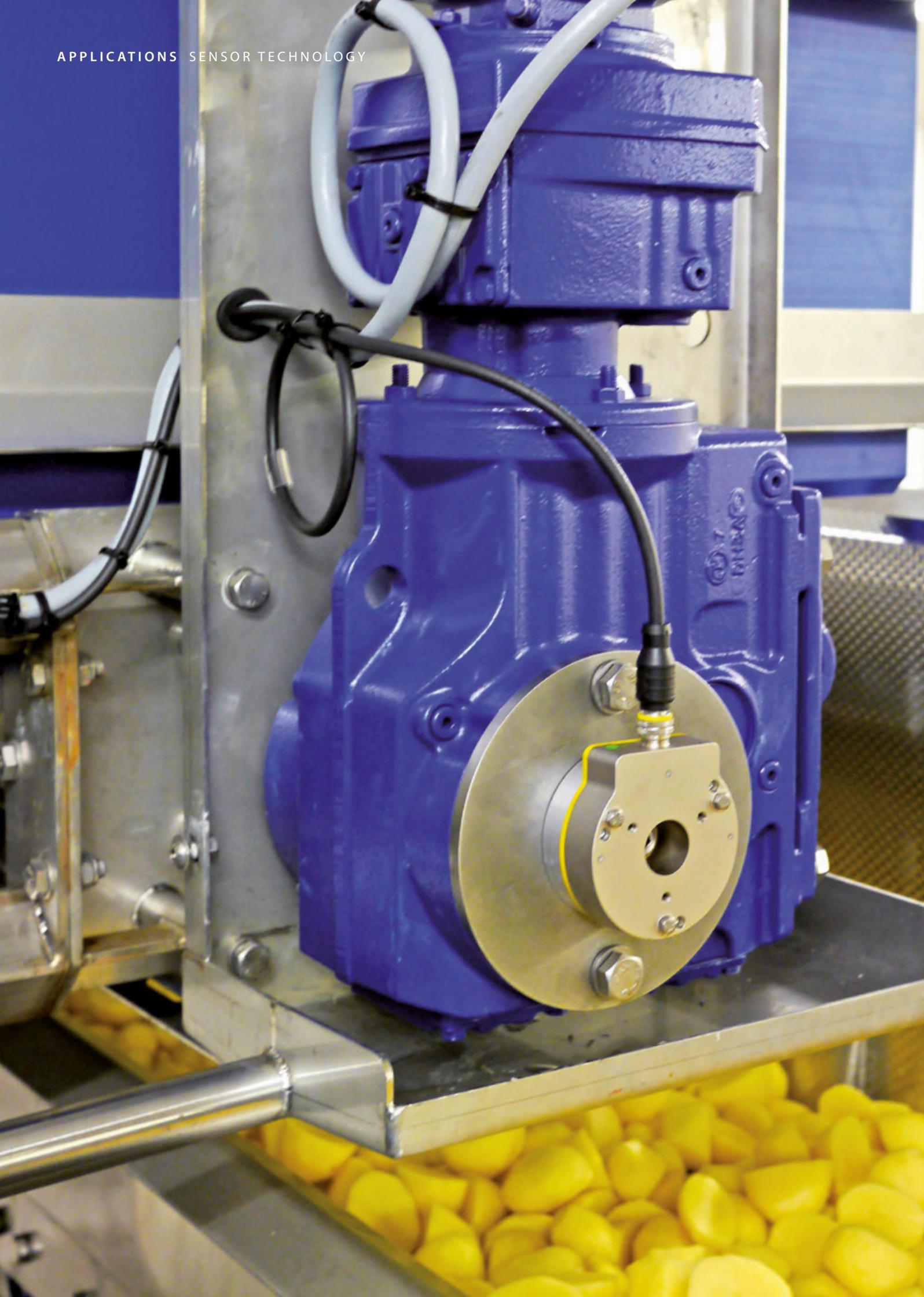
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Buffering Potatoes

Turck's QR24 encoder is demonstrating the superiority of its contactless measuring system on a buffer conveyor in the potato processing area at Schaap, a company based in the Netherlands

The cultivation of the potato spread slowly in Europe at the end of the 16th century. Spanish conquistadors brought it from the New World to the Iberian Peninsula and from there also to the Netherlands, which at that time was ruled by the Spanish. Initially, the plant was passed around the courts of Europe more as a botanical rarity than as an agricultural miracle food. At first it was difficult to cultivate this relative of the deadly nightshade profitably and for a good taste. However, once cultivation got under way, the root crop ensured the population growth in Europe at that time. In the technical journal *Social Research*, the American historian William McNeill even named the potato as an essential factor in the astonishing rise of the West.

