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Cabinet Guard

IMX12-CCM continuously monitors the relevant ambient data inside control cabinets and protective housings



Integrator for Industry 4.0

Thanks to its integrated middleware, Turck's robust DCC module connects RFID solutions directly into ERP, MES and other data systems

Serial Transparency

Turck Korea has implemented a complete serialization and identification system for pharmaceutical products

Short Distances

Beil uses the TBEN-S compact Profinet I/O modules directly on 40 millimeter aluminum profiles in a punch bender for print shops

Discover Solutions



In the last week of April, Hannover is once more the center of the automation world. This is particularly the case this year, as the USA, the world's largest automation market, will be Partner Country at the fair. "Integrated Industry – Discover Solutions", this is the lead theme of the event, combining the European "Industry 4.0" philosophy and the American "Internet of Things" approach. For Turck this combination is a very important one, since we have been operating very successfully in the USA with our own subsidiary for over 40 years.

Regardless how you ultimately want to call it, the smart factory has been talked about for many years and the ideas on how to implement it are becoming increasingly more real. At our fair

stand H55 in Hall 9 we are showcasing our ideas on the subject, including the first RFID I/O module which is able to prefilter and condition the RFID data for MES and ERP systems. This eliminates the need for interconnected control cabinets with PCs running a middleware to perform these tasks – a genuine Industry 4.0 integrator, which we have presented in more detail on page 14.

Condition monitoring also plays a significant role in the smart factory. If you want to know how you can monitor control cabinets and protective enclosures in future, I recommend the title story of this customer magazine. The new IMX12-CCM cabinet guard is easy to retrofit and continuously monitors temperature, humidity and correct door closure. Naturally we have other innovations in our fair package, which we are presenting on the following pages.

I hope you will find the content of this magazine informative.

Yours sincerely,

Christian Wolf, managing director

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38 Laempe Mössner Sinto has automated its new core shooter completely with IO-Link and Turck's contactless IO-Link encoder QR24-IOL

PLC Functionality for I/O Modules



Argee is a new simple PLC functionality for Turck's multiprotocol block I/O modules in IP20 and IP67. It enables PLC functions to be programmed directly on the modules of the TBEN-L, TBEN-S, BL compact and FEN20 block I/O series. In this way, simple controller functions can be outsourced to the I/O modules, thus relieving the workload on the central PLC and the bus communication. The Argee programming environment is a simple web application that requires a web browser such as Chrome or Firefox. It enables users to program basic functions without any knowledge of a programming language.

Block I/O Module for Serial Interfaces



Turck is now also offering a communication module with serial interfaces for its ultra compact TBEN-S Ethernet block I/O series: The slim 32 millimeter TBEN-S2-2COM module comes with two serial ports, which can be individually configured as RS232 or RS485 interfaces as required. Two additional slots offer four universal digital inputs or outputs. A Modbus RTU master is also integrated for the RS485 interface, which can connect up to eight Modbus devices. The new TBEN-S2-2COM modules also support Turck's multiprotocol technology and can therefore be run in Profinet, Ethernet/IP or Modbus TCP networks without any intervention required by the user.

Condition Monitoring for Cabinets

Turck shows an entirely new device class: the cabinet guard IMX12-CCM (Cabinet Condition Monitoring). The new multifunctional device can be installed and also retrofitted in virtually any control cabinet or protective housing in order to continuously monitor the actual degree of protection. The rail-mounted device uses a simple switch signal to indicate to the control system any incorrect closing of doors or the exceeding of limit values for temperature and interior humidity. The IMX12-CCM comes with an intrinsically safe 2-wire isolating transducer interface, thus enabling it to be used also in explosion hazardous areas.

more info
about CCM
on page 8



Factor 1 IO-Link Sensors

Additional uprox3 factor 1 sensors with the world's largest switching distances complete Turck's portfolio. The BI20U-M30 cylindrical proximity switch, for example, offers a switching distance of 20 mm in all materials even with fully flush mounting. The sensor is also available with IO-Link so that parameters such as switching distances, hysteresis or off delay can be set individually. It is also possible to implement speed monitoring, two switch points or diagnostics or temperature alarms. Both versions are available in chrome-plated brass housings or as PTFE-coated variants for welding applications. If larger switching distances are required, the rectangular CK40 and QV40 designs are available. These factor 1 sensors offer unmatched switching distances of 50 millimeters and can even be partially embedded or fully flush mounted if required. These devices are also available for the first time with an IO-Link interface.





IO-Link Ultrasonic Sensors

Turck is expanding the high-end series of its RUU ultrasonic sensors with 3GD models for use in Ex zones 2 and 22. With ranges of 40, 130, 300 or 600 cm they are ideally suited for fill level applications in tanks or feeders. Their rust-proof and acid resistant surface made from stainless steel (1.4403) is also resistant to aggressive media. The new RUU/3GD sensors are provided with switching and analog output, as well as IO-Link interface. The user can choose between diffuse mode and opposed mode as well as between an N/C or N/O switching output via IO-Link or a teach button.

RFID Block Module with Integrated Middleware



At the Hannover Messe Turck is showcasing the TBEN-L-DCC – an intelligent RFID module with integrated data processing functions. The Device Control Center is optimally equipped for use in different Industry 4.0 scenarios in production and intralogistics, such as in incoming goods and dispatch areas, in the localization of containers, order picking or the control of goods flow. The DCC is based on Turck's robust TBEN-L RFID module platform with IP67 protection, and offers an additional eight freely definable inputs/outputs as well as connection possibilities for four RFID read/write heads in HF or UHF technology. Communication with higher-level ERP or MES systems is implemented via Ethernet TCP/IP. The module is equipped with Device Control Service (DCS). See more information about DCC on page 14.

HMI with Codesys 3 PLC and Visualization

The TX500 HMI PLCs with high-end touch displays and fast processors are ideal for use in small to medium-size machines which have processes that have to be controlled, operated and visualized locally. Each TX500 is equipped with a Profinet master and EtherNet/IP scanner, as well as a Modbus TCP and Modbus RTU master. The HMIs can also be run as slaves in both Modbus protocols. Codesys3 allows the lean and simple programming of the PLC and visualization functions. The latest processor technology guarantees the smooth handling of computing intensive processes right through to moving image visualizations. The high resolution TFT display with 64,000 colors enables the attractive and high performance display of graphics and animations. The front panel of the TX500 series is protected to IP66. Turck is offering the TX500 series in three variants with different display sizes and resolutions: two 16:9 displays with 7" or 13" (TX507 and TX513) diagonals and one 10" device in 4:3 format (TX510). The two smaller displays offer 800 x 400 pixels, while the large TX513 comes with 1280 x 800 pixels. More info on www.turck.com/tx500



Robust LED Strip Lights

Turck's optics partner Banner Engineering is expanding its LED lighting portfolio with the new versatile series WLS27. Featuring a shatterproof, UV-stabilized, polycarbonate shell, WLS27 LED strip lights are ideal for machinery and workplace lighting in harsh indoor and outdoor applications. Designed with a durable, low-profile design and efficiency, WLS27 LED strip lights are optimal for mounting even in narrow installation situations.



Ultrasonic Sensors in New Designs



The RU ultrasonic sensor series grows: the RU sensor in the M18 housing is now also available as an angle head variant with ranges up to 130 cm. The ultrasonic sensor in the CK40 housing is particularly suited for room monitoring or sag detection. Its rectangular design enables a very large opening angle of 60°. The CK40 is suitable for ranges up to 250 cm and is available with an M12 or terminal chamber connection. Turck has developed the robust RU-600U in the M30 stainless steel housing with a 600 cm switching distance for applications requiring a very large range. In spite of its large range it comes with a very short blind zone of only 60 cm. More information about the RU series on www.turck.com/ru

Safety Lights Screens without Blind Zone



With the EZ-Screen LS (Light Screen) series of its optosensorics partner Banner Engineering Turck has expanded its range of safety light curtains. The end-to-end sensing design eliminates gaps in detection when mounted on top of machine work surfaces and between cascaded segments. The light screen features highly visible and intuitive bi-color alignment indicators that allow for simplified setup, easy troubleshooting and streamlined installation. The EZ-Screen LS is available in three resolutions: 14 mm, 23 mm and 40 mm – with a range of up to 12 m.



Pressure Transmitters for Any Application

Turck has strengthened its claim to be a full range supplier of fluid sensor technology with an extended offering of pressure transmitters. The compact PT series was developed to meet the demanding pressure measuring requirements in the machine building sector and beyond. Their robust design also allows high-precision wear-free pressure measuring and long term stability even in harsh operating conditions. The entire PT series is UL certified and approved for the Ex area, drinking water applications, and also maritime applications. Customers are provided with the most typical process connections, various types of output signals, as well as ceramic and metal measuring cells, both in the standard measuring ranges -1 to 1,000 bar as well as in the low pressure ranges up to 600 mbar.



Isolated HART Modules

Turck is presenting HART modules for its excom I/O system with fully galvanically isolated channels. This prevents any potential transfers and the resulting corruption of measured values. The temperature resistant HART modules for inputs (AIH401Ex) and outputs (AOH401Ex) enable excom to be used at all temperatures up to +70 °C. This way, the I/O system can be placed even closer to the fieldbus instrumentation even under severe temperature conditions. The new HART modules process the information of multi-variable measuring devices, extended diagnostics or status information faster than previous devices. The modules will be available after completion of ongoing approval activities.



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Cabinet Guard

Turck's IMX12-CCM cabinet guard continuously monitors the relevant ambient data inside control cabinets and protective housings

Availability and reliability are parameters which are of prime importance for the operation of machines or process plants – unscheduled downtimes considerably reduce profitability. For this reason, the operation of installations without any intelligent sensors is a rare occurrence nowadays. Besides the actual process parameters, additional information is sent to the control level simultaneously. For example, measuring ranges can be adjusted during operation or the state of the equipment can be queried. These features offer several benefits and reduce the downtime of machines and plants. In recent years, considerable advances have been made, and field instruments have now been developed into well rounded devices.

If you consider the causes of unscheduled plant downtimes, you will often find that it is not faults in the instrumentation or control technology that stop the production process but the connections between the levels. The information routes, converters and connection points in the field are the elements which are found in analysis to be weak points. This infrastruc-

ture is mostly not suitable for direct exposure to the harsh ambient atmosphere that is very often found in processing plants. These devices are therefore installed in cabinets that protect them from humidity, temperature and other risks – such as mechanical loads.

Protection not permanent

As long as the control cabinet does not have any faults, the devices installed in them are well protected from external influences. However the protection offered can decrease as the period of operation and also the load increase. This can be due to mechanical damage, the aging of sealing material, but also human error such as incorrect closing. The cause may often involve creeping processes that lead to a failure of the devices installed in the control cabinets and thus also to a complete shutdown of the plant.

