Issue 02
2008

more@TURCK

The Magazine for Customers of the Turck Group

Solution Partner

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All in the Coating

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Tailor-Made

Rugged I/O block modules from the new BL compact series offer a variety of I/O in a compact housing

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World-class

Companies who offer world-class products and support should also offer their customers world-class communications. We hope that you already view Turck as a leader in products and services, and we are pleased to offer this customer magazine to our North American customers for the first time. In these pages you will find information on new products, as well as interesting and creative applications from some of our customers throughout the world.

Being a world-class company means more than just supplying the most innovative products and superior support, it means being a partner to each and every one of our customers. Turck strives to provide solutions to you that are not available from anyone else. We have built our business around the concept of supplying customized products to meet our customers' demands. That includes designing custom products, as well as customizing off-the-shelf products to make your life easier and save you money on total system costs. Not custom products (although we do some of that as well) but customized off the shelf products that make your life easier while saving money on total system costs. A great example of this is featured in the article Providing Solutions for Challenging Applications in this issue.

As excited as I am to be providing this new communication tool, I know that nothing is ever perfect. Please take some time to read through this magazine and let us know if **more@TURCK** is meeting your expectations. Feel free to provide feedback via email to turckusa@turck.com. We hope the information presented to you about unique applications from around the world will provide some insight that just may help you solve that next difficult application problem.

I hope you enjoy reading this issue of **more@TURCK**. If you know someone who would like a free subscription to **more@TURCK**, please refer them to www.turck.com/moreturck.

Warmest regards

David A. Lagerstrom, President and CEO, Turck USA

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Reliably Detect Weld Nuts

▶ **Turck introduces** magnetic-inductive sensors for efficient and economic detection of weld nuts. These innovative sensors use signal attenuation to reliably detect ferromagnetic components such as nuts, bushings and spacer sleeves and ensure these necessary components are present before robotic welding occurs – with no additional software or electronics required. Turck's weld nut sensors are easily integrated into existing production lines, replacing traditional location bolts and providing an exceptional solution for sheet metal processing in chassis construction.

These sensors deliver a cost-effective alternative to more expensive optical or vision-based systems, which can malfu nction due to residues such as dirt and weld spatter, and frequently changing lighting conditions in welding zones. The Turck weld nut sensor can be mechanically protected with a customer-supplied stainless steel sleeve, which also acts as a guide to keep the weld nut in place.

Info

You can find more information on the reports or product presentation in **more@TURCK** under www.turck.com. Simply enter the Webcode that you find at the end of each article in the search field. The following article page takes you directly to the product database or you can download or send the article as a PDF.

Sensors for Switch Point Detection

▶ **PK pressure sensors** were designed to provide an economical sensor for switch point detection in air and inert gas applications. The sensor is programmed using easy-to-use push buttons, and the menu may be inverted for additional programming flexibility.

PK sensors provide the two pressure ranges most commonly found in pneumatic applications: -29.5 to 0 inches of mercury (-1 to 0 bar) and 0 to 145 psi, with 3 percent accuracy. Two PNP switch points and an integrated M8 connector further the sensors' applicability in many industries.

Harsh Duty I/O for EtherNet/IP™

▶ **Turck's Advanced I/O** Module (AIM) line now includes EtherNet/IP™ stations with IP 67, IP 68 and IP 69K protection ratings. AIM stations are fully encapsulated to provide a rugged, connectorized, machine-mount solution for EtherNet/IP in harsh duty applications.

EtherNet/IP AIM stations incorporate an additional Ethernet switch that allows integration into existing networks – saving the time and money used to install additional hardware to support the network.

Flexible, Robust I/O on the Plant Floor

▶ **The new BL compact** line from Turck offers a huge selection of signal varieties in an IP 67 package. Select from analog, digital, thermocouple, RTD, signal varieties or a mixture of signal types, all inside one robust node on your network. Available for DeviceNet™, PROFIBUS® and CANopen networks, BL compact stations can solve any application. BL compact offers I/O with M12, M8 or M16 connectors that allow for easy installation into any application, existing or new. BL compact brings flexible remote I/O solutions to your harshest application environments.

M16 Power Wiring with up to 18 Amps

▶ **Flexibility and modular wiring** options in compact and rugged molded connectors rated to 600 VAC/VDC,15-18 Amps are now available from Turck. These 2, 3 and 4-pin connectors accept 12 and 14 AWG wires and are ideal for conveyor, small motor and material handling applications.