Compared to the initial difficulties at that time, today's problems in potato production are relatively small. Nowadays, it is less a matter of life and death than agricultural efficiency. Major potato producers such as Schaap Holland B. V., based in the Dutch town of Biddinghuizen, try to achieve this with the optimal automation and food-oriented processing and packaging of their potatoes.

Around 300 farmers supply the plant and thus make a considerable contribution to Schaap's ability to supply 45,000 tons of potatoes a year to commercial customers and the food service industry. The plant offers potatoes in two processing forms: Cleaned unpeeled potatoes or peeled, refrigerated potatoes for direct processing. Both product groups are available in different potato types, shapes and packaging sizes. The Biddinghuizen plant is divided up accordingly into two main areas. A hygienic area for the peeled potatoes



»We have been looking for an encoder like this for years. When I saw the device on the title page of the customer magazine, I knew: we need something like this.«

Henk van Raalte,
Schaap Holland B.V.

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The weakness of many different encoder types is seldom due to the limits of the measuring principle, nor their electromagnetic compatibility or other interference factors: The Achilles heel is mostly the mechanical system. At the potato processing plant of Schaap Holland B.V., Turck's QR24 now contactlessly monitors a buffer conveyor, saving technical personnel the need for complex mounting solutions and the regular maintenance of traditional encoders.

Buffer conveyor: Up to 500 kilos of potatoes can be buffered on both belts



Double protection: The stainless steel guard covers the entire motor together with the encoder during operation

and an area in which the unpeeled potatoes are washed, sorted and packaged.

Fully integrated process

The sorting, washing and peeling of the potatoes is largely automated. A continuous conveyor section takes the potatoes from the washing area into the refrigeration tunnel. However, the full integration of the entire process also presents the automation engineers at Schaap with some challenges. For example, a machine stop at the packaging machine at the end of the production line causes the entire line to stop as well. In order to prevent this, Schaap uses buffer conveyors in front of the weighing system at the packaging machine.

When the packaging material has to be reloaded, the entire process no longer has to stop, since the buffer conveyor reduces its speed and compensates for the delay. A contactless inductive QR24 encoder from Turck has recently been installed to monitor the motion of the motor driving the belt. This enables up to 500 kilos of potatoes to be buffered in the process. "We use laser sensors to measure the height of the potatoes on the belt so that we know how many potatoes are on it. For every centimeter we need a pulse from the encoder in order to adjust the speed," says Henk van Raalte, technical and maintenance manager at Schaap.

High mechanical stress

The shaft of the motor rotates slowly. The QR24 was therefore set to twelve pulses per revolution. The linear motion of the cooling conveyor has to be monitored with just one pulse every five centimeters. However, this presents us with a major mechanical challenge. The previously used incremental encoder based on the optical measuring principle had to be spring-mounted.

It was mounted on the housing around the shaft with two small spring plates. "The stability and precision of these encoders were not an issue, but this previous solution brought with it some mechanical problems," van Raalte explains. "Due to the vibration of the motor, the spring was always moving so that after two years it didn't work any more."

No need for bearings or spring couplings

With Turck's contactless encoder, this is no longer a problem. Spring couplings are unnecessary since there is no mechanical connection between the shaft and the sensor unit. Only the position element is fastened directly to the shaft. "We have been looking for an encoder like this for years," states Raalte. "When I saw the device on the title page of the customer magazine, I knew: we need something like this."

On all QR24 models the sensor and the positioning element of the encoder are fully encapsulated and designed as two independent and fully sealed units that can withstand vibration or knocks on the shaft. Wear-intensive ball bearings or seals which lead to machine downtimes or long maintenance times are not required. The QR24 series thus has the edge over both optical and magnetic encoders.