Modern electronic devices nowadays have their own onboard temperature monitoring. The measurements monitor the temperatures at critical points on the PCBs. This data can for example be read via

QUICK READ

As part of the diagnostic monitoring of devices in the field and control level, it is often the transmission routes and interfaces that are ignored. On-site cabinets with I/O systems – particularly in legacy installations – are thus nowadays often the Achilles heel of the installation technology. Condition monitoring here was previously only often possible with considerable effort. Turck's IMX12-CCM cabinet guard offers an easy solution for reliable cabinet condition monitoring – also with existing installations. The device on the DIN rail monitors correct door closure, humidity and temperature, and outputs an alarm signal to the control level if the limit value is reached.



modern fieldbus systems and processed further. While these are good features in principle, they ignore some important points; not every plant concept is based on one fieldbus topology. In such cases, additional diagnostic information can only be supplied by providing additional interfaces on the devices. However, very few companies make the effort required and so plant sections without any particular communication technology cannot be monitored.

Furthermore, the temperature in the control cabinet cannot be derived reliably from the temperature on a printed circuit board. This particularly applies to large units. The measurement at a local hotspot can conceal the general temperature. The device temperature therefore provides little information about the condition of a control cabinet and could lead to incorrect interpretations. Moreover, temperature alone is not a parameter from which the general degree of protection of an enclosure or a control cabinet can be derived. Additional variables, such as humidity, light and position have to be integrated in the monitoring

concept instead, in order to ensure optimum and reliable operation.

Condition monitoring for the control cabinet

Turck has tackled this issue and developed a device which can be retrofitted in virtually any control cabinet or box, and which can be configured for the local conditions through a simple teach-in process. The new IMX12-CCM (Cabinet Condition Monitoring) cabinet guard indicates the degree of protection of the control cabinet with a single switch signal. The 12 mm wide device comes with an intrinsically safe 2-wire isolating transducer interface, enabling it to be used in explosion hazardous areas. This means that only a maximum of four wires and available space on a DIN rail are required to install and commission the IMX12-CCM. The teach-in process can be carried out without the need for a computer or an additional tool. The standard HART interface is provided for additional diagnostic options, such as for reading out the absolute measured values.

The 12 mm wide device comes with an intrinsically safe 2-wire isolating transducer interface, thus enabling it to be used also in explosion hazardous areas



Multi-functional device

Besides the interface technology, Turck's control cabinet guard offers a range of sensors which monitor the actual status of the environment: a temperature sensor, an absolute humidity sensor and a triangulation sensor were integrated in the IMX12-CCM. This last sensor measures the precise distance to the cover or door. If the door is not closed correctly, the device indicates this condition and the operator can rectify the fault directly.

As humidity in closed systems is a recurring problem, its continuous monitoring is an important aspect of condition monitoring. The cause of humidity can be seals which have become porous and leaky due to environmental influences, or also faulty ventilation systems. Humidity increases slowly but constantly, and can suddenly cause a device failure. As these effects are mostly only detectable over a long period, the IMX12-CCM monitors these long term trends and outputs a signal to the control level if limit values are exceeded, in order to deal with instrumentation failure in advance. The cabinet guard continuously processes the recorded data of the sensors and compares it with the taught safe condition. As soon as defined limit values have been exceeded, this is indicated to the control level via a potential-free contact. This enables interventions to be made quickly and effectively.

Conclusion

Turck's cabinet guard, IMX12-CCM, is suitable for the continuous monitoring of protection in enclosures and control cabinets in the field, even in the explosion hazardous area. The simple mounting and integration in the existing topology enables it to be used not only in new installations, but also in existing plant sections. No additional cabling is required as the existing signal reserve can mostly be used. The combining of different parameters in one device – closed doors, humidity and temperature – produces an optimum monitoring function and considerably improves the availability and reliability of machines and plants. The CCM multi-function sensor is adapted automatically to the local conditions. Any extensive programming for normal operation is unnecessary. More comprehensive diagnostics can be called up via the HART interface. The cabinet guard will be available from May 2016.

Author | Klaus Ebinger is director product management interface technology at Turck

More info | www.turck.com/ccm

Webcode | more11600e

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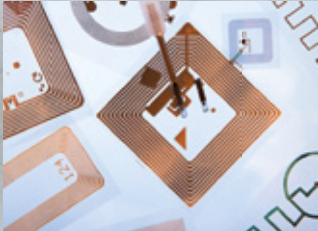
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»Whether Industry 4.0 or IIoT, we will all need to work together«

Dave Lagerstrom | CEO at Turck USA

Turck has been active in North America since 1975. The company has established itself as the market leader in connectors and sensors. In an interview with the trade magazine A&D, Dave Lagerstrom, CEO at Turck USA, talks about changing business models and how to continue the success.

The success of Turck USA was based on an early entry into the market, decentralized company policies and a certain independence of local product development. What factors will be responsible for future success?

Many of the same factors will help us to continue our growth in the North American market. We have just added resources for sensor product development locally and it has already had a positive impact on our ability to meet customers needs.

How helpful was the label „Made in Germany“?

The obvious quality of German made products made this a big part of how we built the sensor business.

„Think global, act local“ is a philosophy of Turck. Do you want to intensify the needs of local markets with special solutions or make Turcks products more compatible for global usage?

The idea is to do both as much as possible. There are obvious exceptions where local requirements dictate differences, such as approvals on cable, but the design can be the same globally. We are always mindful of

requirements in other parts of the world when we develop new products. A good example is our new ATEX approved connectors which will also have IECEx approval. Even though these are not major requirements for North America, we still have spent quite a bit of R&D resources to make these the first of their kind in the world.

For example, the IMX12 series can be used internationally with UL approval for USA. This is also the problem: different countries, different standards / certificates. How aggravating makes this a global product strategy?

Approvals such as UL, CSA, and CCC need to be a part of our global strategy. This is something we are always working on, but all of these things take time. This means new product roll-outs can sometimes be done at different times for different markets. As our global strategy is to design new products to meet any localized requirements, I believe we are in a great position moving forward.

Turck cooperates in Germany with Bihl+Wiedemann for Safety I/O products.

Do you also benefit from it, or will Turck USA search local product cooperations. Does it fit to the 2020 strategy?

The North American market will absolutely benefit from the cooperation with Bihl+Wiedemann. The initial safety blocks have been released with ProfiSafe protocols, but we are also working on the CIP-Safe versions of the blocks. Both of these will be great additions to our product portfolio.

In addition to the product strategy, there is the distribution: Turck Germany relies much on direct sales. In the US, sales work differently. What are the big sales challenges for you in the US?

We sell approximately 75% of all our products through distributors. This is a good and bad thing. With distribution, we have ~2,500 people out selling Turck products. Because of the size of our country, it would be cost prohibitive to have direct Turck sales people in all locations. Using distribution, and most of these are shared with our local partner, Banner Engineering, means we can cover a much larger area with sales people. The only negative is a lack of connection to the end customer.





Turck USA has a “Custom Connectivity Team”. Is there a rising customer demand for individual products?

We started the idea of customized ‘standard’ connectivity products in 2000. At that time, we would get a few requests each week. Today, we create ~35 new part numbers each day and 5 of these are complete new configurations. I would say we are just scratching the surface of this potential market.

Turck USA was 2013 awarded as “Supplier of the Year” from Kuka. Is your guarantee of success short delivery time and the search for alternatives, should something not yet be available?

Being able to offer Kuka the products they need in a very fast time frame is a huge part of our success. The other major factor is the relationships we have with the customer. The sales representative in Detroit is in Kuka almost every day to address their needs. We also have a warehouse in Michigan where we stock items specific for the automotive industry. This is really critical for the delivery needs of our customers. We often deliver from stock in the same day as an order is placed.

Is your business converting more and more towards consulting and services?

We are definitely moving in this direction, but never fast enough for me. As we continue to add capabilities to our product line, we will see much more of this in the future.

Many polls show that US industry is faster than german companies in the adaption of IIoT. How affects IIoT your business and strategy?

With our multiprotocol Ethernet I/O blocks, we are poised to be the leader in IIoT for North America. Imagine the idea of having every inductive sensor connected directly to the internet. That would be ridiculous. With the ability to have our distributed I/O connected simultaneously to multiple Ethernet protocols is what many of our customers are looking for.

What can Germany learn from USA in the industrial digitalization?

Whether it is the German Industry 4.0 or the American IIoT, we will all need to work together in pushing our technologies for the factory of the future. I see this more as a partnership than anything else.

Is Turck USA in the digitalization of the product portfolio the driving force within the company group?

Same as above. I see a great surge of cooperation between the product management teams and the product development teams between USA and Germany. This will be our best way forward. We will accomplish much more as a team and leave behind the ‘not invented here’ syndrome.

How does Turck USA differentiate from the competition?

We are fast and flexible. It is in everything we do.

Author | Christian Vilsbeck, chief editor at trade magazine A&D, conducted this interview
Web | www.industr.com
Webcode | more11630e

Integrator for Industry 4.0

Thanks to its integrated middleware, Turck's robust DCC module connects RFID solutions directly into ERP, MES and other data systems without any additional detours

"Industry 4.0" or the "Industrial Internet of Things" are currently hot topics in the automation sector. These approaches and visions share the fact that industrial production in the future will enable customized mass production through increasing flexibility and maximum automation right through to the automatic control of production processes.

Identification solutions such as RFID represent a key technology on the way towards mass customization. Only through the unique identification of workpiece carriers or workpieces is it possible to create a large number of different product variants in a single

production line. For example, it is possible for different configurations to be stored for this purpose directly on the tag on the workpiece. RFID is ideal for the identification tasks of modern production and logistics as not only the recording of process parameters but also the writing of data to tags or bulk reads – the simultaneous reading of multiple tags – are possible.

