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Multi-Resistant

The wear-free Ri360-QR20 miniature encoder with IP68/69K protection is specially designed for use in mobile equipment

Cabinet Guard

Whether for Industry 4.0, condition monitoring or IT security – the IM12-CCM reliably monitors control cabinets and enclosures

Safety Service

Special machine manufacturer Kirschenhofer guarantees safe tool changes with RFID and ultra-compact I/O modules

Everything Ship Shape

On the super yacht Limitless, the TBEN block I/O modules with IP69K protection provide reliable Ethernet/IP communication

»We're Showing What's Possible«

Industry 4.0 and integrated industry will once more be the leading topics at the fair stands in Hannover – and this also goes for Turck. In our live "Industry 4.0 wins" exhibit we are showing the possible interplay between smart automation components – from the sensor to robust I/O modules in IP67 and controllers right through to data storage in the cloud.

By the way: At www.turck.de/cloud you can access the current status of our trade fair machines and the machine data from any location in the world. As soon as the machine is started up in Hannover, the actual data will be available on the web. You can even send a command to the machine: You can use the command button to control a light in different colors.

With the live exhibit we're showing what's possible. It's up to you and ultimately your customers to decide what is really useful and generates benefits. Turck supports you with its core expertise and supplies solutions for acquiring, transferring, and conditioning data – from the sensor to the connection technology right through to the fieldbus and control technology.

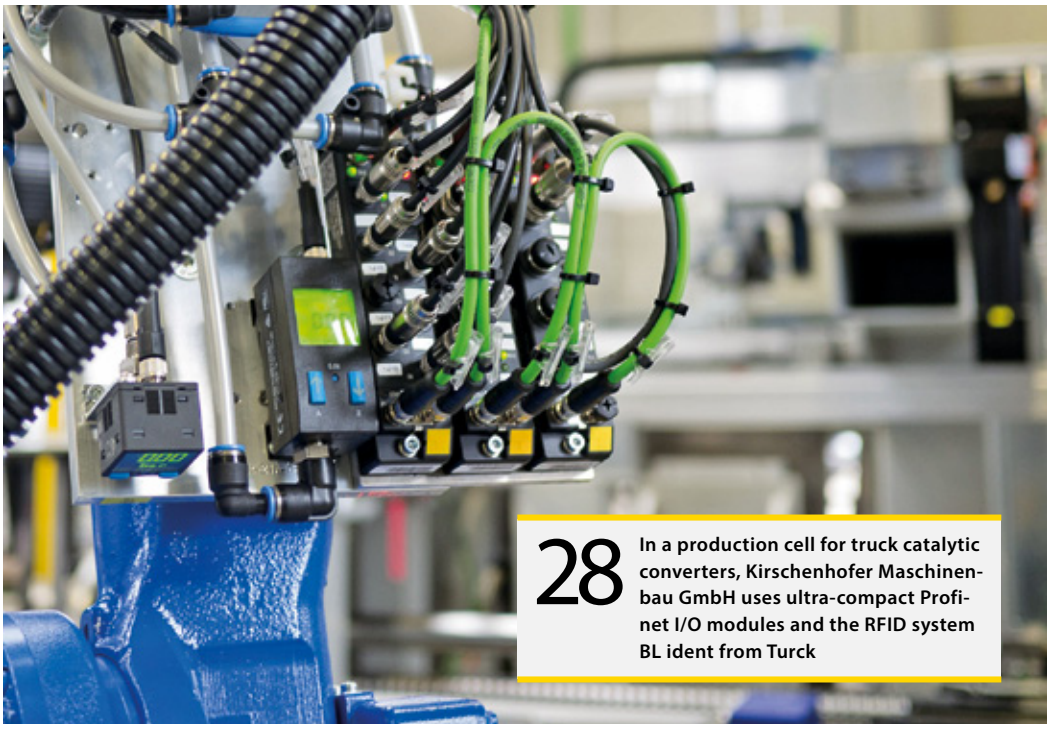
However, Turck not only develops innovations for the smart factory, such as the smart IM12-CCM cabinet guard (from page 18), but also application-focused solutions developed in close collaboration with customers, which generate direct additional value. This is what happened with the Ri360-QR20 miniature encoder, which offers reliable protection for the shaft and positioning element with its brand new design principle. More on this fair highlight can be found in the title story on page 8. We have put together information on other new products on the following news pages.

We look forward to talking with you about your requirements for efficient automation. Visit us at fair stand H55 in Hall 9 or contact your Turck sales specialist.

Yours sincerely

Christian Wolf, Managing Director

Content



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ARGEE Awarded

Turck›s ARGEE programming environment has been awarded 2nd place at the 2016 Automation Award in the "Control technology & system solutions" section. After a specialist jury made up from all competitors drew up a top 5 shortlist, the visitors to the SPS IPC Drives 2016 were able to vote for their favorites. ARGEE 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. It simply requires a Windows PC with a web browser such as Chrome or Firefox. Thanks to Turck's multiprotocol Ethernet, modules pre-programmed in this way can be used in Profinet, Ethernet/IP or Modbus TCP networks. Simple requirements can also be implemented on the Turck block I/O modules completely autonomously with ARGEE. Programming couldn›t be easier. In

Simple mode, which is like a ladder diagram editor, drop-down fields provide the means by which inputs and outputs can be linked with Boolean operators and actions. This makes it therefore possible to program basic functions without any knowledge of a programming language. Professional mode makes the entire range of functions available, which can also be used, for example, to implement sequential function charts.

Miniature Encoder for Mobile Equipment

Turck's compact and wear-free Ri360-QR20 miniature encoder is especially designed for use in mobile machinery. The new encoder series with IP68/IP69K protection exceeds the e1/E1 requirements and comes in a compact 71 x 64 x 20 mm housing. It is based on the contactless resonator measuring principle like its "big brother", the QR24. The key feature: the housing fully surrounds the positioning element and provides it with full protection from the outside. Alternatively, the positioning element can also be positioned above the sensor. This design principle not only reduces the planning work for the designer, but also offers mechanical protection, as well as protection from dust and moisture. The housing is also permanently sealed.

more info on page 8

Sensors for Safety Applications up to SIL3/PL e

More than 350 SIL2 certified inductive, capacitive and magnetic field sensors from the Turck range are now also certified for SIL3 and PL e. This enables these functionally safe sensors to also be used in redundant configurations for high demand applications in safety circuits up to SIL3 according to IEC 61508 and PL e according to ISO 13849-1. In low demand applications the sensors comply with SIL1 or SIL2 and PL c in single-channel configurations. Turck safety sensors are built according to the Namur standard and designed as intrinsically safe equipment. Together with Turck's IMX12 interface series, applications up to SIL2 can also be implemented in explosion-proof areas. Safety manuals can be obtained from the product database on the Turck website.

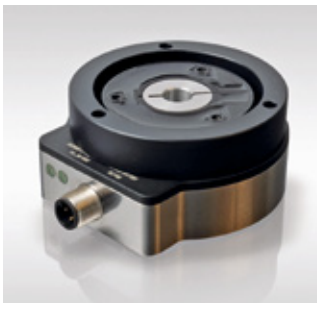
Condition Monitoring

Turck is showcasing the IM12-CCM cabinet guard at the Hannover Messe. The device detects incorrectly closed doors as well as the exceeding of moisture and temperature limits. It also detects unauthorized access to switch cabinets, thus providing protection against manipulation in compliance with IT security regulations. The slim 12.5 mm DIN-rail device can also be installed easily in existing switch cabinets. The IM12-CCM features an internal data logger with time stamp and stores data for up to two years. This enables users to also detect creeping changes over long periods and rectify the cause. An interface enables two cabinet guards to be operated in master-slave mode in order to monitor correct door closing and the other limit values simultaneously at two points in the control cabinet. The master processes the data of the slave and sends a signal to the controller. The standard IM12-CCM comes with two switch contacts and an IO-Link interface. More information on page 18.

Compact Ultrasonic Sensor with IO-Link

Turck has added a variant with an IO-Link output to its basic "Compact" series of ultrasonic sensors. The switch point is taught via IO-Link or via a teach adapter as before. Besides the known benefits of IO-Link, such as inexpensive wiring, intelligent data retention or predictive maintenance, the sensor offers a special mute function feature. This enables the selective switching on or off of the sonic transducer via the IO-Link master. This simplifies the synchronized or staggered operation (multiplex) of several sensors via the controller. Synchronous or multiplex operation was previously only possible by using complex wiring solutions. The compact RU-U sensors with IO-Link are available as diffuse mode or retroreflective sensors in the M18 housing in straight or angled designs with ranges of 40 and 100 cm.

Stainless Steel Encoders with IO-Link



Released in June: a variant with an IO-Link interface will complete Turck's portfolio of wear-free stainless steel encoders. The robust stainless steel variants of the contactless QR24 inductive encoder series are specially designed for operation in applications with particular requirements for cleaning or for extreme environmental conditions, such as in the food and beverage industry. The EQR24 series consists of models with SSI, incremental, analog and IO-Link outputs. With a V4A stainless steel housing (1.4404) and an active face made from PA12-GF30 plastic the device can withstand even the harshest chemicals and pressures in the cleaning process. As with all QR24 models, the sensor and positioning element are fully potted and cast as two totally sealed independent units that can withstand any vibration or shocks of the shaft. Wear-intensive ball bearings or seals which lead to machine downtimes are not required.

Hybrid Safety I/O Module for EtherNet/IP and CIP Safety

Turck's TBIP offers another hybrid safety block I/O module that combines standard and safety outputs in a single device – in this case for Ethernet/IP and CIP Safety. The TBPN model for Profinet/Profisafe is already available. Both IP67 hybrid modules can be adapted flexibly to the actual signal requirements in the machine and also operated as a remote safety controller. The safety functions can also be configured and tested without being connected to the subsequent safety PLC. The high IP65/IP67/IP69K degrees of protection allow use in the most demanding environments. Decentralized plants and modular machine concepts can also be implemented without the need for any additional control cabinets. On the safety side the hybrid modules offer two safety inputs for connecting safety sensors such as light curtains or emergency-stop buttons. Two additional safety channels can be used either as inputs or outputs. The four universal inputs/outputs for connecting non-safety-related signals can switch up to 2 A. Two of the I/Os can also be connected as IO-Link masters.

Joint Venture in Asia

As part of their internationalization strategy, Turck and Banner have joined forces to create their first Asian joint venture in Singapore. Both companies are partly involved in the new Turck Banner Singapore Pte Ltd. The joint venture as regional hub of the ASEAN region (Association of South East Asian Nations) shall further develop the Southeast Asian markets and accelerate growth in the region. In addition, Singapore will be established as a regional training center. The joint venture is based in the German Centre in Singapore. It is headed by Chuck (Chol Seung) Choi, who was previously Managing Director of Turck Korea. The existing Turck team in Singapore is being supplemented by four Banner employees.