Van Raalte assigns the output signal of the QR24 to a standard input of the PLC, a Siemens S7 1500. He set the encoder parameters using the Pactware parameterization program on the PC. Although Turck's easy-teach adapter also enables nine preset values to be selected at the machine, these frequently used values are often between 360 and 5,000 pulses per revolution. Pactware enables between 1 and 5000 pulses per revolution to be selected as required. Schaap selected the output of twelve pulses per revolution because the downstream conveyor belt is monitored with six pulses per revolution. This there-



Previous solution: The spring mounting of this encoder was susceptible to mechanical faults and wear



The two belts with the potatoes (in white) are visualized on the operator panel of the S7 controller

fore simplifies any conversions necessary. Turck's encoder is fitted on the motor underneath a metal protective cover. Turck has recently been offering the stainless steel version of the QR24 as a particularly robust solution that can be installed in food sector applications without any protective measures. Every week, Schaap employees spray the entire plant of the potato production area with a cleaning foam, which is washed off at a pressure of 15 bar after an exposure time of 20 minutes. The entire plant is then disinfected as well.

»The stability and precision of these encoders were not an issue, but this previous solution brought with it some mechanical problems. Due to the vibration of the motor, the spring was always moving so that after two years it didn't work any more.«

Henk van Raalte | Schaap Holland B.V.

Avoiding encoder wear

Encoders are also used in the area of the plant for processing unpeeled potatoes. Problems with vibrations or intricate mounting assemblies often take up a great deal of time on the part of the technicians at Schaap. For example, an optical encoder on a roller dryer measures the linear motion of the belt with 4,096 pulses. When the unit has to be emptied for a batch change, a rake moves over it and pushes all the potatoes down. The absolute encoder fitted here also has spring elements and a coupling that are susceptible to wear. Result: This encoder also has to be replaced or repaired regularly due to mechanical faults.

An optical incremental encoder currently measures the linear movement of another severely vibrating conveyor belt. The technicians have up to now fitted a double bearing shaft in order to keep vibrations down to a minimum. When the QR24 is soon fitted here, this time consuming assembly will also become unnecessary.

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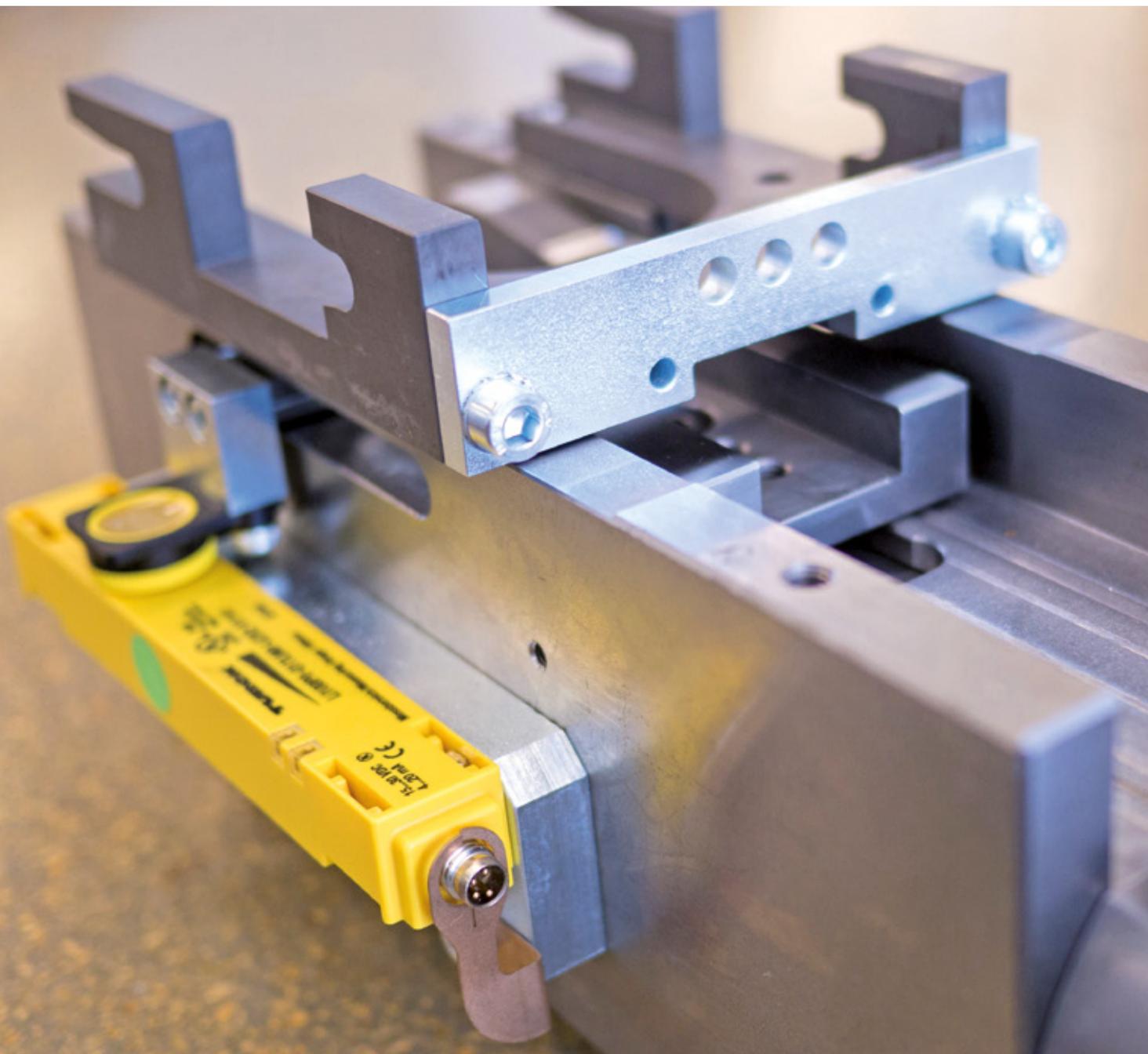
Precise Slide Travel