Intelligent solutions

As very few systems are designed from scratch and newly implemented as part of the evolution of customized mass production, it must be possible to

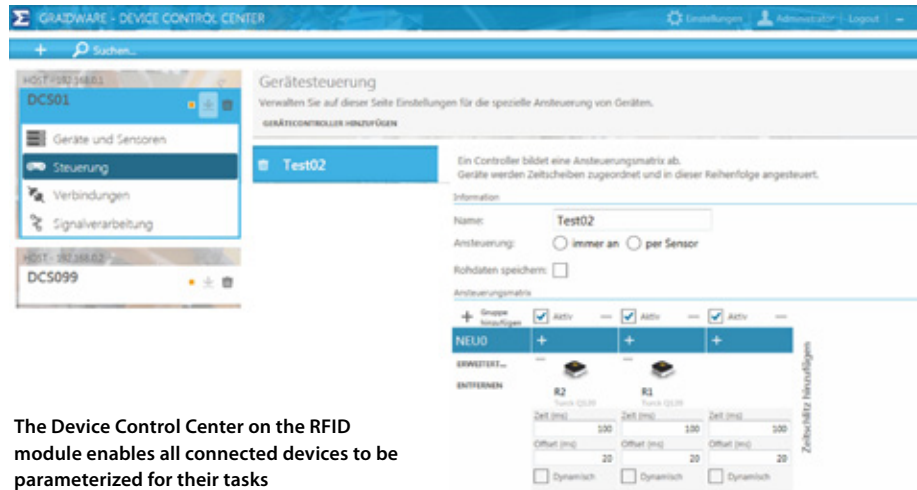


QUICK READ

A new RFID module allows Turck to connect the production world with the IT world and thus prepares the way for Industry 4.0. The TBEN-L-DCC RFID interface is mounted directly in the production environment. Besides four RFID read/write heads in the HF or UHF frequency band, up to eight additional sensors or actuators can be connected. The key feature: Thanks to its integrated middleware, the Device Control Center processes the RFID signals directly in the module and transfers them conditioned and filtered directly to production or corporate management systems.

integrate intelligent sensors and identification technology later in existing production systems. Three things are indispensable for this upgrade: the identification solutions must be easy to implement. The user does not want to write for each application a separate program for preparing the RFID data for its corporate networks and performing the relevant actions. RFID solutions therefore have to be simpler and require less programming than today. Secondly, the interfaces of the industrial hardware for the corporate IT networks and their languages must be opened. And thirdly, IT technology is required, which is suitable for use in industrial systems and the appropriate protection types.

With its latest TBEN-L-DCC – Device Control Center – RFID module, Turck is precisely meeting these requirements. The DCC module enables RFID applications to be retrofitted compactly and quickly in production plants at a later time without any real programming required. Based on the robust TBEN-L module platform with IP67 protection, it offers another eight freely definable digital inputs/outputs as well as



The Device Control Center on the RFID module enables all connected devices to be parameterized for their tasks

connection options for four RFID read/write heads in HF or UHF technology. Communication with higher-level ERP or MES systems is implemented via Ethernet TCP/IP. The smooth running of the module is ensured with an ARM Cortex A8 controller with Windows Embedded Compact 2013 and a 800 MHz frequency, 4 GByte NAND Flash memory and 512 MByte DDR3-RAM.

This level of performance enables the standard tasks of a middleware – from data pre-processing and filtering right through to the multiplex operation of several read/write heads – to be performed directly on the module. Without any knowledge of programming you can use the software of the DCC to set the parameters and identification tasks of the connected devices as well as preselect the data. The actions of the connected sensors and actuators are also set up in the DCC, for example, in order to define trigger signals.

Simple data transfer

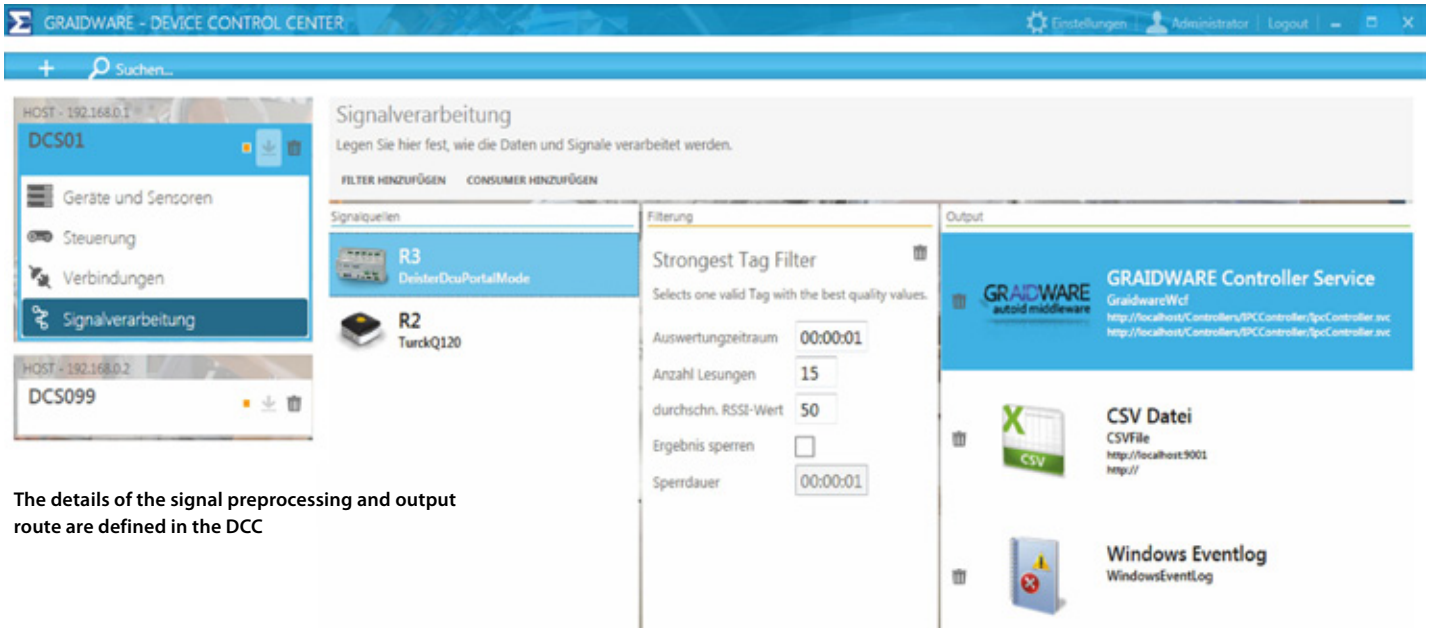
The data transfer is implemented via standard interfaces such as web services, CSV file storage or Windows Eventlog files. This enables the processed data to be forwarded directly to ERP and MES systems or Cloud servers. If the functionality of the TBEN-L-DCC is not enough, it is also possible to communicate directly with the Graidware middleware of Turck system partner Sigma Chemnitz. Graidware is a high-performance middleware which not only manages devices, roles and users, and logs key performance indicators (KPI), but also enables the collection, processing and saving of signals, the plausibility checking of data, the evaluation, statistics and visualization as well as the data exchange with third-party systems such as SAP or other ERP systems.

Cheaper than IPC solutions

Users can implement simple RFID applications directly in the field with the TBEN-L-DCC. This eliminates the need to install a separate industrial PC for preprocessing data. Besides the costs saved for the IPCs, this also saves the mounting and wiring effort involved with a control cabinet solution – particularly when additional actuators or sensors have to be connected via interface converters and GPIOs. Thanks to its internal switch,



Industry 4.0 Enabler:
Turck DCC RFID module brings together the IT and production world



The details of the signal preprocessing and output route are defined in the DCC

several TBEN-L modules can be wired directly in series in a linear topology via the TCP/IP interface. This keeps the wiring requirement down to a minimum.

The compact size and robust design of the device are particularly useful for installations in existing plants. Particularly with retrofits, the space provided in existing control cabinets is not always enough for the additional I/O and IT technology involved, even though designers wish to avoid installing additional cabinets.

Applications in industry and logistics

The easily configured multiplex operation and the possibility to also connect UHF read/write heads make the Turck DCC modules particularly suitable for applications in logistics, such as for gate control with several UHF read/write heads in multiplex operation. In logistics applications, data is also transferred directly to databases and ERP systems more frequently than in production, where the data is mostly processed first by machine controls.

The modules are also highly suitable for use on fork lift trucks due to their high degree of protection and small size. Additional protective enclosures are unnecessary. Even wireless data communication can be implemented via external Wifi or LTE modules. The possibility to connect actuators and sensors via the module brings additional benefits: the ejection of NIO parts on a production section, for example, can be easily implemented.

Outlook

The merging of IT and industrial hardware required for Industry 4.0 has been efficiently implemented in the TBEN-L-DCC. The module is open for communication with IT systems and is at the same time robust enough for use in the harshest environments. Proprietary solutions for connecting RFID technology to databases, ERP and MES systems have become unnecessary.

This also offers a key to Industry 4.0. The connection of decision making systems with the production level must be simple. Programming services are expensive and therefore present an obstacle in establishing an intelligent production process. Turck's TBEN-L-DCC considerably reduces this hurdle. The TBEN-L-DCC will be available in the third quarter of 2016 with Windows Embedded 2013. Further versions based on alternative operating systems are scheduled to follow.

The USB connection is used as a memory interface or for transferring data or software to the device



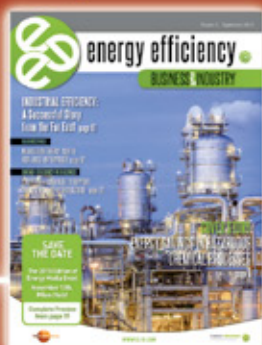
Author | Bernd Wieseler is director product management RFID systems at Turck
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After passing through the rain spray chamber each vehicle passes the second RFID gate that reads the moisture-sensitive media again



Leakproof

Turck offers the world's first system solution for fully automated leakage testing in automobile production

The zero-defect production is the goal of every manufacturer. As a pioneer in production automation, the automotive industry has always been a leading force, when it comes to efficient production process and quality controls. But not everything can be automated one hundred percent - and where manual processes are required, potential sources of error arise. This is also true with the inspection of automobiles for leaks. With the current test methods for leakage tests,

some faulty vehicles are still not detected and delivered to the customers. This is no longer the case as Turck offers a solution to ensure that each vehicle is leak proof when it leaves the production hall. Any costly rework is no longer required.

Relative measuring detects humidity

Together with its partners Smartrac and Vilant, Turck offers the world's first system solution for fully auto-

mated leakage testing. The system is based on UHF-RFID technology and detects all leakages in car bodies without the need for any manual intervention. For this, the car body is fitted during the production process with self-adhesive tags at relevant points, which react to humidity.

Before the vehicle is driven into the rain spray chamber as part of the final inspection, it first of all goes through an RFID gate which registers all the tags. After the spraying process, the car goes through a second RFID gate at the exit, which in turn reads in all the tag data. If humidity has penetrated at any point, the system detects a discrepancy between both read operations and sends an appropriate fault message to the MES system of the user. Car bodies that are affected can thus be removed directly and reworked.

In close collaboration with an automobile manufacturer, Turck has drawn up a requirements profile for the system solution for leakage testing. Once the initial test phase is successfully completed at the user and the feasibility determined in the actual application, Turck hands over the functional turnkey leakage testing solution.

Project partner Vilant is responsible for the provision of the gates and the integration in the MES system of the user. The Finnish company is one of Europe's leading suppliers of turnkey RFID information systems for production and logistics applications. The sensor tag for detecting humidity was developed and produced by project partner Smartrac. The Smartrac Technology Group is the world's leading developer, manufacturer and supplier of RFID inlays and solutions based on the Internet of things.