The connectors are available with shielding or tray rated, exposed run PVC flexlife® cable, and are IP 67 rated with fully encapsulated receptacles and nickel-plated brass housings.

Additional features include optional tees, with or without extension trunk branches and drops. Like most Turck connectivity products, the connectors are available in male or female, straight, standard and custom lengths, pigtails and extensions.

Bring I/O up to Ethernet

▶ **If you have an existing distributed I/O infrastructure** and want to bring it up to the Ethernet platform, Turck's Ethernet gateways provide an easy, flexible migration path while protecting your current investment.

This approach provides interoperability between the higher level Ethernet control system and the device level I/O network. We offer a variety of platforms from which to choose; these platforms interface individual I/O points directly onto the Ethernet level and/or take an I/O sub-network and provide a gateway to the Ethernet level. This flexibility allows communication from the Ethernet level directly to the device level utilizing standardized protocols.

Sensors for Hazardous Areas

▶ **Turck has expanded** its line of pressure sensors to include a specialty sensor for hazardous areas. The PT4300 is a media isolated stainless steel pressure sensor for use in oil and gas, refrigeration, gas compression, test stands and industrial OEM applications. PT4300 sensors are UL/cUL 1604 (CSA 213) Class I, Div 2, Groups A, B, C and D approved sensors for hazardous area applications. The sensors are constructed without o-rings or welds, allowing pressure ranges up to 10,000 psi with burst pressure up to 20,000 psi. PT4300 sensors are manufactured using MEMS (microelectro mechanical systems) technology. With it's one piece sensing design, the PT4300 offers many advantages over other sensing technologies, including high life cycle, high overload and burst pressure cycles.

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Connectivity for up to 30 Amps

▶ **D Size 1 3/8“ connectivity products** from Turck are rated for up to 600 Volts and 30 Amps to provide power for material handling and conveyor applications in a rugged, easy to install power distribution system. The D Size family will consist of cordsets, receptacles, junction tees, lockout devices, reducers,

splitters and E-stop switches in modular, quick-disconnect designs that facilitate installation on the plant floor. The 3-pin versions are available with 10 AWG at 30 Amps, 12 AWG at 25 Amps, and 14 AWG at 18 Amps. The 4-pin versions are available with 10 AWG at 25 Amps, 12 AWG at 20 Amps, and 14 AWG at 15 Amps. The cordsets will be available in straight, right angle, standard and shielded options. The D Size line will be UL and CSA approved, and will conform to NFPA-79 requirements.

Sensors and Cordsets for Washdown Applications

▶ **Turck’s line of uprox+ Factor 1 sensors** now include IP 69k rated washdown versions with temperature ratings from -40 to 100 °C. These sensors are designed to be highly resilient to the high-pressure cleaning agents often found in the food and beverage and pharmaceutical industries. The sensors incorporate durable 316 stainless steel construction and a liquid crystal polymer front cap that aids in resisting moisture ingress.

uprox+ sensors feature longer sensing ranges for detecting all metals, including non-ferromagnetic metals, such as stainless steel, at the same rated distance. This is especially useful for food and beverage applications where the targets are often made from stainless steel.

Also available from Turck are 7/8”, M12, M16 and M23 cordsets that use polypropylene material to withstand cleaners and chemical solvents, as well as high temperatures.

19-pin Connector for 300 Volts and 4 Amps

▶ **Turck has expanded** its 7/8-16UN minifast connector line to handle even more applications with the addition of the 19-pin connector. The 19-pin minifast connectors are rated for up to 300 Volts, 4 Amps.

Turck currently offers straight and right angle 19-pin cordsets with PVC, PUR and TPE cable jackets. The 19-pin connector adds to the existing 9, 10 and 12-pin 1 1/8 inch connector minifast line. Additional minifast connector sizes and pin counts are also available, including 7/8 inch connector with 2-6 pins, and the 1 inch with 6-8 pins. All connectors provide IEC IP 67 protection.

Like most Turck cordsets, the minifast line offers male or female, straight and right angle connectors, standard and custom lengths, and pigtails or extensions. Fully encapsulated mating receptacles with nickel-plated brass housing and 1/2”-14 NPT, 3/4”-14 NPT, PG 16 and M20 mounting threads complete the system.