Ultrasonics with Analog and Switching Output

Besides the "High-End" line, Turck's "Standard" line of RU ultrasonic sensors are now also available with an analog output. As well as the analog output, the new sensor also offers a special switching output, with a switching range that always follows the set measuring range limits of the analog output. Customers who occasionally only require one ultrasonic sensor with a switching output can thus effectively reduce the number of device variants to be kept in stock. The sensor is factory set for an output signal of 0…10 V or 4…20 mA over the entire measuring range. The measuring range can be set individually.

Sensor and RFID Tag in One

For interested customers, Turck can develop and produce application-specific RFID tags with an integrated sensor function. The sensor tags record and store process values such as temperature or pressure in moving components. The sensor element can be replaced and can also be used to measure humidity, magnetic fields, read contacts or inductive sensors. The sensor tags are supplied with power and read via an HF-RFID read/write head. Even the data recording without contact to the read/write head is possible using a separate energy source. The measuring cycles can be run and recorded over several hours. Turck's sensor tags are suitable, both for applications in which measuring values or other data have to be monitored and stored without contact, as well as for use on moving elements that previously had to be connected with slip ring solutions.

VE Smart Camera for Demanding Applications

Turck is presenting the new VE Smart Camera generation from Banner Engineering, its optoelectronics partners. With the VE Smart Camera it was possible to combine the intuitive operability of the iVu vision sensor with the performance of the previous P4 camera system. The free Vision Manager software also provides several powerful image processing tools. It also makes it possible to modify inspection parameters during ongoing operation and thus avoid costly downtimes during production. When used with the optional lens cover, the robust metal housing of the camera meets degree of protection IP67. The two line display with push-buttons enables the user to make product changes during operation and rectify any faults directly at the device. The display also shows information such as the IP address or the set data speed.

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Conventional encoders are often no match for the harsh operating environments that occur in the field of mobile machinery. Shock, temperature change as well as humidity and moisture considerably limit the lifetime of the devices used. To remedy this situation, Turck has now also implemented on the new and compact QR20 series the contactless resonant circuit measuring principle that was used on the contactless encoders of the QR24 series. The QR20 encoders with IP68/69K protection were specially developed to meet the requirements of mobile machinery.

Multi-Resistant

The compact and wear-free Ri360-QR20 miniature encoder from Turck, with contactless resonant circuit measuring and IP68/69K protection, is especially designed for use in mobile machinery

Virtually every sector has its special features. In the food sector, joints and cracks are considered undesirable as they tend to accumulate dirt. In the automotive sector technical components also have to be able to withstand the occasional exposure to weld spatter and must not be disturbed by electromagnetic interference. The mobile equipment sector likewise places very special requirements on the automation used.

For example, EMC requirements are particularly demanding in the field of mobile equipment. Vehicle electrical systems are normally designed for low voltages and have voltage fluctuations which should have no effect on the signals of a sensor. As a result, an extended operating voltage range of 8 to 30 VDC and the so-called load-dump protection are widely used. Components for mobile equipment also have to be particularly mechanically robust. Diesel engines and work units on concrete mixers, wheel loaders or other mobile machinery are a source of intense vibration and shock. Fully encapsulated technical components protect the electronics in these applications from electrical disturbance.

Standard encoders are often unable to cope

The degree of robustness required in the mobile equipment sector presents several problems for virtually all encoders. Design factors require virtually all sensor types and measuring principles to involve the direct linking of rotation axis and sensor – regardless of whether potentiometric encoders, optical systems or Hall encoders are used. This means that vibrations or shocks are transferred via the shaft to the encoder, so that it is put under stress until it finally fails. Besides the vibrations, penetrating dirt and humidity also present possible problems that may likewise ultimately lead to the failure of the encoder.

Turck has solved many of these challenges for years with the contactless encoders of the Ri360-QR24 series and the contactless Ri360-QR14 angle sensor. Due to the special resonant circuit measuring principle used, these devices are not only absolutely wear-free, but also highly resolved and vibration-resistant as well as providing lasting protection to IP68/69K. This measuring principle makes it possible to design a fully encapsulated sensor housing without seals that is separated

The QR20 is available with Deutsch, AMP or M12 plug connectors, as well as with open ended cables

from the positioning element. The possibility of dust or water penetrating into the electronics is fully excluded – even when condensation is present. The encoder can compensate for vibrations and movement of up to 1 millimeter.

While the QR24 has been tried and tested in several applications in factory automation, it was only used in individual cases in the mobile equipment sector. In this area of application it is often too big for the very restricted spaces involved. Only the CAN bus variant is used here. Customers in this sector more often use the smaller QR14. However, it is not a conventional encoder in terms of its resolution, accuracy and speed, and so it is also considered as an angle sensor.

QR20 closes the gap

Turck closes the gap between both products with the Ri360-QR20. The new encoder series provides virtually the same level of performance as its "big brother" the QR24, but comes in a compact 71 x 64 x 20 mm housing that is designed for the mobile equipment market. The key feature: The housing fully surrounds the position-

A mounting option in which the positioning element is protected by the housing is a real breakthrough in contactless measurement technology. The sensor protects the positioning element so that complex auxiliary structures are no longer necessary.

Compact and robust: Turck's contactless Ri360-QR20 encoder fully covers the internal positioning element

ing element and thus provides it with full protection from the outside. A cylindrical recess in the cube-shaped housing provides sufficient space for the positioning element – without requiring a mechanical connection to it. This new principle offers a high level of mounting flexibility and easy mounting as well as maximum device protection. This not only reduces the planning work for the designer but also offers mechanical protection as well as protection from dust and moisture, as no protruding parts have to be taken into account. The housing is also permanently sealed. Even the often problematic potential points of leakage such as LED lenses are eliminated since the QR20 uses a transient plastic at these points, through which the internal LED shines. Even the capillary penetration of water in this fully encapsulated housing from one piece is impossible.

The encoder is not only precisely tailored to the requirements of the mobile equipment market in terms of design but also electrically. This is underlined, for example, with an EMC immunity of 100 V/m, which is also required for the standard market E1 certification. The encoder is also protected from line-conducted interference according to DIN ISO 7637-2 or SAE J113-11. Salt spray or rapid temperature changes, as well as diesel, kerosene or vibrations have no effect on the device. With an operating temperature range from -40 to + 85 °C there are virtually no climatic conditions that could be critical for the QR20.

Ready for everything

With a 12-bit resolution, corresponding to around 0.09 degrees, the Ri360-QR20 offers a degree of accuracy that is sufficient for most applications on the market. The output signal ranges from 0.5 to 4.5 VDC (LU4). If the sensor does not detect a positioning element, the value jumps to 5 volts, clearly indicating an incorrect measurement that can be distinguished clearly from a cable break. The user can choose between four connection types: Deutsch plug connectors, AMP plug connectors, M12 plug connectors or open ended cables. The positioning element supplied with the device allows versatile connection to different shaft diameters. With the new QR20 encoder Turck customers can choose between seven preset angle variants: These are 20°, 40°, 60°, 90°, 120° and 240° as well as 360°.

Applications

As in many other cases, Turck has also closely worked together with customers on the development of the QR20, such as in the field of agricultural machinery. The device is ideally suited for operation in agricultural machinery, such as on a field sprayer. On this machine the encoder can detect the extension of the sprayer arm. Previously, Turck's smaller QR14 was used here, but this did not provide the possibility of flush mounting the positioning element. Many customers therefore mount guards over the encoders where it is necessary. Whoever wishes to avoid this in future will find the RI360-QR20 to be the right alternative.

In another project, a supplier of gear motors worked closely together with Turck. The supplier is now fitting its gear motors with the RI360-QR20 in series production for detecting the currently selected gear. To do this the encoder detects the particular rotation angle between 0 and 320° which determines the current gear.

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More Info | www.turck.com/qr20
Webcode | more21700e

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Dr. Grimm, Industry 4.0 was also a major topic at the Interpack 2017 trade fair. Is the relevance of this subject also reflected in the market?
Industry 4.0 or the Internet of Things is increasingly more often becoming the subject of discussion with customers. However, it has to be said that we have already been talking about the issues involved in these subjects before they were given their names. This is ultimately not a real revolution in my view but rather an evolutionary process. Particularly in the packaging industry, the maximum flexibility of machinery and plants was always a major objective on which the automation experts have been working. If we now also add the possibilities of IT, the Industry 4.0 scenario is perfect.

What in your view is the "Industry 4.0 scenario"?
In Turck's view, Industry 4.0 stands for the "individualization of highly flexible production with the maximum integration of all participants (customers, business partners etc.) in the value creation and business processes". Put simply, "Flexible manufacturing up to batch size 1 in line with the conditions for a highly automated series production". This requires all the relevant data to be available at any time at any required location.

What is Turck's contribution?
As specialists in sensor and fieldbus technology, as well as in RFID, we generate the data, the lifeblood for Industry 4.0 so to speak, and make this available. We support our customers with their tasks by implementing solutions for acquiring, treating and transferring the relevant production data. We use international standards as a basis here and support key technologies with our products, such as RFID, IO-Link, OPC UA or Ethernet. A good example is a pilot project for the serialization of pharmaceutical packaging, which Turck implemented in Korea.

What was involved in the project?
The pilot project, which we implemented two years ago with other partners for the South Korean pharmaceutical manufacturer Daewon Pharm, is an excellent example of automated serialization for pharmaceutical products. This requires the comprehensive availability of the data in addition to identification with RFID or barcodes. This has to be available in a network, which in the final expansion stage runs through the entire production and distribu-

»Data is the "Lifeblood" of Industry 4.0«

"At our fair stand E09 in Hall 6 we are focusing on the topic of track & trace", says Dr. Bernhard Grimm

Dr. Bernhard Grimm | Director Vertical Marketing

In an interview with Kathrin Veigel, editor in chief of the magazine P&A, Dr. Bernhard Grimm explains Turck's contribution to industry 4.0 in the packaging industry and the highlights of Turck and Banner at the Interpack show

tion chain. Serialization is currently implemented right up to the storing of the drugs in the Daewon warehouse. In the final expansion stage, it is also possible for wholesalers and each individual drug store to be incorporated in the system and the data cloud.

What was Turck's task in the pilot project?
Turck Korea was responsible for the entire automation section and developed and constructed complete machines in order to print, affix, check and read the necessary barcodes and RFID tags to different standard packs. These machines, integrated labeling machines, and the so-called Turck/Hamni RFID bulk reading machines communicate with a system, in which the production and packaging processes are displayed. We were able to use a large number of products from our portfolio for the machines: besides inductive sensors, cordsets, power supply units, HMI controllers and fieldbus gateways, the installation also included some products from Banner Engineering, our optical sensor partners, such as photoelectric sensors, emergency buttons, as well as cameras and vision sensors.