Sensor tag

The passive UHF-RFID sensor tag can be stuck directly on metal and later also read in positions that are difficult to access in spite of the surrounding structures of the vehicle. Thanks to this capability and its compact format of 21.5 x 73 mm, the self-adhesive sensor tag can be mounted without any problem at many points in the car body. If areas have to be monitored where direct mounting is not possible, tag variants with extension strips are available in different lengths. The water reaches the tag via the extension even from places that are otherwise inaccessible.

If the tag detects humidity, it reacts with a change in impedance, which is registered by the RFID read/write heads in the gates. A powerful evaluation software enables the affected point in the vehicle to be localized precisely by means of the collected data.

In Europe the tag works in the 865 to 868 MHz frequency range. Being a passive RFID sensor tag, it does not require a power supply and can remain in the car for its entire lifetime so that it can be read again at any time. The tag draws the required energy from a handheld or the read/write heads of the gates.

Conclusion

The fully automated quality control in the production line reliably excludes user faults resulting from manual operations. Faulty vehicles are immediately detected

QUICK READ

Before a new car leaves the production halls, it is also checked for leaks. For this purpose it is first exposed to different situations in a sprinkler that simulates rain, splash water or washes. At the end, the leakage test is carried out, usually with manual testing methods. Since these test methods can never be completely free of errors, Turck has developed a fully automated solution for leakage tests based on RFID in close cooperation with a car manufacturer.

and removed. All detected data is available directly in the MES and ERP system of the user. As only checked vehicles which have been verified as leak-proof are delivered to the customer, complaints from the customer about leaks are a thing of the past. Thus both the customer and the brand can benefit from the increased level of quality.

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Photo: Smartrac

The Smartrac sensor tag changes its impedance when it comes into contact with moisture

Marina 4.0

Tried and tested industrial sensors and RFID components offer proven service in a new luxury marina on Lake Wörthersee

As usual in the cold season, the luxury motor boats that are some of the typical sights on Lake Wörthersee are mostly in their winter quarters, away from the boating area. Lakeside space is ultimately expensive – and always taken. Added to this is the fact that the building of new boat houses around Lake Wörthersee is no longer permitted – although adaptations to already existing lake structures are allowed if the area is kept the same. This year, the boats parked in the new BoatCube at the Velden marina are kept over winter for the first time directly at the lake – and can be used at any time. The heated and fully automated boat house enables these valuable watercrafts to be kept safely, and at the same time available for their owners at any time. The integrated charging stations at every berthing position for electric boats and starter batteries ensure permanent operational readiness. However, the innovative marina concept also offers many benefits in summer: After every trip the boats are lifted



out of the water – kept in dry storage at an optimum temperature and air humidity as well out of sunlight, so that they stay clean and well maintained. This also reduces the use of chemical coatings to prevent the growth of algae. “The boats don’t even need to be covered,” Robert Weixelberger, project manager at Boote-Schmalzl, highlights a small but not insignificant practical detail. “It’s even worthwhile driving to the marina for a short evening tour round the lake – just board the boat and sail away.”

Automated procedure

Boats of 10, 8 and 6.5 meters in length and up to 4 tons in weight can park in the BoatCube on individually adapted pallets. The fully automated storage process starts after a successful login by RFID card at the boat house entrance: Chain drives and pulleys are used to move the transport pallet with its valuable “cargo” out of the four-level BoatCube (on dry land) to the transfer



The new boat house in the Velden marina with the entrance to the BoatCube built on dry land



bridge, where it then changes buildings and moves on rollers into the actual boat house (built in the lake). Once there, chain-driven conveyors lower the pallet gently into the water – the boat is afloat. Up to this point – the entire process takes between 3 and 4.5 minutes depending on the berth – the boat skipper and any passengers have no access, the entry point in the boat house is blocked by a safely controlled sliding glass door as well as the BoatCube, which is accessible (exclusively) via a safety door. As soon as the pallet is located in the safe position, the glass sliding door opens and the boat is ready for boarding. Only the plug of the power supply cable which is possibly connected has to be removed – and nothing else stands in the way of boating pleasure on Lake Wörthersee. The return procedure is similar: the skipper reports remotely by radio from a distance of around 200 meters – the conveying system brings the right transport pallet to the entrance/exit area, opens the boat house door and signals with a green traffic light signal readiness for entry. As soon as everyone is



»We very much appreciate the quality and reliability of the Turck products. The support is also excellent.«

Robert Weixelberger,
Boote-Schmalzl

QUICK READ

Over the last 50 years the family-run company Schmalzl has grown to become one of the most prestigious boat builders in the Alpine-Adriatic region. For good reason: Schmalzl frequently has made headlines on account of its innovative developments. The latest achievement of the former sailing champion and company owner Wolfgang Schmalzl is the BoatCube, erected in his marina Velden on the south side of Lake Wörthersee – a patented storage system for up to 22 boats in an area of only 9 x 26 m². For the required sensors and RFID access system Schmalzl relies on tried and tested quality products from Turck.



Photoelectric light sensors control the correct positioning of the pallets when entering the berthing space



The renter logs in with his RFID chip card on the control panel – the boat is then “delivered” ready for boarding within a few minutes



Inductive sensors from Turck monitor the entire berthing and unberthing of the boats

ashore, the skipper acknowledges this via the touch display at the operator station – the safety door closes and the storage procedure starts. “To prevent a jam, a large lakeside display, which is clearly visible from a distance, indicates the next berth number,” Robert Weixelberger explains the procedure. “To ensure safety, entering boats always have priority over leaving boats.”

Wide range of sensors required

Like the majority of the sensors installed, the RFID access system comes from manufacturer Turck. “We already used Turck sensors at my previous employers – my colleague, who planned the automation, and myself therefore highly value the quality and reliability

of the products,” Robert Weixelberger explains the choice. “The support from Turck is also excellent.” The BL ident modular RFID system installed at Schmalzl operates with HF technology. Besides the read/write head in M30 format and the RFID gateway for connecting to the higher-level controller via the fieldbus (Ethercat), Turck supplied 50 RFID tags in check card format. The entire installation also includes 50 inductive M12 sensors and another 15 inductive M30 sensors – primarily for the position detection of the transport pallets. 22 photoelectric light sensors control the correct positioning of the pallet when entering the bridge and the individual berths. An important control parameter for controlling the lowering of the boat into



the water is the actual water level of the lake – this is measured by M18 ultrasonic sensors. Naturally the scope of delivery also included the entire connection technology for the sensors, i.e. all the cables and connectors. “Although the BoatCube has only been in operation since the last summer season – there have been no problems with the sensors and the RFID system, and I expect this will remain so for a long time,” Robert Weixelberger praises the Turck solutions.

Visionary with innovative ideas

The idea and the concept of the BoatCube installation were developed and filed for patent approval by company owner Wolfgang Schmalzl himself. The boat builder and acclaimed restorer had already made headlines in the sector in the past – such as with the development of a very powerful electric boat, the “Julika 660” with a high performance battery storage system, in which he played a leading role. The engineering for the fully automated storage solution took around one and a half years, the implementation – starting with the reconstruction of the dock in the Velden marina – took that much time again. Success is

always the reward for ingenuity: The BoatCube was already fully booked in the first season. The tenants appreciate the fast, uncomplicated provision of their boats and the convenient boarding, as well as the weather protection, which maintains the value and ensures the safe storage of their valuable watercrafts. Wolfgang Schmalzl is now planning to market the BoatCube concept, which is unique in the world – after all, as Robert Weixelberger concludes: “The problem of space at the shoreline is affecting boating on all inland lakes – not only in Europe but also on other continents. There is, for example, genuine interest in this kind of dock the USA.”

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Up to four boats stored on top of each other in the new fully automated multi-level boat park on Lake Wörthersee. Practical detail: Covers between the levels prevent water marks on the boat berthed underneath caused by dripping water



Serial Transparency

Together with other partners, Turck Korea has implemented a complete serialization and identification system for pharmaceutical products – from the production plant to the dispatch warehouse

The combination of RFID technology with optical sensors and camera technology provides a powerful and reliable total solution

A worldwide search is currently in progress for various ways to stop the counterfeiters of pharmaceutical products. Besides the financial loss (50 billion € a year in Germany alone), counterfeit drugs can seriously damage the health of consumers. The aim of the search is the implementation of an end-to-end serialization of pharmaceutical products within the large economic area. Serialization refers to the identification of all salable packs of medicine using serial numbers across the entire production chain. To automate the identification of the serial numbers, these are not only printed in plain text, but are also affixed as barcodes, data matrix, or RFID codes depending on the packaging unit.

Serialization in the EU by 2019

This complete serialization has to be introduced in the EU by 2019. It must be possible to identify all drug packaging without any uncertainty. Furthermore, this has to be possible at any point along the manufacturing and distribution chain. As soon as the medicine is placed in the first packaging unit (primary packaging),

such as a blister pack, they are assigned to a manufacturer and a batch. This identification must also be possible in larger packaging units such as for wholesalers or logistics providers, as well as in the drug store. Each packaging unit – from the blister and the conventional drug package (secondary packaging) that can be bought in the drug store, to bundles of several packages (tertiary packaging), right up to the complete carton or even an entire pallet of pharmaceutical products – must be identifiable completely. This kind of system is relatively complex. Several interfaces between the different systems are required, and all read and write devices must be able to access the same database in real time.

Serialization pilot project

Turck Korea together with other partners have developed a solution for Daewon Pharm, the South Korean pharmaceutical manufacturer, which could also set a precedent in Europe. The pilot project is an excellent example of automated serialization for pharmaceutical products. This involves a lot more than the actual

The major benefit of RFID compared to barcode technology: In bulk reading mode, RFID can read the entire content of a carton – up to 500 individual tags.

identification with barcodes or RFID tags: The data not only has to be available in the system at individual points but also in a network, which in the final expansion stage runs through the entire production and distribution chain. Serialization here is implemented right up to the storing of the drugs in the Daewon warehouse. In a final expansion stage, it is also possible for wholesalers and each individual drug store to be incorporated in the system and the data cloud. Besides Turck, strong partners were involved in the pilot project, who offered their experience with the parent IT infrastructure and the data connection to ERP and MES systems.

The project partners

The main contract partner in the project was the biotechnology and pharmaceutical company Hanmi, which made a major contribution in terms of know-how and experience gained from the implementation of its own RFID system. Using RFID, Hanmi revolutionized its distribution system, which also enabled an expansion of the company in the US market. Its subsidiary, Hanmi IT, had already gained relevant experience through the “Keidas” supply chain manage-

ment system, which it had developed itself and which provided a basis for the Daewon pilot project. The software can record all production management operations – from the start of production, to packaging, shipment, goods reception, right through to the sale of products. All data for this is not stored locally but is kept available and up-to-date via a data cloud for all members at every point in the production and distribution chain.