Turck's Li-Q7 compact linear position sensors precisely measure the travel of the tool slides in the CNC rotary transfer machines of Precitrame Machines SA

“Watch Valley – the land of precision” is the self-assured name of the valley in the Swiss Jura region. And rightly so, since 90 percent of the Swiss watchmaking industry is concentrated in this area. Biel is often called the capital city of the Swiss watchmaking industry. For example, the town of 53,000 inhabitants is the headquarters of the watch giants Swatch Group and Rolex.

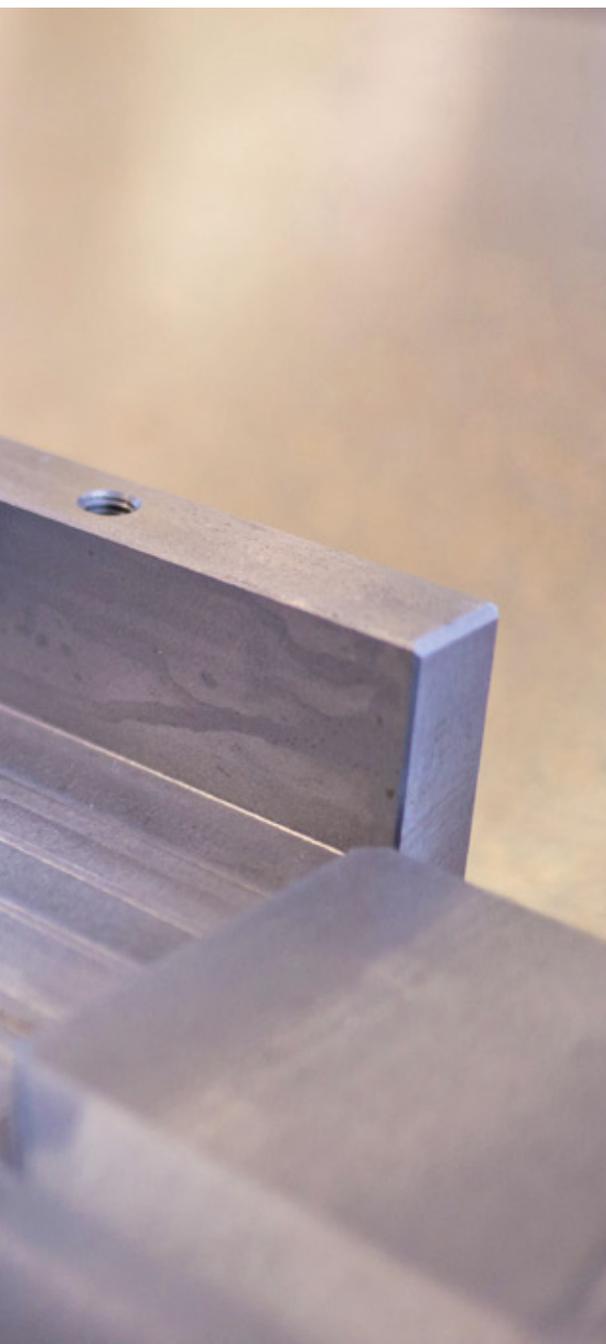
Machine builder Precitrame SA is situated not far from Biel in Tramelan. This company also has its origins in the watchmaking industry. However, in its early