How does the serialization process work at Daewon?
The drug packages are provided 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 later control of several packages and larger cartons is carried out in an RFID bulk reading machine, which can read the entire content of a carton in a bulk read operation – up to 500 individual tags. The identification of multiple cartons on a pallet is then implemented using RFID tags. All read devices are connected to computers via Ethernet connections, which always access the real-time data of the pharmaceutical products via the central data cloud and ensure the continuous assignment of data. This end-to-end identification runs right through to the shipment to the drug store and the sale to the customers.

Are there any other example applications?
Besides these smart packages, there are other good examples of how Industry 4.0 has been implemented. One example is used in chocolate production. Six years ago, we already developed an RFID-based cross-vendor solution that optimizes the production process. For this all molds are fitted with RFID tags. Different machines, such as molding machines or cleaning machines read these tags and can be controlled individually by each mold. This ultimately leads to flexible production and thus considerably reduced product change times and increased product quality, since faulty or old molds can be detected immediately and removed.

What is Turck showing at the Interpack?
Together with our partner Banner Engineering, we are showing fair visitors the possibilities that identification technologies, either RFID or optical identification, have to offer, and how we can support our customers here. At our fair stand E09 in Hall 6 we are focusing on the topic of track & trace. Using small goods carriers fitted with RFID tags and filled with different chocolate bars, we are illustrating what production control can look like with RFID. The customer selects a particular chocolate configuration and has it written on the tags. At a second station the slabs of chocolate are then removed by a camera-controlled vibrating table and placed on the appropriate goods carrier according to the selected configuration. This exhibit also shows the acquisition and display of different diagnostic data. This example is only one of many. We are showing how our intelligent fieldbus stations and controllers can help to modularize machines as well as innovative solutions for personnel safety at machines.

Author | Kathrin Veigel, Editor in Chief of the technical journal P&A, conducted this interview
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The TBEN-L-PLC can form the bridge between Ethernet and CANopen with its various master and device interfaces

Robust and Talented Linguist with Brains

The TBEN-L-PLC IP69K compact PLC is a protocol converter that translates between CANopen or SAE J1939 and various Ethernet and fieldbus protocols

Decentralized I/O solutions in themselves are nothing new, but are becoming increasingly more important in the light of modern automation and machine concepts, which increasingly have a modular design. The trend is moving away from the control cabinet and towards installation in the field. The use of robust I/O technology with protection to IP67 enables users to run the cables of the sensors directly in the field to a nearby I/O distributor, which can route the signals to the control cabinet, either as a passive multipole cable junction or

In the mobile equipment sector, the compact PLC ensures optimum use thanks to its robust, fully encapsulated housing, protection to IP69K and its extended temperature range

actively as a fieldbus device. Compared to point-to-point wiring, this saves the user considerable costs for the connection technology and the wiring. There is also a time saving benefit when the machine is set up at the customer. Instead of running several individual cables to the control cabinet, it is normally only necessary with fieldbus or Ethernet systems to run one communication cable and power supply in order to connect the I/O level to the controller. The wiring of the periphery to the remote I/O technology can then be done in advance at the machine builder.

High performance

Turck takes the decentralization from the control cabinet to the field one step further. The TBEN-L-PLC Codesys-3 controller of the Mülheim automation specialist is a compact IP67 controller for use directly in the field. When used as a master, the device also supports Modbus RTU, in addition to CANopen and SAE J1939, as well as the industrial Ethernet protocols Profinet, EtherNet/IP and Modbus TCP. The RS232 and RS485 serial interfaces can also be used as required in Codesys. The block I/O controller also offers eight universal I/O channels for the direct connection of sensors and actuators.

The TBEN-PLC can also be run as a slave (e.g. device) in the CANopen and Modbus RTU networks as well as in the three supported industrial Ethernet networks, enabling it to be used as a protocol converter. For example, the controller can operate as the CANopen manager of a machine module networked with CANopen and connect this module to a system running with Profinet. As part of the increasing digitization of industrial production processes, this enables existing machine concepts to be made fit for the challenges of closely networked, highly flexible production. Turck is providing an answer to the question of how existing machinery and plants can benefit from the increased efficiency and increased transparency as part of the evolution of Industry 4.0.

TBEN-L-PLC as protocol converter for CANopen

This is particularly of benefit to plant operators wishing to connect their plants and machinery to higher-level ERP or MES systems and wish to network their machines to Industrial Ethernet. Networking with Ethernet-capable components down to the lowest level of automation is not economically advisable necessarily and is rarely necessary in terms of automation. With the TBEN-L-PLC, existing valve blocks or drives which frequently talk in CANopen can also be used in industrial Ethernet networks. The compact PLC then functions in a Profinet network as a Profinet slave and translates this communication as a CANopen Manager for the CANopen devices in the CAN network.

QUICK READ

The automation sector is currently undergoing a major shakeup of old established practices. The change to digitally networked, highly flexible and transparent industrial production, as described in recent years under the label Industry 4.0, is presenting designers and electrical planners with new tasks. One of the routines of mechanical engineering, and particularly in electrical planning, is the design of a control cabinet for protecting sensitive electrical and electronic equipment such as controllers, power supply units or I/O solutions from the severe conditions present at the machine. With its robust portfolio of IP67/IP69K I/O solutions, Turck is also offering a smart alternative.

Turck offers inclination sensors, rotary encoders like the QR24 in this image and angle sensors with a CAN interface

As CANopen is widely used in the field of drive engineering and pneumatics, this protocol converter option is particularly useful here. In most cases the technical benefits of a completely new installation of drive engineering and pneumatics with industrial Ethernet interfaces mostly does not justify the costs involved in a comprehensive Ethernet network. Many of the components are not at all available with Ethernet interfaces.

Controller for mobile machinery

Besides the protocol converter function, the compact TBEN-L-PLC also allows stand-alone control of complete machines. These can be conventional machines or machine modules, as well as mobile machinery. Thanks to its robust and fully encapsulated housing, the TBEN-L-PLC is particularly suitable for the field of mobile machinery. It is very well protected against vibrations and shock and complies with degree of protection IP65/67/69K. The extended temperature range from -40 to +70 °C and the fully screwed plug-in connections are important features in the field of mobile machinery. The fact that most programmers in the mobile equipment sector master CODESYS makes it ideal for use in this sector.

As an increasing volume of data is being networked with Ethernet, the use of TBEN-L-PLC as a protocol converter can also be helpful here. Particularly when the user wishes to use peripheral devices with a CAN interface which have proved successful in the past or for which there is not yet a counterpart with an Ethernet interface.

The Turck sensors with a CAN interface are often used in the mobile sector. Turck offers its B1N (single axis) and B2N (twin-axis) inclination sensors with CAN bus here. Customers from a wide range of different sectors are purchasing the QR24 rotary encoder as well as the smaller QR14 angle sensor with a CAN interface. Both sensors are fully encapsulated and detect rotary movements without contact.

Besides the block modules of the piconet and BLcompact product families, the BL20 and BL67 modular I/O systems are also available with a CANopen gateway. The modular systems offer outstanding performance, particularly thanks to their flexibility. For example, Turck's BL ident RFID system can also be connected to CANopen via BL20 or BL67 CAN gateways.

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Doorman at the Server Cabinet

Turck's IM12-CCM monitors the relevant ambient variables of control cabinets – regardless of whether in industrial applications or for protecting IT systems at utility companies and infrastructure facilities

Whether in industry, banking or energy supply applications: Control cabinets and protective enclosures can be retrofitted in an instant with the IM12-CCM in order to meet the requirements of the IT security law

On July 2, 2015, the IT security law came into force in Germany with the aim of increasing the security of IT systems. Not only in the IT sector but also in critical infrastructure installations, such as for electricity and water supply, finance, health and food production. The law applies wherever malfunctions or failures may result in dramatic economic, national and social consequences.

The first implementation of the IT security law, which came into force on May 3, 2016, requires compliance from the energy, information technology, telecommunication, water and food sectors. These sectors are primarily required to increase the security of their information technology and forward a message to the responsible authorities in the event of an attack on their IT system. Reporting is mandatory as soon as a company has more than 500,000 consumers. The law here stipulates explicitly that all IT systems that are essential for the functioning of the critical infrastructure must be protected by a minimum level of security standards.

Energy suppliers, water works, water drainage companies, information technology as well as food manufacturers are now required to create a safety concept for their IT systems. Other sectors such as finance, transport, traffic and health will probably be incorporated in 2017. Manipulation protection from direct access to the control level via the control cabinets is an important point in these safety concepts.

Manipulation protection

It is precisely here where Turck's cabinet guards of the CCM family show their strength. Any control cabinet containing instrumentation, as required in the operation of a critical infrastructure, is exposed to a certain degree of risk of manipulation. Any unauthorized person could gain access here to the control level or also switch off the safety systems. The cabinet guards of the CCM series also reliably monitor the closure of the door and can then prevent or indicate any manipulation.

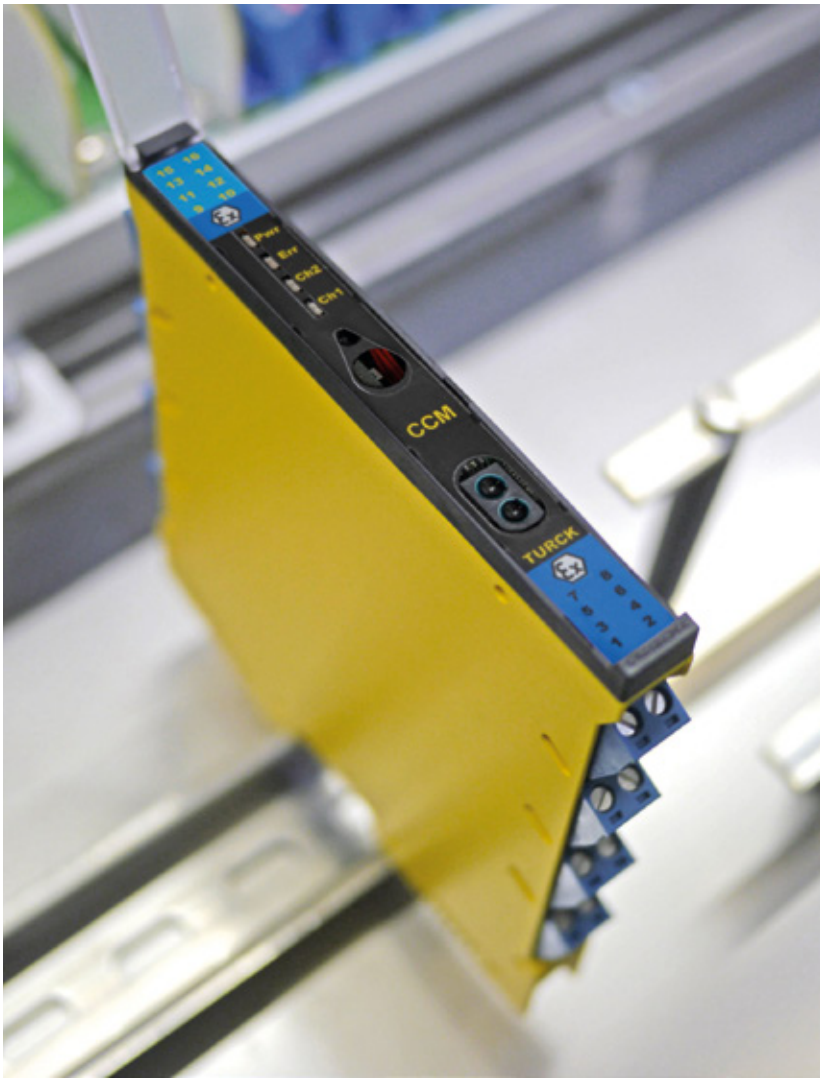
Besides the IMX12-CCM, which was launched a year ago for use in explosion hazardous areas, Turck is now offering a second model, the IM12-CCM, for use in non-Ex areas. Thanks to their slim design, the cabinet guards are easy to retrofit and are difficult to manipulate. The DIN-rail devices can be integrated quickly in existing infrastructure systems. A simple switch contact is enough to indicate an alarm and has a 24 volt power supply.