Other project partners were also involved. South Korea Telecom (SKT) provided the data cloud. The company is certified with the ISO 27001 IT security standard, and guarantees that the cloud services are reliable as well as manipulation proof and failsafe. Agathon, the consultancy firm, supported the project partners in the validation of the computer system.

Turck Korea completed the automation part of the project, in which the company developed and built complete machines which print, affix, check and read the necessary codes and tags on different packaging units. These machines communicate in turn with the Keidas system, where they provide information on the production and packaging process.

Integrated labeling machine

A labeling machine that is integrated into the production process is provided at the beginning of production in the Daewon plants. The drug packages are provided here with an RFID tag which is written with the appropriate serial number. The boxes are also provided with a 2D code and plain text print containing the same information. The correct operation of the RFID tags is checked directly in the machine, and tags are discarded if necessary. The print quality of the data matrix codes and the OCR marking is also checked.

Turck developed an RFID bulk reading machine for the project and provided it with some products from its own portfolio: Besides the inductive sensors, cordsets, power supply units, VT250-HMI controllers and BL20 fieldbus gateways, the installation also included some products from Banner Engineering - Turck's optical sensor partners - such as photoelectric sensors, emergency buttons, cameras, and vision sensors.

QUICK READ

Counterfeit pharmaceutical products present health authorities and competition regulators with a great deal of problems. For this reason, the entire production and sales chain of pharmaceutical products will be made fully transparent in the future. Together with other partners, Turck Korea introduced this so-called serialization for pharmaceutical manufacturers Daewon Pharm Co. Ltd. The cloud-based solution records the drugs from the production stage to storage in the dispatch warehouse. Depending on the requirements, barcodes, data matrix codes, either OCR text recognition or RFID are used for identification. However, all identification technologies refer to the same database in the central data cloud.



The pilot project initially comprised the development and construction of ten bulk reading machines and seven labeling machines

Hanmi/Turck RFID bulk reading machine

Before they are stored, the individual packs of medicine have to be combined into larger units but still have to remain identifiable in order to ensure the end-to-end tracing of the individual packs. For this reason, Turck has developed and built the RFID bulk reading machine in collaboration with Hanmi. It uses RFID to identify all packs contained in a carton even when it is closed. RFID provides a major benefit compared to barcode technology: In bulk reading mode, RFID can read the entire content of a carton – up to 500 individual tags. To do this, the packer simply places the carton in the opening of the machine and the read operation starts automatically. A total of ten RFID antennas detect all the tags in the carton. One antenna moves inside the machine in order to exclude

any duplicate readings or unread packs. Following the identification stage, the machine initiates the printing of a barcode and serial number label, which is stuck onto the outside of the carton for further identification and shipment.

Turck built both a manual version of the machine, in which employees place the cartons in the opening, as well as a conveyor belt version, in which the cartons move into the machine on a conveyor and are transported further for palletizing after identification. The compact machine is just 1.6 meters high and is very mobile.

Identification by fork lift truck

The identification of multiple cartons on a pallet is then implemented using RFID tags. The data is allocated completely. All read devices are connected to computers via Ethernet connections, which always accesses the real-time data of the pharmaceutical products via the central data cloud. This end-to-end identification encompasses the entire process, from the shipment to the drug store and finally the sale of the products to the customer.

The strength of the solution is based on the combination of the latest RFID technology with the powerful optical sensor and camera technology. Both technologies - optical identification via barcode and data matrix codes or OCR text recognition and RFID - have their strengths. The performance and process reliability of the system solution for Daewon Pharma is based on the clever combination of both identification systems. The centralization of all data in one place excludes the possibility of data synchronization errors

THE PROJECT IN NUMBERS

- Duration 2014 - 2015
- 7 integrated labeling machines
- 15 monitoring panels
- 10 RFID bulk reading machines
- 2 conveyor monitoring systems
- 8 printer panels
- 1 RFID system for fork lift trucks
- 22 copies of the Edge software
- 22 BL20 Ethernet gateways with electronic modules
- 20 VT250 HMI controllers
- 20 sets of P4 vision camera and iVu vision sensor



project has clearly proven, RFID is the cheaper version with respect to an overall view of all costs (total cost of ownership), including labor costs, and equipment. The benefits of RFID are clearly in the speed and reliability of the processes: Identification is not only faster, but as many as 500 tags can be read simultaneously without having to unpack the carton. Meanwhile, optically based processes are only able to read a maximum of 200 tags simultaneously and require line of sight in all cases. However, as most recipients at the end of a logistics chain (i.e. the drug stores) do not have an RFID reading device, optical identification is used as well.

Customers benefit from project experience

The pilot project enabled Turck to gain considerable experience in the serialization of pharmaceutical products. The know-how acquired with fully automated machines - as well as the handling of projects of this magnitude in collaboration with several partners - is of particular value to both Turck and its customers. Ten subsequent projects followed in Korea alone, and discussions are in progress concerning similar projects in Europe, America and Asia.

and the other disadvantages of an asynchronous solution.

The identification

If you compare the costs of RFID and data matrix identification superficially, RFID is around ten times more expensive if you only take the costs for tags and label printing into consideration. But, as the pilot

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The RFID Bulk Reading Machine is available in two variants: one for manual operation (left) and one for use on conveyor systems (above)



Employees at the new pick-to-light workplaces work more ergonomically and with greater concentration

Everything at Hand

Turck has optimized THT assembly at its Halver production site with two pick-to-light systems

For PCB assembly, manufacturers often rely on SMD technology (surface-mounting technology) as this process is fully automated. However, as soon as wired electronic components have to be fitted, alternatives such as the THT process (through hole technology) are used. Components here are inserted through contact holes in the board, which even today still requires manual assembly work. To accomplish this, employees place the individual electronic components on boards and use a soldering wave unit to form a permanent connection with the PCB track.

Depending on the size of a board and the number of components to be fitted, this assembly process can be very complex. Roynic assembly tables are therefore frequently used in the THT assembly of PCBs to ensure process safety and quality. This is also the case in the THT assembly at Werner Turck GmbH in Halver.

The Roynic assembly table shows the employee where to fit particular components by means of light indicators. Normally 8 to 15 similar boards are positioned in a transport frame. Each time a component is inserted, the employee presses an acknowledgement button on the table.

Cost and process optimization

Production processes undergo regular examinations at Turck as part of its practiced CIP process. The process specialists in Halver calculated that employees spend a total of 240 hours a year just pressing the acknowledgement button. The fact that the frames with the boards had to be lifted manually by the employees to a conveyor belt for the soldering wave unit was also not efficient. There was a lot of overall potential for increasing the efficiency of the THT assembly process.

QUICK READ

Greater ergonomics, faster processes and lower costs – this is the result of a process optimization that Turck has implemented for its Halver site for the manual assembly of electronic boards. Instead of using the previous Royonic assembly tables, employees assemble the boards on two pick-to-light workplaces. The new solution was planned and implemented by Turck subsidiary Mechatec in close cooperation with the Halver production planners.



The assembly process optimized with pick-to-light results in a considerable increase in production at the workplaces at full capacity.

For Alexander Kohlhaas, expert in manufacturing technology in Halver, it was clear that the Royonic assembly tables were not the optimum solution for the boards with up to 15 components. The decision to implement a pick-to-light solution with system components from Turck was one of the initial ideas. The transport of the frame also had to be automated, which eliminated the need for employees to carry the frames and also optimized manufacturing. As such, it was no longer necessary for logistics processes such as the restocking of components to interrupt assembly, as these could be carried out by the logistics employees.

System solution from Turck Mechatec

Together with Natalie Krumme, at that time a micro-technologist trainee, Kohlhaas developed the idea of a THT workplace based on a pick-to-light system. After



Turck's BL67 I/O system processes and controls the signals of the plant and communicates with the IPC via Modbus TCP



The employees confirm the removal and fitting of the components by touching the capacitive sensor light

the Halver production planners had defined the functional and ergonomic requirements of the application, Turck subsidiary Mechatec got on board. Turck Mechatec offers complete electrical system solutions to meet customers' specifications, from the planning stage to handing over a turnkey solution. From the requirements profile, the Mechatec specialists worked out and implemented a system solution that was both ergonomic and cost-optimized.

With its pick-to-light solutions, Turck has already provided several customers with workplaces for

manual mounting and order picking. Mechatec could therefore draw on the automation specialist's extensive wealth of experience for the system planning and combine the optimal individual components with software specially developed for the THT application in Halver. The software not only controls the process but also measures the productivity of the THT assembly and visualizes it via a separate monitor. The data is logged so that any further optimizations can be identified during later analysis. The hardware used on the new assembly stations includes two HMI/PLC systems, a BL67 I/O station, as well as various sensors and light buttons together with the connection cables. Today, the employees stand in front of two ergonomically designed pick-to-light shelving systems which are provided with up to 48 compartments for holding the components to be assembled.

Efficient assembly process

An assembly process starts with the insertion of the empty boards into the frame carrier. The large HMI/PLC screens visually indicate the individual work steps and the next component to be fitted, with the location and the assembly position on the board. The display on the monitor also serves as a work instruction at the same time. This eliminates the need for any training time and enables production employees to be deployed more flexibly. Besides the display on the monitor, an activated light indicates the shelf location from which the employee has to take the current component to be fitted.

After the employee has fitted the component on the board, she confirms this operating step by touching the capacitive pick-to-light sensor and the visual-



Initial training unnecessary:
The image on the display
gives precise instructions for
inserting the next compo-
nent, and the sensor light
indicates its storage location



Both shelving systems can be filled with new components from the back without interrupting the production process

Productivity and other production parameters are visualized on an additional monitor

ization on the monitor indicates the next assembly location. The pick-to-light sensor indicates on the shelf locations the next component to be taken. Once the boards are complete, the employee pushes the frame to the conveyor belt. The frames with the assembled boards are automatically moved via the conveyor belt to the soldering wave unit and then back to the workplaces. Here the employee takes out the fully assembled and soldered boards and refills the frame with empty boards for the next operation.

Concentration on essentials

The shelves are designed so that they can be refilled from the back with new components without interrupting the assembly operation. This relieves production workers from logistics tasks so that they can concentrate on the actual assembly operation. The two shelving systems are also an advancement in terms of ergonomic design. Instead of having to lift the component frame weighing approximately eight kilos from the belt for assembly, a conveyor belt now moves the

frames with the boards to the employees. They just have to push the frame a short distance until it is picked up by the conveyor belt and transported to the soldering wave unit. All necessary preliminary work for assembling new products can now be carried out externally by the work scheduling unit. The entire process is described and defined in a CSV file. The production planners can also define whether the workplace is to be used by one or two employees in order to shorten the throughput time for the products. As soon as the new product is started, it is only necessary to load the CSV file together with the images into the IPC and the BL67 station. In the future, solutions can also be linked to the new inventory management system without any major effort.