Detecting Slope Angles with Turck's Inclinometer

▶ **Turck's new inclinometers** detect the angular tilt in many applications. These sensors feature compact rectangular housings, and may be mounted at ±10, ±45 and ±60 degree angles. These sensors have numerous uses, including in solar plants, transport devices or automatically adjustable furniture.

The new Turck inclinometer measures angular tilt referenced to gravity. At the heart of Turck's inclinometer is a MEMS (micro electro mechanical system) device. The MEMS device incorporates a micro mechanical capacitive sensor element which utilizes two parallel plate electrodes, one stationary and one attached to a spring-mass system. Movement causes acceleration which produces deflection in the non-stationary electrode. This produces a measurable change in the capacitance between the two plates which is proportional to the angle of deflection. This small signal is then conditioned and amplified to provide two analog outputs (0.1 to 4.9 VDC) or two curent loop outputs (4 to 20 mA).

The micro board design in the MEMS technology allows for a compact, precise inclinometer in a very robust, industrialized package. The inclinometer is IP 67 rated, with a temperature range of -30 to 70 °C that permits its use in many applications.

6.2 mm Wide Interface Modules

▶ **Turck's new IMS** interface module measures a mere 6.2 mm wide and may be configured with a laterally mounted DIP switch for added convenience. This extremely compact module provides complete galvanic isolation, and up to 2.5 kV for the input, output and power supply. Galvanically isolated IMS modules are available with signal conditioning that acts as a dead-zero to live-zero signal. One and two channel modules are available without signal conditioning. Modules are also available for temperature detection using Pt-100 technology or other thermo-elements. Those that use Pt-100 technology achieve 0.3 percent of the full scale, and are available with 2, 3 or 4 wire connections. An analog signal transmitter that achieves 0.1 percent of the full scale completes the IMS line.

Double-Digit Growth

▶ **Turck is once again expecting double-digit growth for 2008**. As Managing Director Christian Wolf announced during a press conference that the family-owned and operated company is expecting consolidated group sales to increase by more than 11 percent to about 370 million Euros. The total number of employees in all 27 locations grew by more than 8 percent to 2,830. "Despite the current crisis in the world economy, the Turck Group was able to achieve double-digit sales increases for the seventh consecutive year," says Wolf. "The result shows that Turck's strategy of positioning itself as a customer solution partner through innovation and customer proximity has been successful – regardless of whether we are referring to the BL ident RFID System, the new BL compact block I/O family or the expansion of our overall product portfolio."

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BL compact allows customized signal combinations for a multitude of I/O tasks

Tailor-Made

Rugged I/O block modules from the new BL compact series offer a variety of I/O in a compact housing

Quick read

I/O systems are increasingly being installed outside the control cabinet and in direct proximity to sensors and actuators, which demands that they be rugged, efficient and user-friendly. With the new BL compact Block I/Os, Turck is supporting this trend and adding flexible Block I/Os for analog and digital signals to its IP67 product line. These combine the variety of the modular BL67 systems in a very small space in a completely sealed housing.

The world of automation is evolving at an increasingly faster pace; customer-specific applications – regardless of whether machine manufacturing, production or logistics - are becoming more complex and challenging. Those seeking cost-effective integration of machines cannot ignore flexible solutions that allow workpiece or workflow changes at a low cost and with short retrofitting times, which in fact increase machine capacity. Sensor, connection and fieldbus solutions used should not be pushed to the back of the queue. With its new field-proven I/O solutions, Turck is now responding to the growing trend of bringing together as many varied applications as possible with the most cost-efficient automation strategies.

Large variety, small package

Based on its tried-and-true modular BL67 I/O systems, the automation specialist is launching a new series of rugged I/O modules: the BL compact fieldbus family. In doing so, Turck is using its existing BL67 I/O portfolio and combining the electronics from different BL67 modules, including gateways, in a unique housing. The compact stations combine connections for up to 16 digital or analog input signals, regardless of whether they are simple, discrete signals or special applications such as RFID, with distinctive monitoring and diagnosis functions. The

fieldbus modules initially available for Profibus DP and DeviceNet allow end users to reach the next step towards decentralized automation – and to do so cost effectively. Even under tough electrical and mechanical conditions, these modules can be connected directly to the machine in a rugged industrial environment.