A certain degree of security can naturally be achieved by simple means, such as with locks or door position switches. However, these solutions are easy to circumvent with very simple means and therefore do not sufficiently meet the requirements of the IT security law. A simple lock, for example, does not offer any direct indication of opening or manipulation.

With an IO-Link interface and master/slave mode, the new member of the CCM cabinet guard series is ideal for factory automation and IT security

QUICK READ

Turck's IM12-CCM cabinet guard can monitor temperature, humidity and the correct door closing in the control cabinets used in the manufacturing industry. The device can be retrofitted easily and reliably offers protection from any manipulation at the control cabinet. This makes also it suitable for protecting IT systems, as required by the IT security law for critical infrastructure facilities.



The IMX12-CCM launched a year ago is primarily designed for use in the Ex area thanks to its intrinsically safe 2-wire isolating transducer interfaces

The IM12-CCM model in particular is suitable for the tasks covered by the IT security law. The device can not only monitor the distance to the door, but also the closure of the door via a connected reed contact. This provides additional security since both security functions can only be defeated simultaneously with great difficult. Besides the door closure, the IM12-CCM and its counterpart for the Ex area also monitor humidity and the temperature in the control cabinet. They also indicate to the controller with a simple switch signal the exceeding of taught limit values.

With larger control cabinets, one location is not enough for monitoring. This applies both to door closure as well as temperature monitoring, since the temperature in the control cabinet can develop unevenly. In this case, the use of two devices is recommended. In order to avoid having to use several input channels in a PLC, it is possible to operate two IM12-CCM devices via an interface in master-slave mode. In this case, the master operates as the data collector of the slave and processes the data to determine the limit values.

Which cabinet guard is the right one?

As the IM12-CCM model is not designed for the Ex-area, unlike the IMX12- CCM model, it can be supplied with 10 to 30 VDC and is equipped with different interfaces. The new device is provided with an IO-Link interface for setting parameters. The IO-Link channel enables all process parameters to be read as measured values. They are then processed via an IO-Link master such as TBEN and Profinet/Profibus in the higher-level system. As with the IMX12-CCM, FDT software such as Pactware can be used alternatively for setting the parameters.

Both devices are equipped with an internal data logger. Thanks to its integrated real-time clock, the IM12-CCM can even store the data with a time stamp. Users read the stored data via the IO-Link interface. The device saves data for up to two years. In the event of a power failure, the clock power supply backup is implemented without the use of batteries. If the device is connected via IO-Link, the measured values can also be written to a memory continuously. This can also continue over a long period. Gradual changes in internal temperature and humidity can then be detected more easily in order to identify the cause.

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Detecting gradual changes

Humidity is often a problem in enclosed systems and should therefore be measured continuously as part of the condition monitoring system. The protection provided by control cabinets can decrease as the period of operation or the load increases. This can either be due to mechanical damage, the aging of the sealing material, defective ventilation systems or negligence such as incorrect closure. It is often gradual processes, such as continuously increasing humidity, that eventually lead to the failure of installed equipment. These effects can often only be detected over a long period. Turck's control cabinet guards also detect these long-term trends and notify the control level when limit values are exceeded.

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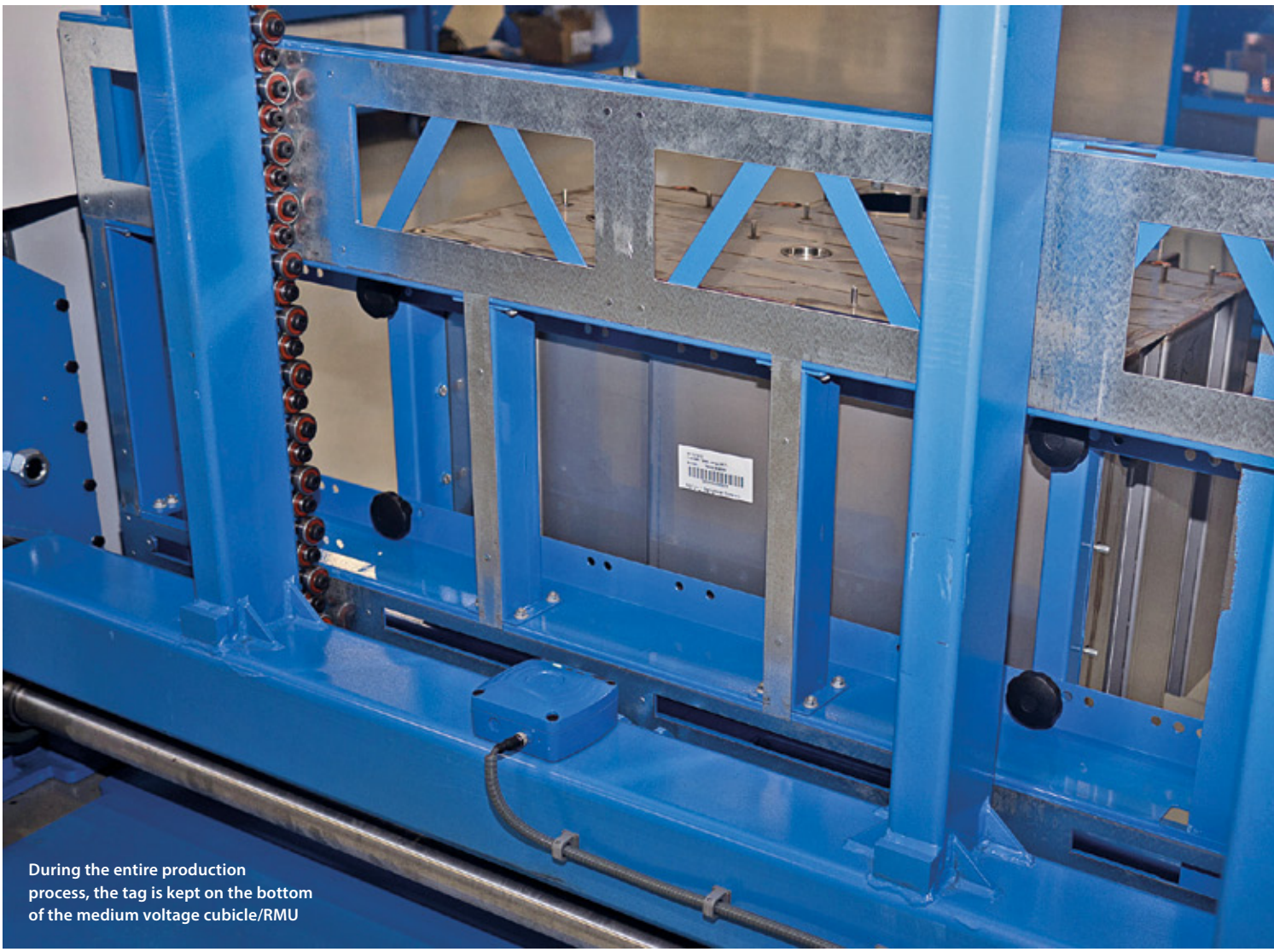


During the entire production process, the tag is kept on the bottom of the medium voltage cubicle/RMU

Transparency at High Voltage

SGC – SwitchGear Company, the Belgian medium-voltage switchgear specialist identifies its RMU ring main unit medium voltage cubicles using 34 UHF read/write heads from Turck

"We are proud of the increased lifespan of our medium voltage cubicles," said Sophie Vandoorne, owner and CEO of SwitchGear Company (SGC), the Belgian manufacturer of medium voltage cubicles. The company develops and produces medium voltage cubicles for indoor and outdoor applications and operates under the motto "Built to last". The devices are used worldwide in electrical switchgear assemblies, medium voltage motors, wind generators and with large consumers, such as in factories, hospitals, in agricultural, horticulture and other application fields. They transform medium voltage from 3 to 36 kV to low voltage from 231, 400 or 690 volts.

The medium voltage cubicles are protected by means of a switch disconnector with integrated fuses or circuit breakers. In the event of a short circuit or

»The greatest benefits of the RFID system are the increased flexibility, the increased safety, the permanent traceability of each production step, as well as the minimum manual operation required.«

Sophie Vandoorne | SwitchGear Company SGC

overvoltage, both ensure that the circuits are disconnected. The "Arc killer" patented by SGC ensures the safety of operating personnel 100%.

Up to a few years ago, SGC primarily focused on the DF-2 modular medium voltage cubicles. Customers combine the different modules, such as transformers, measuring units, switchboards and other components according to their requirements. An arc flame may possibly occur if there is a problem such as a leakage current. This could lead to an explosion in one of the modules, in which case only this one module has to be replaced. As the lifespan of a switchgear assembly is normally more than 30 years, this solution is often the most economical.

However, the market demanded more affordable versions which make no compromise in terms of safety. SGC consequently developed its DR-/DT-6 product series. These compact units combine the different functions of the medium voltage cubicles in one enclosure and are called ring main units (RMU). SGC initially produced the ring main units largely in piece production. However, an automated production line was required as demand increased. Manual operations had to be minimized in order to produce the RMU economically.

Large product variance requires intelligent production

The RMUs are offered in a large number of product variants – from a stand-alone version (combined with different cubicle functions) to an expandable unit, each one with or without the "Arc killer". With manual production, this large range of variants required the maximum degree of care in the production documentation, particularly the tests that the RMUs have to go through during and after production.