years in the eighties Precitrame had the problem of not being able to find suitable machining centers for the components of its watch movements. Although high precision machines were available, the components always had to be clamped onto the individual machining centers, which reduced the precision. Precitrame therefore developed its own rotary transfer machines with several CNC machining stations. The workpiece here only has to be clamped once and is transferred by the machine in rotation from one machining step to the next until it is fully machined.



It didn't stop at production for the company's own requirements. Competitors and companies from other industrial sectors became interested in the rotary transfer machines. In 2001 the watchmaking business was completely demerged from the machine building area. Since then Ebauches Micromécanique Precitrame SA (EMP) has been producing components for watch movements as an independent company while Precitrame Machines SA has been manufacturing CNC transfer machines and other machines. Today, Precitrame Machines SA has 160 employees worldwide, of which around 140 are based at the headquarters in Tramelan.

Today, the CNC machining centers from the Bernese Jura are valued by automotive suppliers, telecommunications and medical technology companies, as well as the customers from the watchmaking industry. One major strength of the Swiss is the precision and flexibility of their machines. Depending on type, the machines themselves detect tools that are subject to wear or changes caused by temperature drift and



»The accuracy of the previous sensor was simply not enough. We also had to look for an alternative sensor due to the effect of the electric motor.«

Daniel Kunz | Precitrame Machines SA

readjust machining units as required in order to ensure that the workpieces stay within the required tolerances. The modular design of the machine also simplifies the retrofitting of tools or workpiece carriers.

The CNC transfer machines are equipped with between four and 20 stations. Besides the feed and unloading station, each of these units have an extendable clamping system for milling, drilling, and cutting the workpiece on the carrier or performing any other type of machining. For each of these modules, the controller must detect whether the clamping system is correctly tensioned, is operating correctly or whether machining has finished. Only then when all the workpiece carriers are free can the rotary indexing table be turned.

Turck fitted its Li sensor with an M8 connector specifically for Precitrame

Previous sensor solutions were unsatisfactory

The clamping systems here move forward and backward on a slide. This movement must be measured. "For a long time, we used proximity switches to limit the travel during operation. We moved the slide with our DC motor until the sensor switched. The problem with this solution was the fact that we couldn't move very quickly, otherwise the slide would collide with the mechanical limit," Daniel Kunz, head of the electrical design office at Precitrame, explains the reason for looking for an alternative solution to detect the tool slide.

"We then looked for a linear position sensor in order to monitor the entire travel. However, the first magnetic position sensor that we used had considerable

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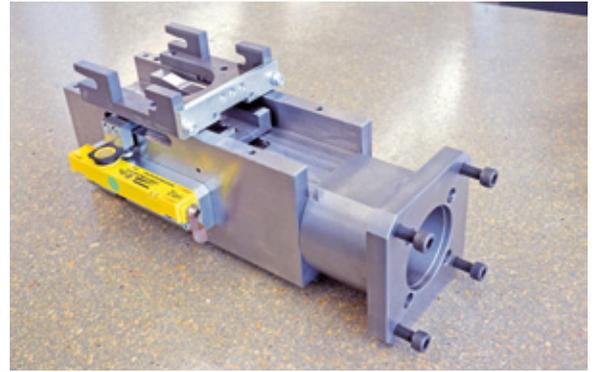
The Swiss company Precitrame Machines SA has not only made a name for itself with its CNC machining centers in the watchmaking industry. Automotive suppliers, telecommunications and medical technology companies also appreciate the precision machines from Tramelan. For a long time the automation specialists at Precitrame were on the lookout for the ideal solution for measuring the position of the tool slides until they finally came across Turck's Li-Q17 inductive linear position sensor, the first sensor to meet all the challenges of this application.

disadvantages,” Kunz continues. First of all, the sensor did not supply a linear signal over the entire travel of the slide. The last five millimeters at the end areas were not output as a linear signal. This meant that we could not detect relevant positions exactly. Furthermore, that absence of magnetic field immunity in the magnetic sensor frequently caused problems since the 400 series transfer machines feature a synchronous motor in direct proximity to the sensor. The measured values of the original sensor also did not offer any temperature stability. “The accuracy of the previous sensor was simply not enough. We also had to look for an alternative sensor due to the effect of the electric motor,” Kunz explains his need to take action. The electrical design office searched for the optimum sensor solution for around ten years in total. The use of potentiometric linear position measurement and a combination consisting of a wedge with an inductive sensor sliding over it did not offer convincing results.