While Turck's BL67 – consisting of a gateway and stackable I/O modules – continues to offer an unbeatable variety of signal combinations and fieldbus interfaces, BL compact can be mounted where limited space is available. A BL67 station can be used to process many different signals, but requires more space for mounting than BL compact. If only a small number of specific signal combinations needs to be processed, BL compact's limited space requirements and simple assembly provide a viable alternative.

The plastic housing of the BL compact series is completely sealed with epoxy resin and meets the requirements of the IP67 protection class. It is initially available in three sizes each with varying connection profiles. Alternatively, it can be equipped with M8, M12, or M16 metal plug-in connectors for the full plug-and-play functionality, control for on-site diagnosis and rotary encoding switches for simple address setting. Thus, the I/O modules offer a new degree of application compatibility in the market of compact fieldbus solutions.

Increased flexibility, low configuration costs

The BL compact series is strategically positioned between the reliable modular stations of the BL67 series and the compact fieldbus modules (FLDP, FDN) from the Turck portfolio. It combines the advantages of modularity with the benefits of cost, installation and low maintenance modules in a new decentralized concept. Market-oriented connection combinations (XSG-PD, analog inputs/outputs, RS232, RS 485, SSI or RFID) and, on request, possible special customer solutions allow end users a high level of flexibility even at low levels of expansion in supply chain management – regardless of whether in the machine manufacturing, automobile, packaging or food industries.

Thanks to its coherent modular concept, Turck has integrated the complexity of hybrid fieldbus solutions normally handled by the customer into its own production processes. The customer now receives a tailor-made solution right off the rack at a competitive price. The addition to the procurement costs, the BL compact solution can provide impress with further savings in processing costs. Compared to hybrid fieldbus systems, storage is easier because space no longer has to be reserved for each individual I/O module, including the gateway. Furthermore, a module that is precisely tailored to the application can be installed without engineering or assembly work, which above all results in a time advantage particularly with the use of numerous fieldbus stations. The use of new modules will pay off anywhere that new I/Os are to be integrated into existing control system solutions in the foreseeable future.

26 variations to start with

The Profibus DP and DeviceNet bus protocols used most often in production automation will initially support 26 different housing and connection configurations at the time of market launch in November. In the future, Turck will offer CANopen and Ethernet-based I/O solutions (Modbus/TCP and EtherNet/IP) in this design. Due to the modular concept, the customer can also have tailor-made I/O block

BL compact is based on Turck's tried-and-true BL67 I/O system and combines the electronics of different BL67 modules into a fully encapsulated housing

modules assembled. And should the market require certain module combinations that are not yet part of the portfolio, Turck can assemble these in just a few weeks.

Even intelligent actuators and sensors, such as valve clusters or optical sensors via an I/O link interface, will be installed in the future using BL compact. With the inclusion of this interface in the BL compact product family, Turck is not only rounding off its comprehensive fieldbus portfolio, but also highlighting its claim as a competent solution partner that offers its customers complete automation strategies. From a multitude of pressure, ultrasound or temperature sensors to flexible interface modules from the BL compact series, end users can rely on complete I/O link solutions from Turck.

Summary

With the BL compact rugged I/O block module series, Turck has created an easy-to-install low-maintenance fieldbus solution that allows users to fully exploit newly emerging automation potentials in rugged industrial environments and to increase their machine capacity based on highly compatible and simple to integrate I/O stations.

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Author

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Christian Wolf promises Turck customers more time for the essentials

"Understanding the Automation Environment"

KEM editor Denise Froehlich spoke with Christian Wolf, Managing Director of the Turck Group, about the positioning of the automation specialist company

Mr Wolf, Turck was founded in the sixties. What does Turck stand for today?

Turck has transformed itself from a conventional supplier of sensor components to a supplier of complete automation solutions. Our business is not only to understand the single application, but also the automation environment. This in turn enables us to reduce the "time" factor for the customer. For this you need to understand the automation periphery, you need to know which control tasks are required by the customer and how these have to be networked. We see ourselves as solution partners for our customers, both in factory and in process automation, because we offer complete signal processing solutions.

Which products provide the actual solutions?