To ensure efficient and above all error-free production in spite of the high level of complexity, SGC decided on using an RFID system. This is required to identify each RMU at any time in production with a one-off identification code. Thus all relevant data from the ERP system is linked to this identification code and is available in the production environment.

Patrick De Clercq, responsible product engineer at SGC, soon rejected the possibility of using barcodes to identify the products. He wanted to avoid manual read processes as he ultimately wanted a system that cannot interpret the identification code incorrectly. In the existing environment with many reflecting stainless steel surfaces and changing light conditions, the RFID solution identifies better than optical sensor systems.

Large range through UHF system

The read/write range of up to 70 centimeters that was possible with HF technology was not enough. The dimensions of the cubicles vary so much that a precise position for the tag could not be defined to ensure reliable reading with HF readers. "Furthermore, in the later production stage several products are located on a skid which all have to be recorded," explains De Clercq, regarding his decision to use a UHF system with a larger range. During the project, De Clercq and his team tested the UHF systems of several manufacturers.

QUICK READ

The greater the number of variants that a product has, the more difficult it is to manage the resulting manufacturing complexity. This was also the case for switchgear assembly manufacturers SwitchGear Company. The company therefore uses a UHF RFID system from Turck to track the production of its DR-6 series with its many variants. This increases production efficiency and flexibility whilst guaranteeing 100% quality assurance. For example, the correct data is loaded automatically in test installations, which considerably reduces any possible manual errors. Turck Multiprox also programmed the control of the RFID system on BL20 gateways using Codesys.

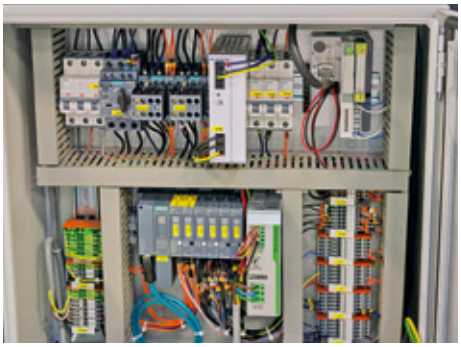
A read/write head also records products when they are checked in and out of the internal warehouse

The UHF system was required to provide a TCP/IP connection in order to establish a link to the company›s ERP system. This system, called DF-One, was programmed for SGC by the in-house IT team and was frequently adapted to changing requirements. At the same time it takes over the tasks of an MRP system for material requirements planning and management.

Although Turck›s UHF reader does not offer an integrated TCP-IP interface, Turck could nevertheless meet this requirement in conjunction with its BL20 RFID interface and I/O system. Furthermore, with the programmable BL20 gateway, Turck is able to offer a solution that takes over the control tasks and can thus operate independently of higher-level systems. The system communicates with the ERP system of SGC via TCP/IP. "We wanted a solution that could also run in stand-alone operation and which only exchanged the necessary information with the ERP system," De Clercq explained. SGC has minimized the risk of a double reading by only permitting the BL20-RFID interface to read one read/write head. Turck Multiprox, the Turck subsidiary in Belgium, supported SGC in the entire project and took over the programming of the system with Codesys.

Using 34 UHF read/write heads, SGC now detects the products in all production stages on the production line. An initial read/write head detects the storing of the raw materials in the fully automated shuttle warehouse. Read/write heads are furthermore installed in each workplace – such as in the assembly section, at the welding robot, at the test stations, or at the leakage testing system. The Q120 or the larger Q175 UHF readers are used, depending on the range required for the particular stations.

The test installation takes the appropriate test parameters for the actual product from the ERP system



Turck's programmable BL20 gateway is not only the interface to the read/write heads, but also controls the system and communicates with the ERP system via TCP/IP

Sophie Vandoorne and Patrick De Clercq

Faster and more reliable function tests

"The greatest benefits of the RFID system are the increased flexibility, the increased safety, the permanent traceability of each production step, as well as the minimum manual operation required," explains Sophie Vandoorne. Before the cubicles are welded, a critical bounce test and a resistance test is carried out since the cubicles are later hermetically sealed. Besides the mechanical tests, various electrical tests have to be documented. Not only is the test result recorded and the subsequent production step released by RFID, but the test system also takes the relevant test parameters for the current product from the ERP system. Compared to previous test processes, in which the parameters were read and set manually, automated testing is safer, faster and thus cheaper.

The new production system is particularly flexible. This therefore enables parts of switchboards to be manufactured in advance and stored in reserve in case there is a shortage of bought-in parts or if other products have to be given a higher priority. The tag itself is created from the ERP system and fitted to the bottom of the semi-finished products. This tag contains a sequence number, which is linked with the unique serial number of the RMU after it has been manufactured and successfully tested.

Outlook

Patrick De Clercq sees even more potential for optimization with the system: "At SGC, we even want in the future to know the time required for each production step, so that we can calculate the costs of the individual steps and manufacture modules more precisely." With additional automation it would be possible to determine quickly from this information which process incurs the highest production costs. Possible sources of error can also be determined more easily. Project engineer De Clercq is very pleased with the result. "We are thinking of installing a similar system in production at Mevoco." The affiliated company Mevoco manufactures components for the medium voltage range at the same location.

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Taking the Heat

Turck's RFID system ensures correct positioning of the charging carriage in the dust-laden heat of a Chinese carbide production plant

Hot location: The correct position of the charging carriage is reliably detected with RFID, eliminating the problem of slippage

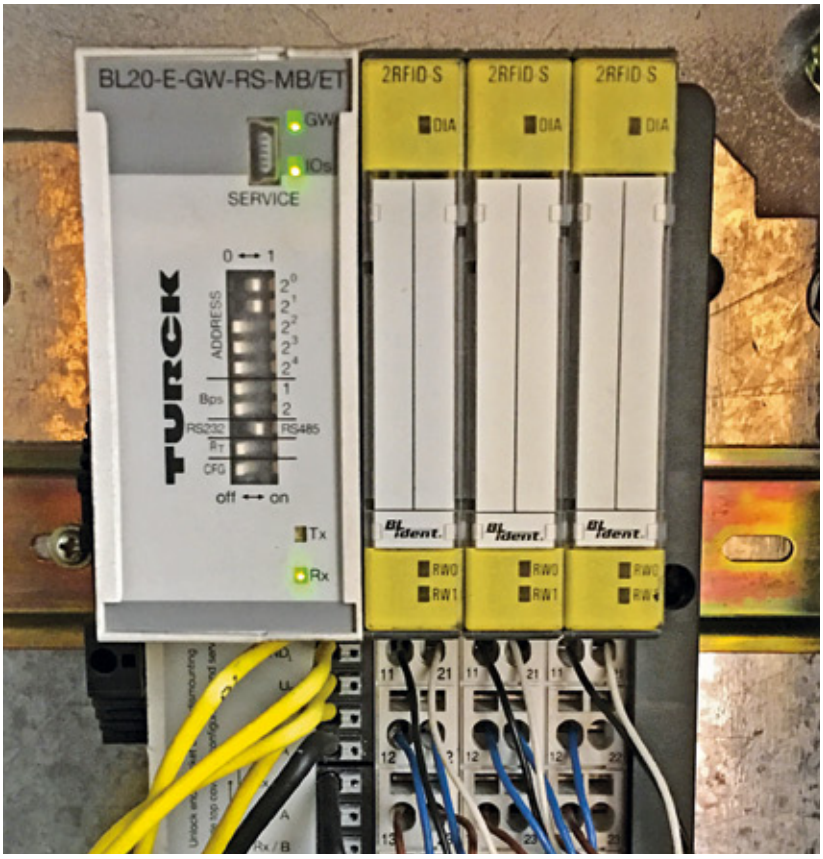
The most important materials required for the manufacture of calcium carbide are coke and lime. They are converted in arc furnaces at high temperatures into carbide and carbon monoxide. Carbide production is a cyclical process. After the burnt carbide is removed from the furnace it is reheated and fed with coke and lime. The temperature is then further increased until the optimum reaction temperature is reached and maintained. During the reaction, the carbon contained in the coke and the calcium of the raw lime chemically combine and produce carbide.

Alignment of the charging carriage error prone

A Chinese carbide producer urgently had to optimize its production process. A rail-guided carriage for feeding the raw material in the carbide furnace has to be correctly aligned to the charging door. With the previous solution, the position was measured using an encoder. However, the frequent acceleration, deceleration and braking of the carriage can cause this to slip a little. The slippage distance is not measured by the encoder, so that the encoder's position data is no longer correct. This resulted in the carriage no longer being aligned to the charging door.

In this case, personnel are required to make a manual intervention. However, the area surrounding the charging door is very hot since the furnace is situated directly beneath it. It is a dust laden, highly flammable and explosive environment. The severe conditions present in this area mean that personnel have to wear protective equipment and are exposed to a considerable safety risk. All in all, not an environment in which a person would wish to work frequently.

The plant owner therefore chose an RFID solution for positioning the charging carriage. The solution essentially consists of three tags fitted on the charging carriage: one at the opening of the carriage, and one each at a specific distance in front of and behind the opening in order to indicate the position. A read/write head is positioned on the rail at the position of every charging door. If the charging carriage moves on the rail, the tags on either side of the carriage opening pass the read/write head at the charging door. The read head reads the information from the tags and sends a feedback signal to the controller, which then slows down the charging carriage. If the tag on the carriage opening is opposite the read/write head at the charging door, the read head outputs the information from the tag. After the controller has received the information, the charging carriage is stopped and the material fed in. This is executed in fractions of a second and the correct position of the carriage is guaranteed by the



The BL20 gateway with an RS485 connection provides communication to the controller, while the RFID-S slice module enables simple connection without any programming

With degree of protection IP67, an extended temperature range and large read/write ranges, the TN-80 readers are optimally designed for use on the hot charging line

reliable RFID positioning system. Any manual corrections and the associated inconvenience are thus considerably reduced.

Solution concept with BL ident

As the customer uses a Supcon process control system, an RS485 interface is already provided at the installation site. Turck therefore supplied a BL20 fieldbus gateway which supports RS 232/RS485. As the tags are only used for indicating the position, the data requirement is very small. An RFID-S module, which can be integrated easily, is perfectly sufficient. The customer requires no programming in the PLC for S-Interface (S stands for simple). The RFID interfaces can be used as conventional inputs. As the installation site is exposed to considerable dust, the user had to install the gateway and the modules in a fire-proof cabinet. The read/write heads with degree of protection IP67 are suitable for use at temperatures from -25 to +70 °C and can be fitted directly at the installation site. The tags are made from epoxy resin and are extremely robust. Even if the surface is scratched or dirty, its function is not impaired.

Conclusion

Through the use of Turck's BL ident RFID system, the operator could increase the production capacity of the plant and make considerable improvements in terms of energy savings, reduced consumption and safety at the same time. As a result of the even more stringent requirements placed on the precise positioning, the customer also intends to use the RFID solution in other parts of the production plant. The RFID solution offers a wide scope for development in this field.