After further researches, Kunz and his colleagues came across the Li linear position sensors from Turck. The Li sensors operate as inductive systems and have no magnets, thus ensuring an extremely high immunity to interference and magnetic fields. Precitrame tested the Li in the Q25 design first of all. However, this was difficult to mount in the application due to the limited space available. The more compact version in the Q17 design then proved to be the optimum solution.

“The compact design and the simple teach functionality of the Li sensor are major benefits for us,” Kunz states two central criteria. In order to be compat-

A close thing: The Li-Q17 is mounted on the left of the slide inside the standard tool module



Precitrame installs around 1,000 of these workpiece grippers in its machines each year



Precitrame built this device itself to enable its employees to teach the Li sensors the required 55 millimeter measuring range at the push of a button

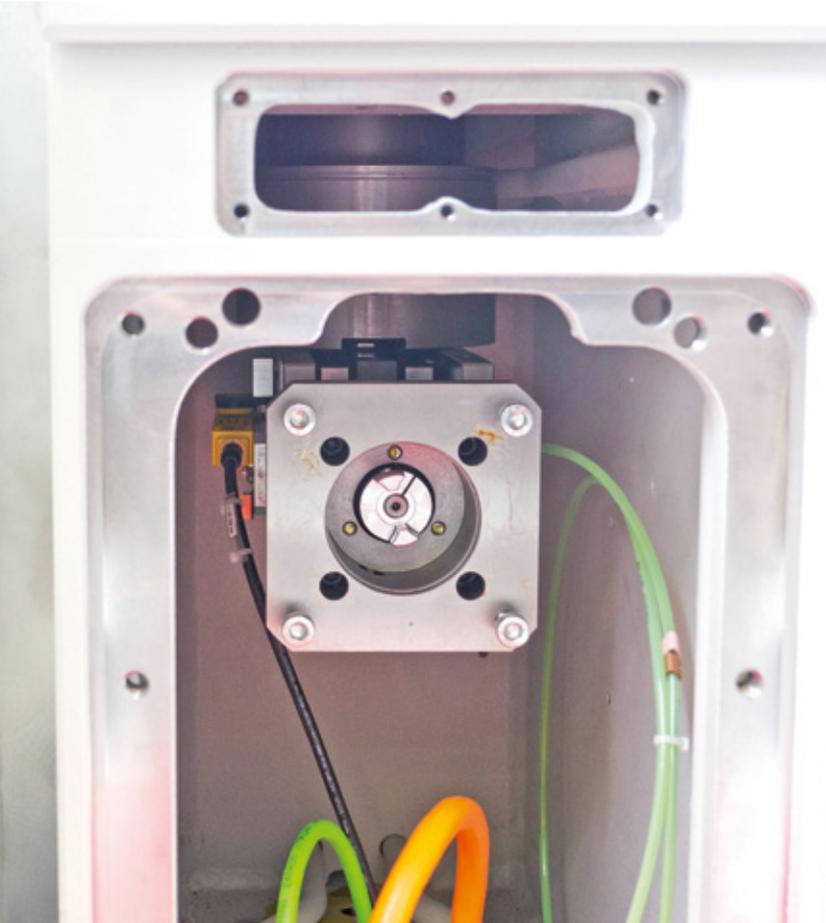
ible with the existing connection solutions, Turck developed a sensor variant with an integrated M8 connector specifically for Precitrame. The devices normally come with a cable outlet or with an M12 pigtail as standard.