In factory automation, our range of products covers the fields of sensor, fieldbus and connection technology, right up to complete solutions such as RFID, which are also available with compact controllers in the form of programmable gateways. In process automation, we are developing the links between control systems and field devices in all their variants, from point-to-point, to point-to-bus, right up to bus-to-bus processing, i.e. interface, remote I/O and fieldbus technology. In addition to interface technology, such as isolating switching amplifiers or analog data transmitters, Turck offers remote I/O systems for zones 1 and 2, as well as fieldbus solutions for Profibus PA, Foundation Fieldbus, HSE and HART.

The Turck Group has a very decentralized structure. Which areas are the individual sites responsible for?

While Turck has a decentralized structure worldwide, it also has an integrated system of management. At the same time, every location is charged with a high degree of individual responsibility: The local management has a high degree of self responsibility and utilizes control mechanisms – always with the aim of encouraging an entrepreneurial mindset within the company. Each general manager is responsible for their own profit and loss account. This decentralized structure is particularly important for overseas companies, because these companies best understand their respective markets. The German management has the task of implementing the overall strategy with the general managers locally. In our view, it is critical not to impose a global strategy on

national subsidiaries without taking local requirements into account.

Doesn't this kind of division give rise to lengthy decision processes? Is it still possible to respond flexibly?

On the contrary. The decision is made where it belongs, exactly on location. In this respect, we follow the principles of a lean organization: The individual general managers are free to act as required in the local implementation of the strategy, even in key areas. For example, it is not possible to promote the fieldbus everywhere because the degree of automation is not so strongly developed in certain countries and regions. In other markets and regions, sensor technology is subject to enormous price pressure, and customers require an all-round automation partner from the start. This is a requirement we have to meet in order to make a quick return on investment.

Turck generates around 30 percent of its sales in the automotive industry which is considered the "Rolls Royce" of the automation sector. How do you manage to be one of the top suppliers?

The only way is by very close customer contact. One part of the business is standard, for example conventional inductive M12 sensors, where large volumes are required. However, the most exciting areas naturally involve special applications on robots or on the painting line where intricate tasks have to be solved. With the automotive customer, the distinction is between companies who are development partners and those who are just component suppliers.

RFID is a key area at Turck. According to your own statements, you have made the most advances in this field. What does this mean in real terms and what are the future trends?

Our RFID activities concentrate exclusively on industrial applications. We have no intention of penetrating the consumer sectors, but aim to focus on the automotive industry, machine building, the packaging industry and industrial logistics. For this we have developed rugged components such as tags, write/read heads and interface devices which we have integrated directly in a modular fieldbus system. This means that the RFID processing is implemented directly with a fieldbus coupler. This is located on the fieldbus level in close proximity to the controller.

Right from the start, we have been able to offer our high temperature tag for the automotive industry, a product that previously never existed. This tag can even be run through paint lines at temperatures up to 210 degrees Celsius. Our RFID offering began with the 13.56 Megahertz technology, and we are currently working with UHF technology, as well as the 125 kHz solutions, in order to round off our product portfolio. As far as write/read heads are concerned, we are continuously offering new designs that are optimized for applications, such as for roller conveyors. We also offer a higher level of integration in the existing automation environment.

Turck invests around 10 percent of its sales in R&D. What are the other challenges that you face?

We intend to gain a firmer foothold in the field of pressure, temperature and flow sensors, especially in the machine building sector. We also intend to make further developments in the field of linear position sensors, and also in the field of analog measuring. Bus technology allows us to develop further as a solution supplier, penetrating the control technology sector, as well as in the field of industrial identification. IT and automation technology will continue to merge even further, and this is something we must take into account within our strategy. A high R&D investment is very important for us. If you want to maintain an innovation edge, you have to remain one of the top 3 suppliers in each market segment. We manufacture around 70 percent of our products in Germany. If you are number 5 or 6 in the market, this is not very attractive and does not guarantee double-digit annual growth. In the USA, we are market leaders in inductive sensors and connectivity solutions. In China, we are also market leaders in these areas and are now already the number 2 in fieldbus technology. We need to expand this further since this is where the largest automation markets outside Europe are to be found. The outcome of the struggles for new markets, such as in Russia, India, Brazil or the Middle East will be critical. We have already taken a leading position in Eastern Europe because we started at a very early stage. However, it must also be said that our aim to penetrate overseas markets is also based on our intention of strengthening our activities at home in Germany.