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QUICK READ

The position of the charging carriage in a Chinese production plant was previously determined by an encoder on the carriage wheel. However, this information became increasingly incorrect due to slippage during acceleration and braking, making it necessary to carry out manual position corrections. Today, the manufacturer measures the position using RFID tags on the carriage and a read/write head on the transport rail. This enables the carriage to be reliably positioned in front of the charging door. Neither the IP67 read/write head nor the robust tags are damaged by the dust and heat from the production process. Today the plant operates with greater energy and consumption efficiency, while employees work in a safer environment.

The compact Profinet TBEN-S modules on the robot pass on analog values as well as digital signals to the pneumatic valve

QUICK READ

Kirschenhofer Maschinen GmbH in Nersingen-Straß has made a name for itself as a special machine builder, and also for the development and manufacture of production plants for catalytic converters. The now completed manufacturing cell for truck catalytic converters can produce around 60 different types for customers. Kirschenhofer uses state-of-the-art automation technology to ensure that each catalytic converter meets the stringent quality standards and the traceability of each individual catalytic converter. Profinet I/O modules and the RFID system for the ultramodern production plant come from Turck.

Safety Service

Kirschenhofer Maschinenbau GmbH the special machine manufacturer, guarantees safe tool changes for truck catalytic converters with Turck's BL ident I/O system and TBEN-S I/O modules

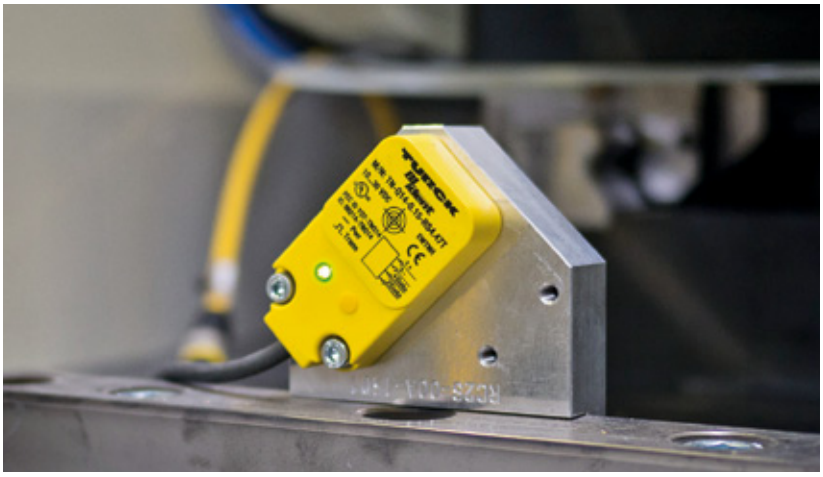
Large engines produce a lot of exhaust gas. The exhaust gas cleaning systems of a truck are thus sized accordingly. Up to six catalytic converter systems clean the exhaust gases of a large truck engine. A catalytic converter for a car and for a truck consists of three main units: a monolithic ceramic block (mono), a fiber mat wrapped around the monoblock and an outer metal pipe. The ceramic block has a honeycomb structure. The honeycombs are coated with a catalytically active precious metal. Under the microscope, this so-called wash coat can be seen to be extremely rough. As a result, the coating has a surface area of up to 100 square meters per gram. The catalysis of carbon monoxide, which converts hydrocarbons and nitrous oxides into carbon dioxide, water, and nitrogen takes place on this surface.

The fiber mat ensures correct positioning inside the outer metal pipe and must have precisely the correct density so that the exhaust gas does not flow past the monoblock. The outer metal pipe provides the process connection to the engine and the downstream exhaust gas line of the vehicle. Major vehicle manufacturers mount these three basic elements and other components themselves, depending on the type of catalytic converter, in their vehicle plants. Monoblocks, fiber mats, and pipes are supplied.

Hard stuffing vs. soft stuffing

There are two different processes used for mounting catalytic converters: Hard stuffing and soft stuffing. With hard stuffing, a monoblock with a fiber mat is inserted under pressure into a pipe that is enlarged beforehand to the required dimension. With soft stuffing, the monoblock with a fiber mat is loosely inserted into an outer casing and then compressed (or shrunk) to the required dimension.

With both processes, the mounting of catalytic converters in an automated manufacturing cell is highly complex. As a result, many well-known vehicle manufacturers now turn to Kirschenhofer Maschinen GmbH in the Swabian town of Straß near Neu-Ulm. The special machine manufacturer specializes in these kinds of mounting machines and has acquired a considerable amount of know-how. With 25 employees, the company produces machines that are technological leaders in their sector.



Kirschenhofer chose the TN-Q14 read/write head with IP67 protection due to its compact design

Flexibility and traceability

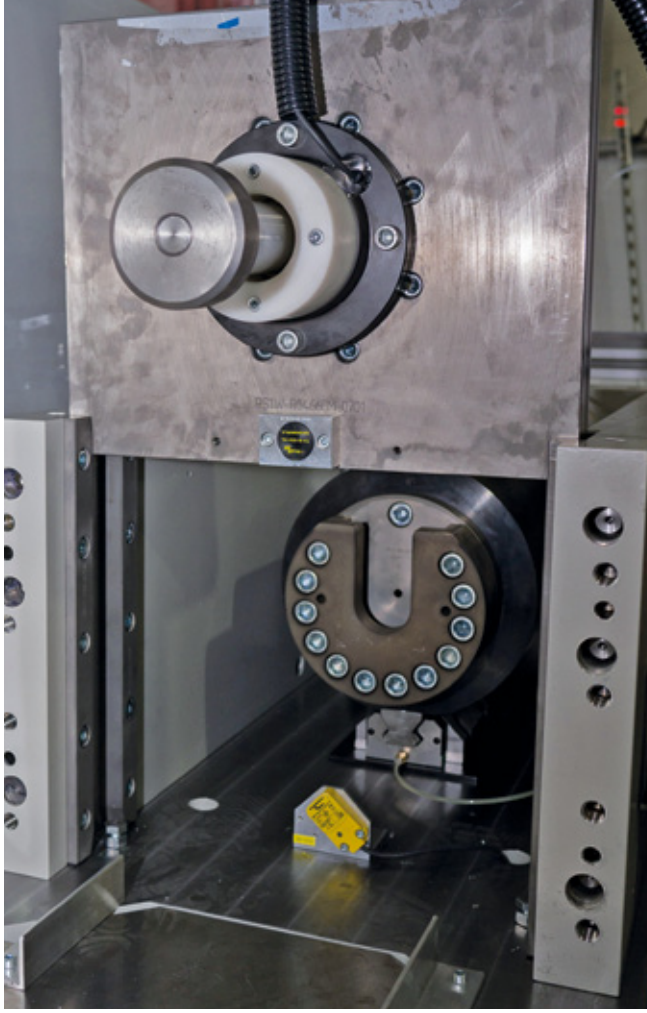
Up to 60 different types of catalytic converters can be produced in a mounting plant for this major truck manufacturer. These catalytic converters vary in size, with round, oval or polygon cross sections, and are also manufactured using the hard stuffing or soft stuffing process. The plant has to offer a high degree of flexibility in order to handle all the variants without any refit times. The batch of pipes, fiber mats and mono blocks that were fitted in each catalytic converter must also still be traceable after ten years. This enables any costs or image damage to be kept to a minimum in the event of any recall action.

RFID tool identification

Production faults are prevented and detected by the machine during the manufacturing process. The monoblocks, for example, are checked for cracks and damage at the edges and any faulty parts are removed. With the hard stuffing process, the pipes have to be expanded to the required dimensions. Depending on the geometry of the subsequent catalytic converter, the different tools required are clamped into a machine and mostly changed after a production batch. This takes place several times a day, with batches of between 200 and 1000 catalytic converters and a production rate of around one catalytic converter per minute. As the tools are stored in a central high-bay

»We previously cabled everything individually. There was a giant conduit with cables and a lot of wiring was required. Today we only have one Profinet cable and a power supply.«

Craig Craill | Kirschenhofer Maschinen GmbH



The TW-R30 tag at the top of the tool can also be read reliably if it is mounted on metal

warehouse from where they are also used in other machines, the customer required an automated tool identification system.

"The customer has 20 different tools in use. The ID number of the particular tool is stored on the RFID tag. The machine uses the ID number to check whether the correct tool was inserted and only then enables the stretching of the pipe," explains Thomas Schön, programmer at Kirschenhofer. With a force of between 30 to 60 tons exerted by the machine, the use of the wrong tool would cause enormous damage and major production failure.

The tool identification process was implemented with Turck's RFID BL ident system. The tools are fitted with TW-R30-M-K2 tags for this, which are embedded in the metal. Turck's compact TN-Q14 HF read/write heads are fitted at the tool holders. "We chose Turck's RFID readers due to their compact design," said Craig Craill, head of the electrical department at Kirschenhofer. The Q14 is only 14 millimeters high and offers a maximum read/write distance of up to 72 millimeters. Although the range is shorter in the metal environment, it is still enough to protect the read/write head from colliding with the tool.