Conclusion

The initial experience has shown that the assembly process optimized with pick-to-light results in a considerable increase in production at workplaces at full capacity. The soldering wave unit is now continuously and evenly utilized. Any process interruptions, as was previously necessary for refilling components, have largely been eliminated. The error rate could also be reduced as the interruptions are generally error sources in the assembly process. The investment in the optimized equipment will pay for itself very quickly.

TURCK MECHATEC

Turck Mechatec offers complete electrical system solutions to customer specifications for all areas of industrial automation. As a service provider, the Turck subsidiary places great importance on customer service. At the same time, the company is so flexible that it can complete its individual tasks promptly and efficiently. The essential factor for success is the close analysis of customer requirements and operating conditions. Any existing components are integrated upon request; new components are selected carefully.

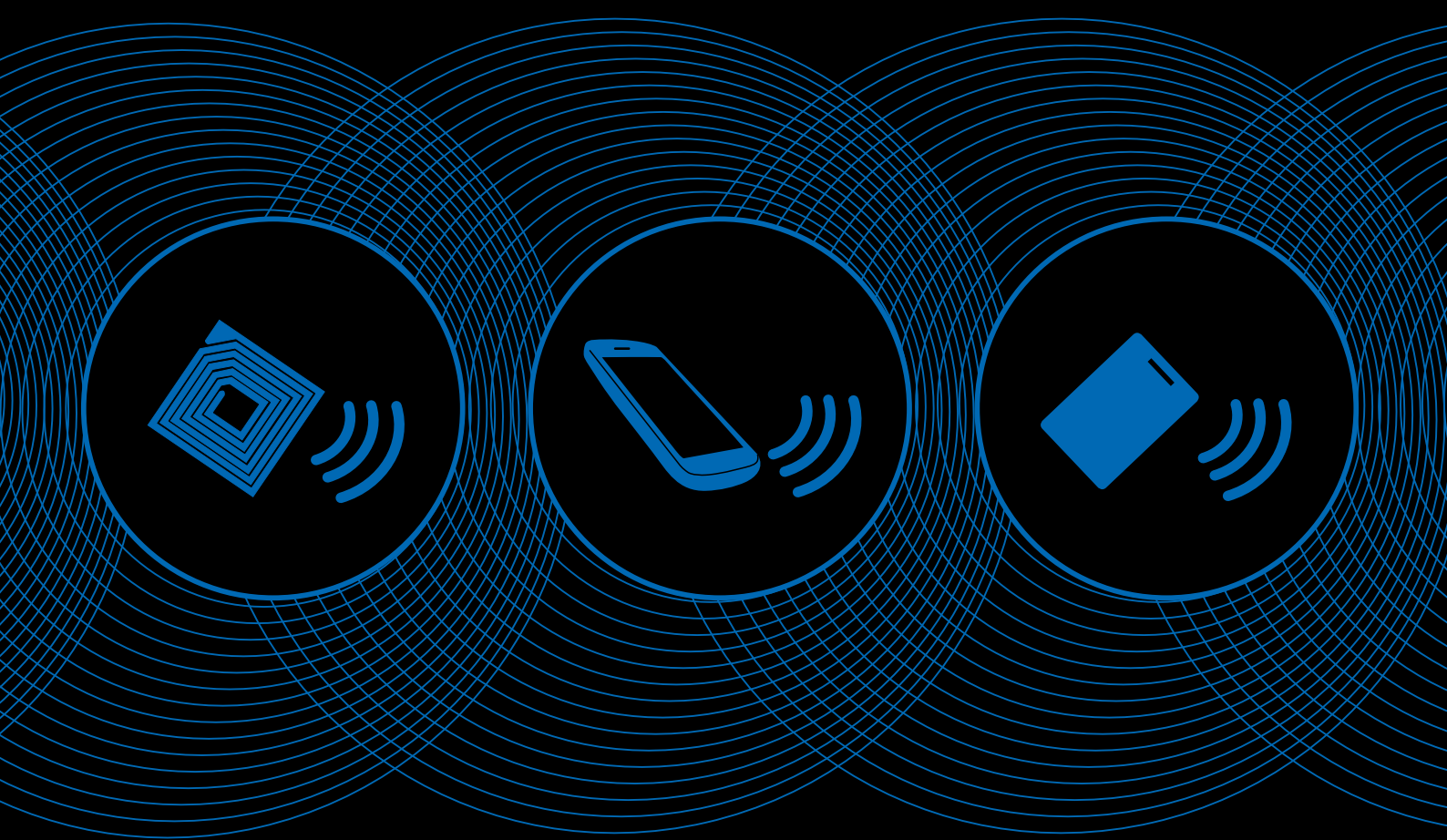
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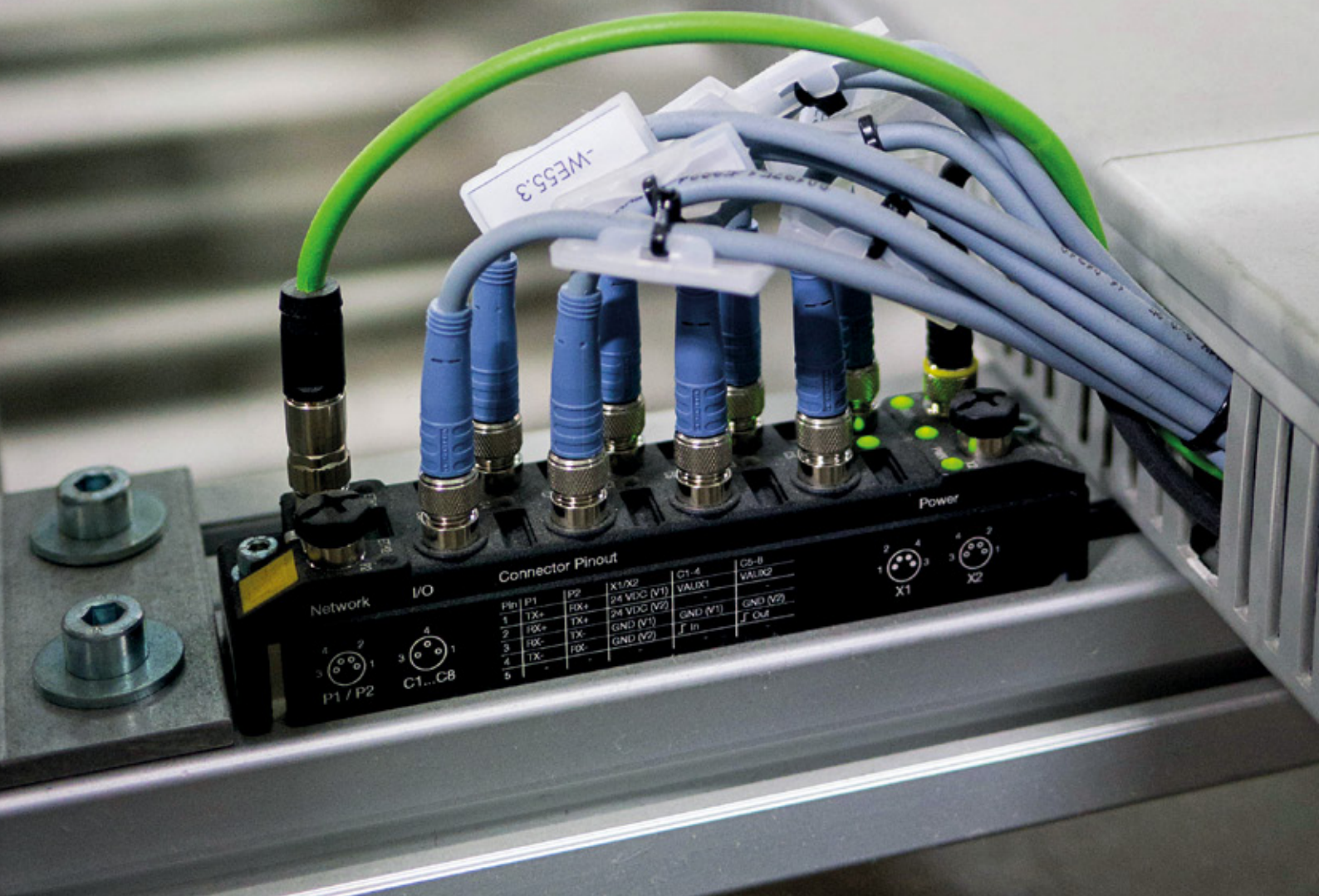
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The compact TBEN-5 I/O module fits optimally on 40 millimeter aluminum profiles



Network I/O

Pin	P1	P2	X1/X2	C1-4	C5-8
1	TX+	RX+	24 VDC (V1)	VALD1	VALX2
2	RX+	TX+	24 VDC (V2)	GND (V1)	GND (V2)
3	RX-	TX-	GND (V1)	F In	F Out
4	TX-	RX-	GND (V2)		
5					

Power

P1 / P2 C1...C8 X1 X2



The signals of the sensor and the electromagnet are directly connected to the TBEN-S on the stacker carrier

Short Distances

Beil uses the TBEN-S compact Profinet I/O modules directly on 40 millimeter aluminum profiles in a punch bender for print shops

The journey from the first print with movable letters to offset printing was a long one. If you look at the art of book printing in Europe, you will more than likely come across the name of Christoph Plantin. In his print shop in Antwerp, the Belgian brought book printing into its heyday in the 16th century. Even today, the historic building of the print shop still houses a book printing museum, which impressively showcases Plantin's work.

The offset printing process widely used today has little in common with Plantin's print shop. Offset printing is neither a high speed process, such as linoleum printing, nor an intaglio printing process, as is the case with copperplate printing. In offset printing, the printing plates are set with a photosensitive layer in the so-called computer-to-plate (CTP) process. The exposed parts of the printing plate are oil absorbent and water repellent. The unexposed areas are oil repellent and water absorbent. After the oil-based ink is applied to the plates, the areas that are not to be printed are washed off with a water roller. What remains on the printing plate is a negative of the print image.

The CMYK process is normally used for four-color printing: Cyan, magenta, yellow and black (key). A printing plate is exposed for each of these colors. However, between exposure and entry into the printing machine, the plates often have to be trimmed in order to be fitted precisely to the print rollers. Depending on the requirements and the process, parts of the plates may also have to be cut off.

Registration marks are punched into the plates so that they can be aligned exactly and fixed on the

rollers in the printing machine, with some plate setters directly punching these marks themselves. If necessary, the plates may have to be rotated in order to obtain the correct position for the printing process. A stacker finally stacks the printing plates on carts, which are then taken to the printing machine.

The punch benders, as well as the turning unit and stacker for this section of the printing process, frequently come from Beil Registersysteme GmbH, based in Abensberg, Bavaria. The company is one of the few full-range suppliers worldwide for punching and bending printing plates in all segments of the printing industry.