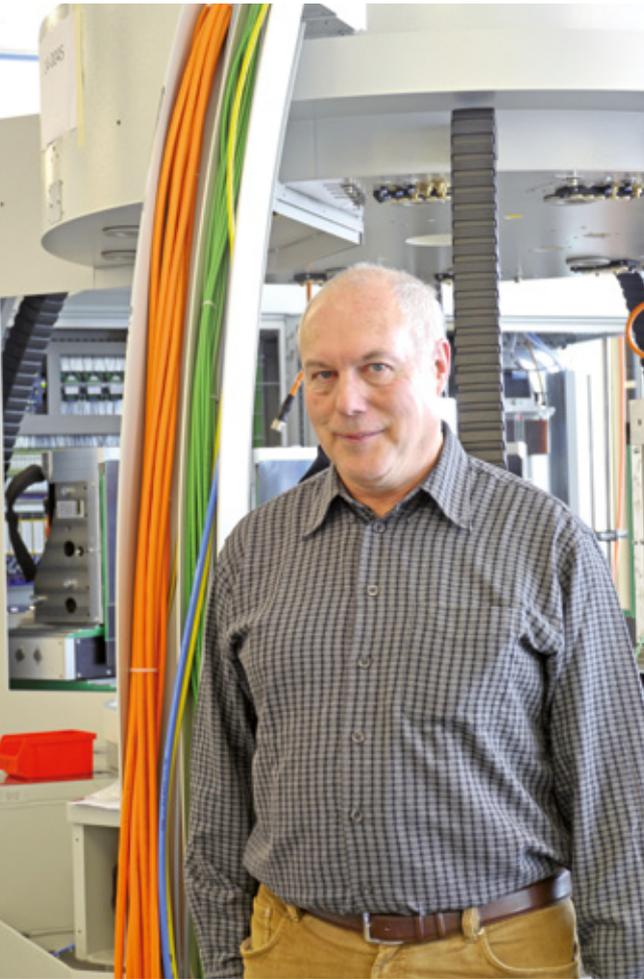
Simple teaching at the press of a button

In Precitrame's standard tool modules, the linear position sensor does not have to detect the entire 100 millimeters possible. All sensors at Precitrame are taught to a measuring distance of 55 millimeters, since the input of the positioning module does not have any particularly high resolution of the analog-digital converter. “The teach functionality, however, enables us to use the full resolution of the sensor from

»The teach functionality enables us to use the full resolution of the sensor on this short distance and thus not lose any precision.«