Optional wear detection

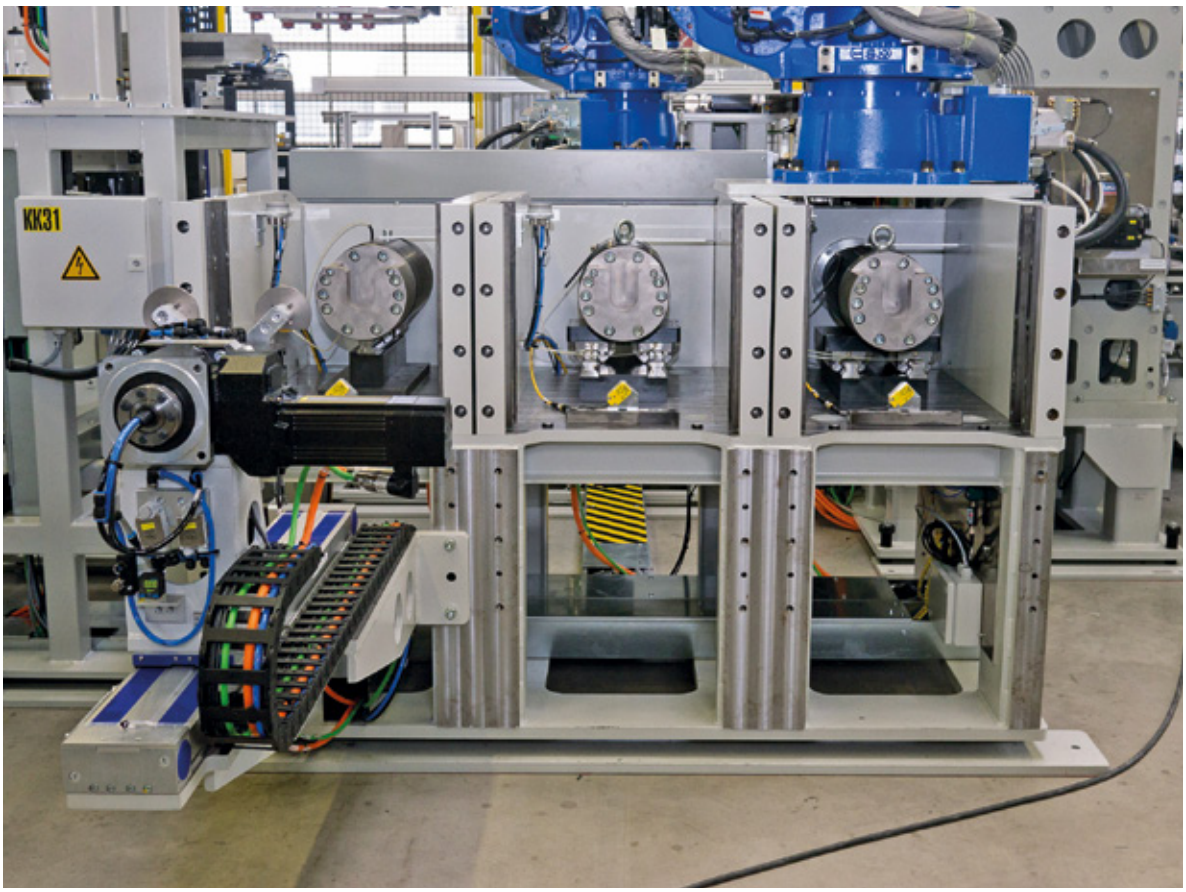
Another machine type from Kirschenhofer, of which more than ten are already in use by a major German car manufacturer, also checks the pipe diameter after the stretching process and compares the value with the tolerance values stored on the tag. The benefit of this additional option is that the machine can detect during stretching any wear on the tool, any material faults, or operating errors. The maximum and minimum diameters of the pipe are also stored on the tag in the current plant for truck catalytic converters. If this function is required, it can thus be retrofitted easily.

Sensitive robot grippers

The empty and full pipes are transported between the two processing stations in the plant by means of robot grippers. The pneumatic gripper has to apply a different pressure depending on whether the pipe is empty or full. The robot arm with a pneumatic gripper must only use 2.5 bar to grip an empty pipe in order not to squash it. The robot brings the pipe to the insert station where it is filled with a monoblock with a fiber mat. It then weighs around 20 kg and has to be gripped at 6 bar, so that it does not fall out of the gripper.

Profinet I/O module maintenance-friendly and time saving

The relevant analog values are transferred to the pneumatic valve using Turck's compact TBEN-S2-4AO Profinet I/O block. The IP67 module is fitted directly on the robot arm and passes on the values from the controller to the valve. A TBEN-S2-4AI module with analog inputs returns the analog values of the pneumatic valve to the controller. "We previously cabled everything. There was a giant conduit with cables and a



Three read/write heads in the tool holders ensure the use of the correct tools

lot of wiring was required. Today we only have one Profinet cable and a power supply," Craig Craill explained. "Today's solution is also a lot more maintenance-friendly. If the customer has a problem, we look at it and can see what's going on precisely." Another robot gripper just has to transport the stuffed pipes and therefore also manages with I/O modules with digital inputs/outputs. For this, Kirschenhofer uses the universal TBEN-S1-8DXP, with eight channels that can be used as inputs or outputs.

"The problem with other I/O modules in this design is the fact that they don't have their own IP address but have to be accessed via an internal bus. I can also expand the Turck system as required without any major effort," said Craill, describing the differences between TBEN-S and alternative products.

Turck's TBEN-S multiprotocol modules talk three industrial Ethernet protocols and can therefore not only be used in Profinet but also in EtherNet/IP and Modbus TCP. "We only use Profinet, although we are repeatedly being asked by US customers whether we can also use an Allen-Bradley controller," says Craill. "However, we nevertheless have our standard and can only work economically if we keep to it. We have to technically understand our system in every detail."

Outlook

Craig Craill is looking forward to the TBEN-S2-RFID modules recently launched. You can connect up to 32 addressable read/write heads in so-called bus mode in a linear topology. This reduces the wiring effort from the read/write heads to the RFID interface. Furthermore, fewer interfaces are required, which in turn saves costs and space.

Craig Craill and Thomas Schön (right) are just as impressed by Turck's BL ident RFID solution as by the TBEN-S-I/O modules

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Everything Ship Shape

On the super yacht Limitless, Turck's TBEN compact block I/O modules with IP69K protection provide reliable EtherNet/IP communication between sensors/actuators and PLC

With a length of 97 meters, Limitless is classed as a super yacht. The ship was launched in 1997 from the Lürssen shipyard in Bremen. Whilst not a particularly significant age for a ship, a great deal of development has gone on in the field of electronics and automation over the past twenty years. This is particularly the case since the yacht's electrical equipment is in fact 24 years old, as it was installed shortly after the construction of the yacht was started. The period from when the construction of a ship of this size is started to the time when it is completed is around four years.

Floating transformer: The stern of the Limitless opens out as a platform, the rear boarding ladder just moves straight out

Technical equipment getting on in years

The yacht is equipped with two boarding ladders, two small platforms which can be lowered on the water and two large platforms. One of the platforms opens up to lower a tender into the water. The other platform at the stern of the ship is lowered onto the water surface. The ship also has a gangway at the stern, which likewise moves out of the hull of the ship. The yacht can thus be accessed from the stern. The yacht also includes several impressive features, including two cranes, a swimming pool, and a number of automatically operated and secured doors; all of which are hydraulically operated. A modern control technology had not yet been installed when the Limitless was built. The equipment was controlled with relay devices and simple point-to-point connections.

When the platform with the boarding ladder is deployed, the inclination of the platform must be measured in relation to the ship

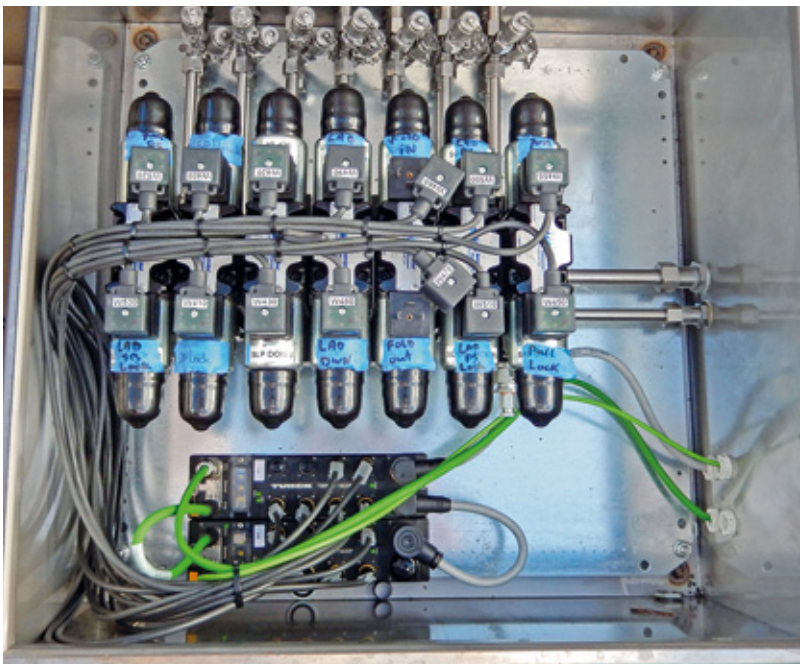
In recent years, the faults on the moving parts of the yacht's equipment have increased. Moreover, the functioning moving elements were no longer state of the art. A central controller was not possible. Everything had to be operated by pushbutton at the equipment. Akerboom Yacht Equipment in Leiden, Netherlands, was commissioned by the captain to complete the technical refit of the entire ship. The company has gained a reputation in the field of electrical yacht equipment and is part of the Feadship Group, which also includes the De Vries shipyard.

EtherNet/IP controllers replace island solutions
Previously, each crane and each automated platform on the ship had its own control cabinet, in which the signals of the devices and drives were wired directly. A central controller did not exist. Akerboom replaced these several island solutions with I/O modules with EtherNet/IP communication and two modern controllers.

Ed Groen in `t Woud from Akerboom was in charge of the technical aspects of the project and was considerably involved in the implementation: "It soon became clear to us that we needed a modern industrial controller for the automated systems. We decided on two Allen-Bradley controllers with EtherNet/IP communication." Both controllers are networked and can be reached from the central control room. In theory, one

QUICK READ

Dutch ship equipment supplier Akerboom Yacht Equipment reworked the entire automation setup on the 20 year old super yacht Limitless with state of the art technology. Two controllers and one EtherNet/IP network replace the previously used point-to-point wiring of equipment such as cranes, boarding ladders or platforms. Akerboom relies on Turck's robust TBEN-L and S Ethernet block I/O modules to transfer a large number of I/O signals. With their fully encapsulated plastic housing and protection to IP69K, the I/O modules are ideal for use on ships, eliminating the need for control cabinets or other protective measures.



Each Turck TBEN-L-16DOP block I/O provides 16 digital outputs for connecting hydraulic valves

Control cabinets and other protective devices are no longer necessary with Turck's robust block I/O solutions with IP69K protection

Ed Groen in `t Woud is very satisfied: "Turck's I/O blocks have saved us a lot of wiring work."

controller would have been enough but with a ship's length of virtually 100 meters the wiring required would have been too much.

TBEN I/O modules save space and time

"I came across Turck when looking for the right I/O solution. I was looking for robust I/O blocks which could bring my signals directly from the field to the controller via EtherNet/IP," said Groen in `t Woud. "The controller manufacturer could only offer one solution, which did not have an integrated power supply for the connected sensors and actuators. This would have required time consuming assembly of special connectors, which we wanted to avoid. The design and the high degree of protection of Turck's TBEN-L were also ideal. We love plastic because it can't rust. The IP69K I/O block modules also saved us a lot of space as well as wiring. Many control cabinets on board are now unnecessary because the TBEN-L modules are mounted directly next to the hydraulic valves. Today the room formerly used for control cabinets is used for storing wetsuits."

A large number of digital input signals are used on the ship. These are supplied, by end position switches, which detect the position of the locking bolts in the doors. Analog signals are output by inclination sensors. Turck's B1N360 inclinometers detect the inclination of platforms when they are lowered onto the water. Measuring the inclination in relation to the ship and not as an absolute value is an important requirement here.