QUICK READ

Machines in the printing industry have many interfaces to the office world. Plate setters, punch benders and the actual printing machines must be networked together and connected to the system of the print shop. Barcode scanners and monitors also have to be connected. Ethernet solutions simplify this through the use of the common TCP/IP platform, leading companies like Beil Registersysteme GmbH to use Ethernet solutions in their machines for the printing industry. To connect sensors and actuators, Turck's ultra compact TBEN-S I/O modules are used in a Belgian print shop. The wiring in the machine as well as the integration in the controller environment couldn't be simpler.



Each of the five stacker modules are provided with a TBEN-S, which connects the input and output signals of the sensors and actuators

The illuminated pushbutton indicates that the cart is ready for fetching



Until now, Michael Denk, electrical designer at Beil, had to run up to 40 lines in the cabinet: "We wanted to save all this effort and replace it with a decentralized solution."

Ethernet simplifies data transfer

Beil produced a punch bender together with a rotating table and stacker for a Belgian print shop near Antwerp. The interfaces to the system of the print shop and the printing machine were integrated accordingly. The system assigns the individual printing plates to the print jobs at hand and ensures that all the plates are present at the printing machine in the correct order and at the right time.

The data transfer between the different machines involved in the printing process is now implemented with Industrial Ethernet and is considerably easier and more economical to set up than with conventional fieldbuses. "Machine communication with Ethernet has a major advantage over fieldbuses like Profibus, particularly when I want to connect a monitor to visualize data or connect a printer. That would have

required more effort and would have been more expensive," explained Michael Denk, electrical designer at Beil. "Ethernet brings the office world and the industrial world together."

After bending, the printing plates are identified by their data matrix code and transported to the Beil stacker. In the Belgian plant, the plates are already punched in the CTP machine. The stacker is equipped with vacuum grippers in order to set up the plates carefully. After receiving 100 to 120 plates a cart is filled, and this is indicated to the operator by a light and acoustic signal. The cart can be released via a signal actuator. A control slip is printed at the same time in order to identify the plates stored on the cart.

To anchor the carts on the stacker, electromagnets are fitted which can be locked or released via the pushbutton actuator. An inductive sensor detects whether a cart is positioned correctly. If an emptied cart is positioned in front of the sensor, the light button flashes and the cart can be locked again for renewed filling.

Two carts are positioned opposite the stacker to form a module, and the print shop in Belgium has a total of five modules. Two electromagnets (actuators), two light buttons (sensor and actuator), and two inductive sensors are fitted on each module. Overall, there are roughly 40 input and 40 output signals, which run from the stacker to the controller on the turntable.

Reduced wiring effort

"Previously, we routed all the signals directly to control cabinets," said Denk. "With some systems this required cable lengths of between 10 to 15 meters for each of the 40 cables required. We then had to provide a terminal strip and required another module on the

»Today we are only using one Ethernet cable and a power supply to the control cabinet. This therefore reduces the mounting time at the customer's site as we just have to connect up the modules with two plugs and connect the entire run in the control cabinet.«

Michael Denk | Beil

ET200 to read in the information. We wanted to save all this effort and replace it with a decentralized solution.”

Instead of the conventional point-to-point wiring, Beil used Turck's TBEN-S-I/O modules with IP67 protection. The Profinet modules collect the signals directly on the stacker and bring them to the box PC controller in the control cabinet. The TBEN-S modules are connected up in a linear topology. “We are only using one Ethernet cable and a power supply to the control cabinet. This reduces the mounting time at the customer's site, as we just have to connect up the modules with two plugs and connect the entire run in the control cabinet.”

Ethernet address and web server on board

The TBEN-S modules have a very compact design and, thanks to their width of only 32 millimeters, could be mounted directly on the 40 mm profiles of the module carts. An even more noteworthy feature of the compact design is that the modules do not require a sub-bus with an additional Profinet coupler. Each module is an autonomous Profinet station with its own Ethernet address. A web server and two Ethernet ports for linear topology are also on board. Each TBEN-S also “speaks” Profinet, EtherNet/IP and Modbus TCP. As multiprotocol devices, the modules are set automatically to the Ethernet protocol used on the bus. In this case, this function was not important, but they may be of interest for machinery designed for export.

As each stacker module requires four inputs (one pushbutton actuator and one sensor per cart) and two outputs (one magnet each and the button light per cart), the signal distribution of the TBEN-S with four DI and four DO fit perfectly. The signals for the limit switches on the vacuum grippers are directly connected to the I/Os of the valve block.

Easy configuration in the TIA Portal

The TIA Portal combines some of the formerly separate engineering and visualization tools for electrical design in a single software platform. The GSDML file of the TBEN-S modules can be read directly in the TIA Portal. The configuration of the modules couldn't be simpler through the use of drop-down fields and drag and drop technology. Each module has a separate Ethernet address and can thus be easily maintained later.

Remote maintenance and diagnostics via Ethernet

Remote diagnostics are often sufficient in this case. “I don't have to travel to the customer. I can access the machine remotely via VPN and see directly where the fault is,” Denk explained. “This also enables us to help our customers during the startup phase. Another useful feature is that it's possible to diagnose the module in its entirety as well as each individual channel of the TBEN-S.

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IO-Link Instead of Fieldbus

Laempe Mössner Sinto GmbH uses IO-Link in a new core shooter machine and achieves shorter cycle times with Turck's QR24-IOL IO-Link encoder

“When I first read about it, I thought: please don't add another fieldbus system. Today I know that IO-Link isn't a fieldbus but quite the opposite. In many areas, IO-Link means for us the end of bus systems because it makes communication simple once again,” explains Tobias Lipsdorf, controller programmer at foundry machinery manufacturer Laempe Mössner Sinto GmbH. When the engineer talks about the IO-Link intelligent communication standard, you get a sense of genuine enthusiasm – so too with his colleague Andre Klavehn, who is responsible for the electrical planning. The two of them jointly redesigned the electrical planning of the new machine generation and implemented the automation entirely with IO-Link. The success has proved them right: the newly developed LHL30 core shooter was sold directly from the Gifa foundry trade fair in Düsseldorf 2015. The feedback at the fair was positive – not only with regard to the automation. Today the order books contain more LHL machines.

The LHL30 already received a lot of positive feedback from visitors at the Gifa 2015 fair in Düsseldorf

Laempe Mössner Sinto is a global leader in core shop technology for the foundry industry and one of

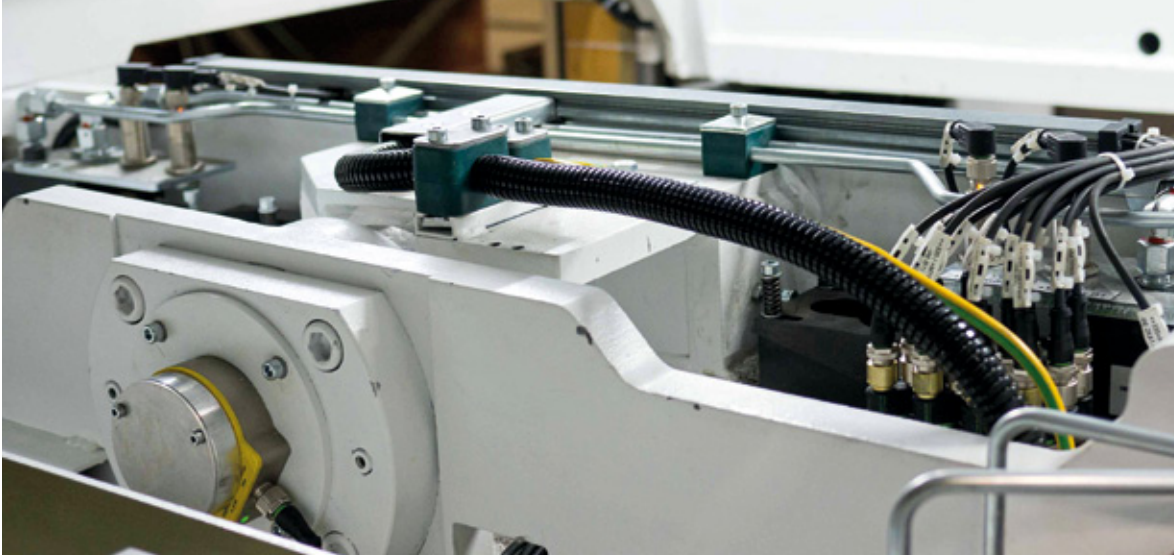
the few manufacturers of core shooters worldwide. The machines produce sand cores for metal casting. If, for example, the casting of an engine block is required, cores are placed inside the casting mold to later produce the cavities of the engine. The cores are “shot” from a binder sand mixture with compressed air into a mold – the core box – at a high speed between 0.3 and 0.5 seconds. The mold mixture is then hardened in the closed core box using process gas or heat and can then be removed. After casting, the binder loses its hardness due to the heat from the filled melt. The cores disintegrate, the sand can be removed from the cast, leaving behind the required internal contour.

A key objective of core shooter manufacturers here is short cycle times. The molding plants installed downstream of the core manufacturing process “swallow up” the cores in 15 second cycles.

Trailblazers in inorganic core production

However, not only the cycle time is critical for modern core shooter machinery. The foundry industry has recognized that foundries will only have a future if





Three into one: Intelligent IO-Link field devices like the QR24 encoder are fitted with a standard cable instead of two bus cables and one power supply

their production is environmentally friendly and meets the more stringent work safety requirements in place. The organic binding agents that are widely used for the sand are burnt during the casting process and emit waste gases that are environmentally harmful and a health hazard. These gases in turn have to be treated using complex filter and extraction technology. The company has extensively pushed the development of a "white foundry" for the manufacture of cores using inorganic binding agents. The improved environmental compatibility and other benefits resulting from these binding agents, however, also present the core production and the downstream processes with several challenges. Laempe Mössner Sinto was the first manufacturer to develop the process from the theoretical solution to a viable industrial process for large-scale use.

The new LHL machine generation is an innovation leap in three ways. Besides the ability to use inorganic binder systems, it is equipped with a highly energy efficient hydraulic system which achieves energy savings of up to 60 percent. With a machine cycle time of only 13.8 seconds on the LHL30, the machine series also sets a benchmark in terms of productivity and efficiency. Machines in this series come in a range of sizes with shoot volumes of 30 to 300 liters.

IO-Link eliminates many disadvantages

It is also an absolute innovation in terms of its automation. "We have incorporated many intelligent components in our machines, which before normally had a bus connection. This meant that we had to connect the operating voltage and two bus lines individually to a positioning system. All three lines were run on drag chains and were consequently put under severe stress," Lipsdorf describes the previous wiring. "If you didn't have any advanced diagnostics systems in Profibus, you could take a really long time to locate a cable break," adds electrical planner Klavehn.