Daniel Kunz | Precitrame Machines SA





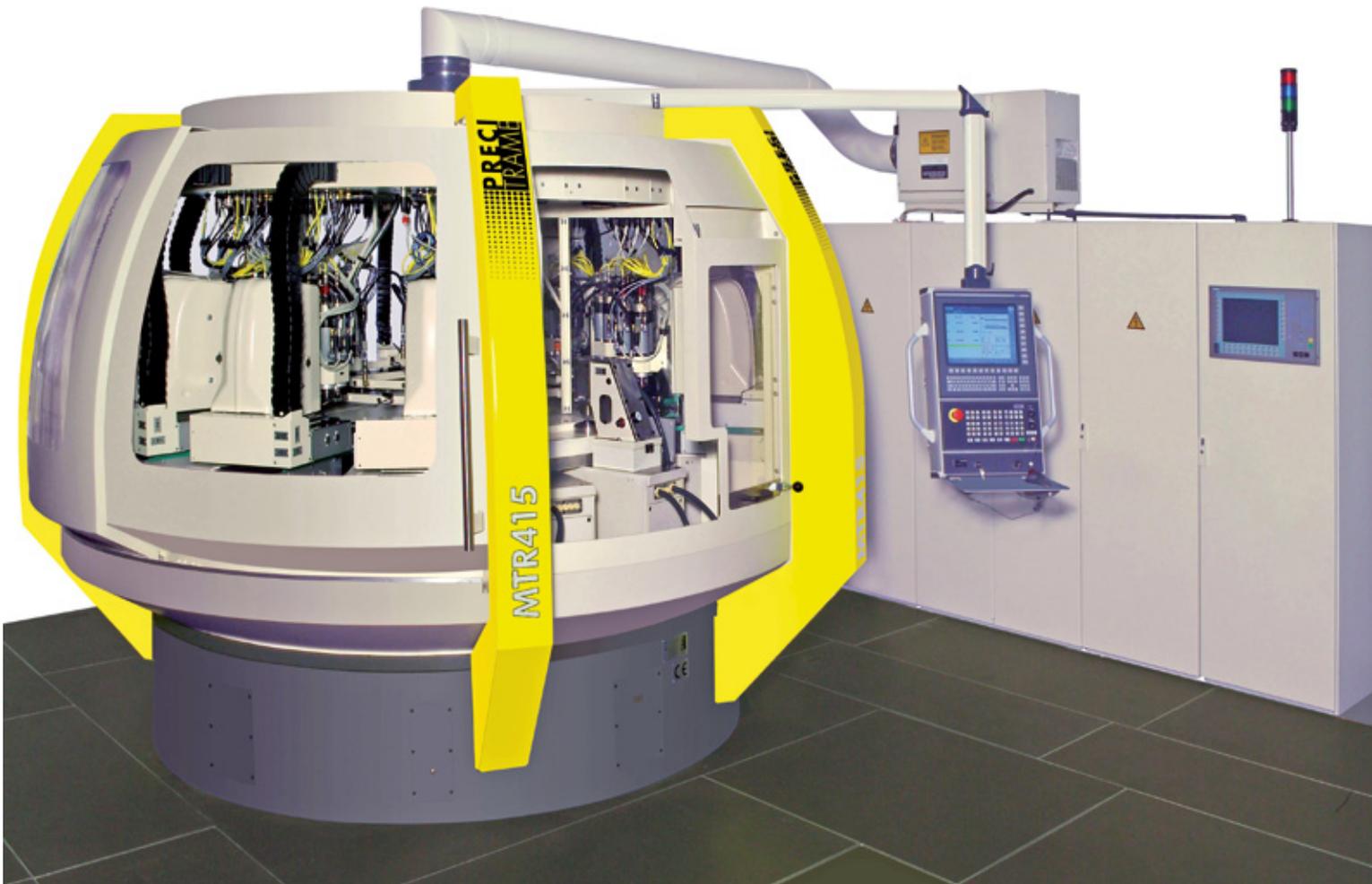
4 to 20 milliamperes on this short distance and thus not lose any precision," Kunz says. To do this, the employees place each Li sensor on a specially designed teach stand on which the two default end points can be taught with two button presses. Besides the good 12-bit resolution and the required magnetic field immunity, the Li-Q17 also offers an impressively high temperature stability. The temperature drift is less than 0.01 per Kelvin – over a temperature range from -25 to +70 degrees Celsius.

Today Precitrame uses the Li sensors as standard in the 300 and 400 series of rotary transfer machines – between four and 20 of them depending on the size of the machines. The sensors inform the controller whether the workpiece carriers are free or clamped on the spindle. An intermediate position must also be detected in certain machine types, and this is also not a problem with the analog output signal. Thanks to the high resolution of Turck sensors, the machine can complete the movement more dynamically, thus also reducing cycle times. "We are very satisfied with the sensor. It meets all our requirements," Daniel Kunz sums up.

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The workpiece holders of the 400 series have a rotary axis for the free machining of workpieces – Turck's Li-Q17 linear position sensor detects the clamping and releasing of the workpiece carriers

For Daniel Kunz, head of the electrical design department at Precitrame, Turck's Li sensor meets "all requirements"



Trade Shows

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

Date	Trade Show	City, Country
13.04. – 17.04.2015	Hannover Messe	Hanover, Germany
15.04. – 17.04.2015	RFID live	San Diego, USA
22.04. – 23.04.2015	ISA	Calgary, Canada
22.04. – 23.04.2015	ACIconnect	Sidney, Australia
22.04. – 23.04.2015	Euro Expo Industrimesse	Stavanger, Norway
04.05. – 07.05.2015	Offshore Technology Conference	Houston, USA
06.05. – 08.05.2015	Indumation	Kortrijk, Belgium
12.05. – 14.05.2015	SPS IPC Drives Italia	Parma, Italy
13.05. – 15.05.2015	Industrial Automation	Beijing, China
19.05. – 21.05.2015	Smart Automation Austria	Linz, Austria
15.06. – 19.06.2015	Achema	Frankfurt, Germany
16.06. – 19.06.2015	Expo Pack	Mexico City, Mexico
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27.10. – 29.10.2015	Automation	Saint Petersburg, Russia
27.10. – 30.10.2015	Gastech	Singapore, Singapore
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09.11. – 12.11.2015	Fabtech	Chicago, USA
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Imprint

Publisher

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