As the ship is constantly swaying slightly, Ed Groen in `t Woud and his team installed two inclinometers: One in the control cabinet, the other directly at the platform. The sensor on the ship supplies the reference value. The controller calculates the actual angle between the platform and the ship by subtracting both inclination values. The analog signals of the inclinometers are brought to the controller via Turck's ultra-compact TBEN-S2-4AI I/O station. The TBEN-S modules with a width of only 32 millimeters are even more compact than the TBEN-L, whilst still meeting IP69K requirements at the same time. A TBEN-S is installed in the back area and in front area of the yacht. Both bring the signals from two platforms to the controller.

There are also no analog signals. The hydraulic drives are not regulated with conventional proportional or servo valves. "For us there is virtually only one manufacturer for proportional valves. For that reason they are also relatively expensive," explains Ed Groen in `t Woud. In the luxury goods sector, customers keep an eye on costs. Groen in `t Woud has developed an alternative solution for the dynamic control of hydraulic drives.

»I came across Turck when looking for the right I/O solution. I was looking for robust I/O blocks that could bring my signals directly from the field to the controller via Ethernet/IP.«

Ed Groen in `t Woud | Akerboom Yacht Equipment

Block I/Os simplify wiring

This solution was really effective through the use of the TBEN-L1-16DOP digital block I/O modules. This enables all the output signals to be brought from the controller via an Ethernet line to the digital valves. "Turck's I/O block modules save us a lot of wiring work. Our mechanics could also wire the M12 connectors easily, without any electrical knowledge or a detailed wiring plan." As multi-protocol devices, the TBEN I/O modules can be used on controllers equally with Profinet, EtherNet/IP, and Modbus TCP protocols.

The complete refit of the yacht was impressive. As the Limitless was also given a visual makeover and the remaining onboard electronics and air conditioning were also brought up to the current state of the art, the ship almost looks brand new. The crew can now operate all systems locally via HMIs, via remote control, or via the central control room. The yacht owner was extremely pleased, although he could certainly have bought a new ship. However, as he had been involved in the construction of the Limitless himself, he is very attached to his yacht. As they say in Germany, "Old love never rusts!"

Efficient regulation of hydraulic cylinders

On another ship that is currently being reworked by Akerboom with Turck solutions, they even can dispense with further analog signals. The hydraulic drives are not controlled by conventional proportional or servo valves. Groen in `t Woud has developed an alternative solution for the dynamic control of hydraulic drives.

The drives of the platforms and cranes have to be dynamically controlled in order to be able to execute the movements faster. The force of the hydraulic cylinders therefore has to be controlled by the oil pressure. Instead of controlling this with a constant pump output and dynamic valves, digital valves are used on the Limitless, which only determine the direction of the oil flow. Groen in `t Woud regulates the force of the cylinders with a variable pump output. The frequency inverter that drives the hydraulic pump has an EtherNet/IP interface via which it can be dynamically controlled.

All technical systems can now be operated via a touch screen

The controller has a function block or add-on stored in it for each movement schema, which sets how long the pump is to be run at which frequency. In this way, dynamic positioning sequences can be run in order, for example, to retract and extend the ladders and gangways on the ship quickly, judder-free, and also economically. Digital valves do not lose energy through heat loss, as is the case with proportional valves.

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Unbreakable

Turck's QR24 contactless encoder withstands vibrations and water ingress at Love Your Rug, the Canadian carpet cleaning company

»We were pleasantly surprised at the ease with which the Turck encoder could be replaced. We are so impressed by the product that we immediately recommended the encoder to the machine manufacturer.«

Jim St. Pierre,
Love Your Rug

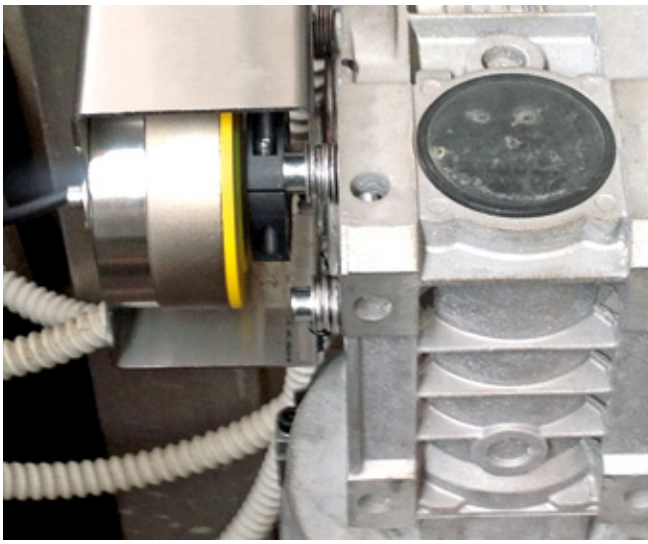
Carpet cleaning is time consuming and is normally done by hand. The Canadian company Love Your Rug offers the possibility of fast, efficient and reliable carpet cleaning – with the help of a Turck encoder. The company is the first in North America to specialize in the cleaning of carpets with a wet cleaning machine. The parent company Trillium TLC is already a specialist in the dry cleaning of leather jackets and boots, as well as the wet cleaning of carpets. When Love Your Rug was founded, its operations were restricted for many years to the chemical dry cleaning of carpets. However, in response to growing customer demand for wet cleaning, the company shifted its focus. Initially all carpets were cleaned by hand, which required around 45 minutes for each carpet. In 2015, Love Your Rug asked a machine builder to manufacture a machine for wet cleaning carpets. The machine now enables 400 to 600 carpets to be cleaned each week, instead of the previous 50 to 60.

The machine is largely automatic but requires an operator to load the carpet and initiate the cleaning process. The machine can clean carpets of up to 4.5 meters in width and approx. 5 meters in length. Encoders are indispensable components for the fault-free operation of the machine. They are located on belt rollers to give positional feedback to the PLC, which monitors and controls the entire cleaning process. The use of the new machine was profitable for Love Your Rug: It not only saves water, detergent and electricity, but also reduces the average cleaning time by 80 percent.

Too much for standard encoders

The automated cleaning of the carpets initially only brought benefits. However, the first problems started to occur after about eight months. Downtimes become increasingly more frequent since the installed encoders could not withstand the exposure to high temperatures as well as aggressive chemicals and continuous vibration.

The design of virtually all encoder types and measuring principles available on the market require the direct linking of rotation axis and sensor – regardless of whether potentiometric encoders, optical systems or Hall encoders are used. This means that vibrations or shocks are transferred via the shaft to the encoder, so that it is put under stress until it finally fails. Besides the vibrations, penetrating dirt and humidity also present possible problems that may likewise ultimately lead to the failure of the encoder. It was precisely this fact that was the downfall of the encoder installed in the cleaning machine.



The incremental QR24 measures rotary movement at the belt rollers, customers can set the pulses per revolution themselves

The company started to find it difficult to keep its promises to the customers. "Our commitment to our customers is to deliver professionally cleaned products in a timely fashion, and we have to honor that commitment every day, no matter the challenges," says Jim St Pierre, national sales manager at Love Your Rug.

The manufacturer of the cleaning machine was unable to supply a suitable encoder for Love Your Rug. Furthermore, it would take four to six weeks to replace the existing faulty encoder. The estimated downtime would result in lost revenues from cleaning an average of 40 to 50 rugs each day, as well as loss of goodwill.

QUICK READ

Canadian carpet cleaning company Love Your Rug uses Turck's Ri360P-QR24 for its wet cleaning machines. Love Your Rug was the first company in North America to clean carpets with a machine instead of by hand. The standard encoders that were initially installed were unable to withstand exposure to stresses such as water ingress, vibrations and chemicals. Turck's QR24 contactless encoder has been providing protection to IP68/69K and overcoming these challenges for many years.

QR24 offers a fast and reliable solution

Love Your Rug solved the problem with Turck's QR24 encoder. Turck-Chartwell Canada was able to supply the contactless encoder directly from stock in Markham, Ontario. The cleaning machine was back in service in a matter of hours and could continue its work.

Turck has been solving challenges like water ingress and vibration for years with its contactless encoders. The inductive resonant circuit measuring principle makes it possible to design a fully encapsulated sensor housing without seals, that is separate from the positioning element. The device therefore operates absolutely wear-free and permanently meets the requirements of IP68/69K protection. The ingress of dust or water in the electronics is prevented – and this also applies to the condensation and steam that typically occurs in the carpet cleaning process. The encoders also provide a highly resolved output signal of 16 bits for high-speed applications. The incremental version of the QR24 used at Love Your Rug supplies 1024 pulses per revolution as standard. It can also be set to 360, 512, 1000, 1024, 2048, 2500, 3600, 4096 or 5000 per revolution via a teach adapter.

Jim St. Pierre was "pleasantly surprised at the ease with which the Turck encoder could be replaced. The previous encoder did not have the durability and programmability of Turck's QR24. We are so impressed by the product that we immediately recommended the encoder to the machine manufacturer. All the carpet washing machines of the manufacturer will now be fitted directly with the QR24." Love Your Rug now uses the QR24 as standard in all its cleaning machines.

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The QR24 even supplies its incremental signal reliably when exposed to aggressive chemicals, water, steam and vibrations

Trade Shows

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

Date	Trade Show	City, Country
24.04. – 28.04.2017	Hannover Messe	Hanover, Germany
04.05. – 10.05.2017	Interpack	Düsseldorf, Germany
09.05. – 11.05.2017	RFID Live	Phoenix, USA
09.05. – 12.05.2017	Industry Days	Budapest, Hungary
16.05. – 18.05.2017	Smart Automation Austria	Linz, Austria
10.05. – 12.05.2017	Industrial Automation	Beijing, China
23.05. – 25.05.2017	SPS IPC Drives Italia	Parma, Italy
23.05. – 26.05.2017	Oil. Gas. Technologies	Ufa, Russia
13.06. – 15.06.2017	Expo Pack	Guadalajara, Mexico
14.06. – 16.06.2017	Vi Automatisa	Bogota, Colombia
11.07. – 13.07.2017	Semicon	San Francisco, USA
25.09. – 27.09.2017	Pack Expo	Las Vegas, USA
03.10. – 05.10.2017	Hi - Teknologi- og Industrimesse	Herning, Denmark
09.10. – 13.10.2017	MSV	Brno, Czech Republic
25.10. – 27.10.2017	Automation	St. Petersburg, Russia
25.10. – 28.10.2017	XXXII Convencion Internacional Minera	Guadalajara, Mexico
07.11. – 11.11.2017	Industrial Automation	Shanghai, China
06.11. – 09.11.2017	Fabtech	Las Vegas, USA
28.11. – 30.11.2017	SPS IPC Drives	Nuremberg, Germany

The Net

On the Turck website and product database you will find all the relevant information about Turck's products and technologies, systems and industry solutions – from success stories to data sheets right through to the download of CAD data.

www.turck.com

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With 28 subsidiaries and more than 60 branch offices, Turck is always nearby, anywhere in the world. This guarantees fast contact to your Turck partners and direct support on site.

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