IO-Link rectifies many of these disadvantages: the two bus lines plus power supply are replaced with a standard three-wire cable which is run in the drag chains of the LHL30. "The savings in cost here enable us to use a very high quality cable," Klavehn says. A cable break is virtually excluded and even if it does occur, diagnostics with IO-Link is easy.

All intelligent analog sensors and devices now have an IO-Link interface and are connected to the PLC via an IO-Link master, while simple proximity switches and digital actuators are connected via IO-Link-capable hubs. Sixteen switch signals can be connected via a standard three-wire cable, which keeps wiring effort down to a minimum and also enables the implementation of basic diagnostics for the proximity switches. The planners also replaced some proximity switches with analog positioning systems. "With the new LHL30, we tested everything and no longer measured the end positions but the complete axes. This has thus enabled us to now produce a core shooter for Industry 4.0," Andre Klavehn reports, "even if I am quite skeptical about this buzz word."

End position detection problematic

The upper part of the core box on the core shooter can be swung 90 degrees out from its production position to a maintenance position. Depending on the binding process, the design of the core box and the contour of the core, this may be necessary several times an hour in order to check the core box for any residue and clean it. The swing movement was previously detected with end position switches. To increase the speed of the swing movement in other machine types, two additional proximity switches had been installed to



»In many areas IO-Link means the end of fieldbus systems.«

Tobias Lipsdorf,
Laempe Mössner Sinto

QUICK READ

When the foundry machinery manufacturer Laempe Mössner Sinto planned the new LHL machine series, it decided to implement the entire automation for this with IO-Link. This produces several benefits: Besides costs, the manufacturer also saves the time required for the installation, wiring and electrical planning, whilst customers benefit from a more dynamic and faster machine. Faults occur less often and can be diagnosed and rectified more easily. The swing movement of the core box carrier has a major influence on the cycle time of the machine, and this can now be measured by Turck's QR24-IOL contactless IO-Link encoder.

»Turck's QR24 encoder met all our requirements and successfully passed all our tests, so that we no longer had to look any further«

Andre Klavehn | Laempe Mössner Sinto



perform the rapid/creep speed switchover before the end positions are reached. This solution wasn't without its problems, as Lipsdorf explains: "Even if we only detected the end positions, it was difficult to find a suitable point for mounting the sensors. In order to detect the exact position, the design required us to fit initiators on the outside. However, the available mounting space for the required holders was limited. With four initiators this is even more difficult because space also had to be found for the two additional ones. Furthermore, in the harsh operating environment of the core shooter, each additional sensor is a potential fault source."

IO-Link encoder detects swing of upper core box

The solution was to detect the entire swing movement. If the rotation movement was detected at the axis of rotation, one bearing point for mounting the encoder was guaranteed, without the need for any additional supports. "For this we looked for an encoder which was as robust as possible, i.e. with a contactless operation, and which had an IO-Link output. Turck's QR24 encoder met all our requirements and successfully passed all our tests, so that we no longer had to look any further," Andre Klavehn describes the fast product selection process.

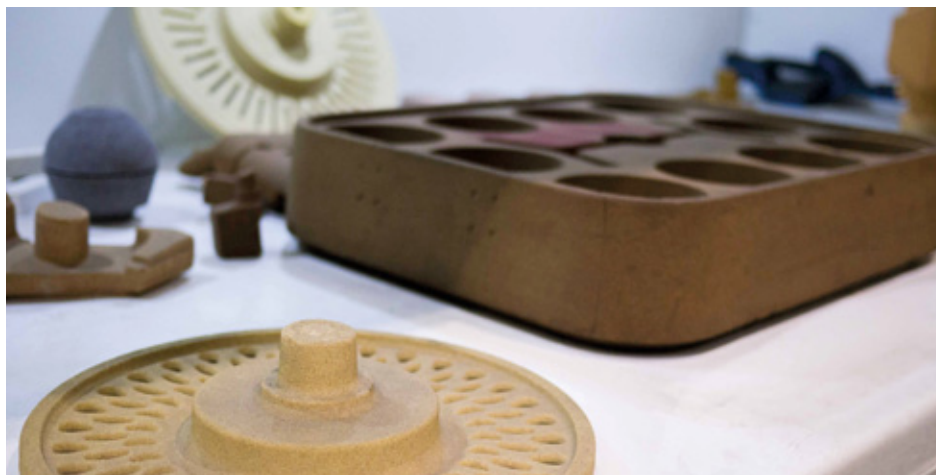
Turck's QR24 single-turn encoder operates with a measuring principle based on an innovative resonance coupling, which does not require the use of magnetic positioning elements. Thanks to the completely

contactless operating principle, the robust sensors are both maintenance-free and wear-free, as well as offering outstanding reproducibility, resolution and linearity over a large temperature range. The QR24-IOL variant is the first contactless encoder with an IO-Link output. Previous IO-Link encoders only used the technology for setting parameters. If IO-Link is also used as a data interface, the user can make some effective cost savings, as is the case here. Expensive shielded or twisted pair cables, as required for conventional analog signal transmission, become a thing of the past. IO-Link works reliably with inexpensive standard three-wire cables.

Besides the cost saving benefit, the QR24-IOL boasts some clever parameter options. The user can select the zero point as required and does not have to make any compromises in mounting and commissioning. The device also enables predictive maintenance. Besides the 16 bits which are output as a position signal, the encoder also transmits 3 bytes of status information. These increase the diagnostic coverage and indicate whether the positioning element is measuring correctly or not, or is being operated in the border area. This information can also be provided early on via the controller, if blows or shocks have caused the encoder or positioning element to become loose prematurely – and before a signal failure occurs. LEDs directly on the encoder show this information as well and simplify diagnostics in the field and the correct mounting of the positioning element.



The WLS-28 dimmable LED machine light from the Turck portfolio is also connected with standard M12 connectors



The core shooters from Laempe Mössner Sinto produce different sand cores for metal casting

The 16-bit resolution of the QR24 encoder and the 1 kilohertz scanning of the angle signal were more than enough for the requirements of this application. As IO-Link does not transmit any overhead, the message reaches the controller in time without any real-time capability needed. The encoder is also provided with a data storage option thanks to IO-Link version 1.1. This enables parameter sets, in this case the zero point and orientation of the signal, to be stored in the IO-Link master and simply reloaded if the device is replaced.

IO-Link simplifies setup and wiring

The detection of the swing movement over the entire distance is already a major benefit when the machines are set up. Lipsdorf has programmed the controller to convert the degree data from the encoder into millimeter position information of the outer movement. This is useful when setting up the machine, if the move to the production position has to be performed from the controller. Instead of running long trial and error movements, the path covered can be controlled directly. The wiring of the entire machine couldn't be easier. "Previously, the electricians sat with the tools on the machine, shortened Profibus cables and fitted the shield manually according to the situation. With IO-Link we only had one large materials trolley with straight and angled M12 cables in different lengths. "That was it," Lipsdorf compares the situation with and without IO-Link.

For the customer it's not only the cycle times that are critical but also the times for cleaning, tool changing and quality assurance processes. This requires the core box to be swung out, which is now considerably faster thanks to the detection of the rotary movement. Another benefit occurs with basic cleaning, maintenance or repair: if cables or connectors are loose or damaged, the machine operator can quickly detect at switch-on whether the sensors are operating fault-free. Through the automatically generated error message, the operator knows immediately whether there is an electrical or mechanical problem and can inform the right specialist. When the swing of the core box was detected with end position switches, it was not always clear whether the core box carrier was located

between the end positions, whether the connector of the sensor was loose, whether there was a wire break or whether the switch was damaged. The signal in the controller was zero in all cases. The indicated fault could have several causes.

Neither is the encoder solution expensive in terms of cost. If you compare the cost of four proximity switches with their associated cables and mounting requirements with an encoder with IO-Link, the overall cost of the encoder is less expensive. Compared to the encoders with a bus connection, the IO-Link variant is less expensive anyway.

Faster engineering

The customer recognizes the benefits of IO-Link and now aims to use the interface in the upstream mixing plants and downstream robot cells which Laempe also produces. Although this may sound like work for the PLC programmer, Lipsdorf puts the programming effort involved with IO-Link into context: "Actually everything is much faster now. I no longer have to program two pages as I manage entirely without any additional components and processing units. Apart from three analog sensors with signals we have to convert for the IO-Link master, we only have IO-Link devices in use, which go directly to the IO-Link master on the controller. I no longer need a conventional electrical plan. Nowadays, I just need a table to program a machine. I no longer have to see which signal types are sent in which signal range since the specifications of the devices used are enough."

Conclusion

The intelligent IO-Link interface has found two enthusiastic champions in Tobias Lipsdorf and Andre Klavehn. The initial enthusiasm for new solutions often decreases in time, but after delivering the new generation of LHL30 machinery the two colleagues are certain: "IO-Link is the only new system to date, in which we simply cannot see any disadvantages."

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Date	Trade Show	City, Country
25.04. – 29.04.2016	Hannover Messe	Hanover, Germany
03.05. – 05.05.2016	RFID Live	Orlando, USA
10.05. – 12.05.2016	Smart Automation Austria	Vienna, Austria
10.05. – 13.05.2016	Elmia Automation	Jönköping, Sweden
11.05. – 13.05.2016	Industrial Automation	Beijing, China
17.05. – 20.05.2016	Expo Pack	Mexico City, Mexico
24.05. – 26.05.2016	SPS IPC Drives Italia	Parma, Italy
31.05. – 02.06.2016	Eliaden	Lillestrøm, Norway
12.07. – 14.07.2016	Semicon	San Francisco, USA
06.09. – 08.09.2016	Sindex	Bern, Switzerland
12.09. – 17.09.2016	IMTS	Chicago, USA
13.09. – 15.09.2016	Automatik	Brøndby, Denmark
03.10. – 07.10.2016	MSV	Brno, Czech Republic
04.10. – 07.10.2016	World of Technology & Science	Utrecht, Netherlands
25.10. – 28.10.2016	12 Seminario Internacional de Minería	Hermosillo, Mexico
01.11. – 05.11.2016	China International Industry Fair	Shanghai, China
06.11. – 09.11.2016	Pack Expo	Chicago, USA
07.11. – 10.11.2016	Adipec	Abu Dhabi, United Arab Emirates
16.11. – 18.11.2016	Fabtech	Las Vegas, USA
16.11. – 19.11.2016	Metalex	Bangkok, Thailand
22.11. – 24.11.2016	SPS IPC Drives	Nuremberg, Germany
23.11. – 26.11.2016	EMAF	Porto, Portugal
30.11. – 03.12.2016	Machine Tool Indonesia	Jakarta, Indonesia
08.12. – 10.12.2016	Elektro Vakbeurs	Hardenberg, Netherlands
08.12. – 10.12.2016	New Industries	Gorinchem, Netherlands

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