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"For us, it's not just about understanding individual application of the sensor, rather the automation environment. This, in turn, enables us to reduce the "time" factor for the customer."

Christian Wolf

"A high R&D investment is very important for us. If you want to maintain an innovation edge, you have to remain one of the top 3 suppliers in each market segment."

Christian Wolf

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Over thirty years of experience has led Turck USA to become a market leader in inductive sensor and connection technology

Providing Solutions for Challenging Applications

Turck USA has a rich history of customizing solutions to meet customers‘ expectations, while also providing excellent customer service and quick delivery

In today's competitive business world, customers are looking for more than just off-the-shelf products. They are looking for solutions that will add value to their applications, while promoting efficient and cost effective operations. The response from suppliers has been to work closely with customers to find solutions that are ideally suited to their application requirements. "A supplier can provide unmatched value by collaborating directly with the customer to provide expertise beyond the product level. This leads to greater visibility of the processes and a more holistic view of the application at hand," says Jeff Osterhues, Vice President of Marketing for Turck USA. "This is what Turck understands: How to add value to our customers, and that's how we've set up our organizational structure."

Customer focus

No two days are alike for the 500-plus employees at Turck USA's offices. These employees work out of two facilities – one dedicated to sales and marketing and the other to manufacturing – located the city of Plymouth, recently named by Money Magazine as the No. 1 place to live in the United States. The company that began operations in the United

Turck employs the highest manufacturing standards and advanced technology to produce both standard and custom products

Quick read

Turck tailors solutions specifically to a customer's applications to bring added value to their operations. Dedication to customer satisfaction and a focus on direct support and fast delivery times has led to Turck's success over the past 30 years.

On average Turck USA manufactures 9,000 products a day at its 7,000 m2 production site in Minneapolis (Minnesota)

"In terms of personnel and structure our organization is capable of promptly solving customer problems at all times."

Dave A. Lagerstrom, President & CEO, Turck USA

States over 30 years ago is now a thriving multimillion dollar business that still prides itself, first and foremost, on dedication to the customer.

Dedication to quality

This dedication is evident by the thousands of channel partner salespeople that hit the streets every day demonstrating Turck solutions and ensuring that customers' needs are fully understood and expectations are met. "Turck channel partners know that they can contact any of Turck's seasoned application engineers for assistance in designating product for a particular application, but they also know that Turck works hard to fulfill customer requests – even if it means designing a custom solution," says Jeff Ursell, Vice President of Sales for Turck USA.

This is precisely what happened when a channel partner uncovered a challenging application involving RFID. Turck business development managers and product engineers, along with the channel partner, visited the customer site to learn more about the application requirements, and helped conceptualize an RFID system that included custom RFID tags. The design concepts were then brought to Turck's R&D group, consisting of 25 engineers and drafters, that worked with Turck's product management to design a beneficial and cost-effective solution. When prototypes were completed, they were sent to the customer for final approval. The speed and initiative exhibited by Turck personnel, along with the efficiency of Turck's manufacturing operations and the assurance that even their custom-made tags could be delivered quickly, were key attributes in meeting the customers' expectations. Turck was then able to leverage its expertise to provide other solutions, including sensors, cordsets and network I/O.

Fast response

On an average day, Turck USA manufactures 9,000 products, utilizing the talents of employees in manufacturing, logistics, quality assurance and engineering in its 79,000 square foot production facility. "When an order enters the production schedule, regardless of whether it is a standard or custom product, it is processed and shipped within our standard lead time parameters," notes Guido Frohnhaus, Vice President of Technology at Turck. "We implemented a fast track design and modification system so that engineers in R&D and manufacturing are able to efficiently create new or modified products that are ready for production in less than

The Minneapolis production facility delivers high-quality goods in the shortest possible time

Manual skill backed up by computers

one week." Utilizing this system allows Turck USA to issue over 200 new part numbers each week, and has led to much faster delivery dates than competitors. Adds Frohnhaus, "To enhance our flexibility and speed to market even further, a new state-of-the-art tool, die and molding operation was established in 2008." All of these capabilities lead to successful production – quickly and to customer specifications.

Turck's customer focus, ability to react quickly and provide innovative solutions has resulted in a loyal customer following that grows on a daily basis. "We've changed the way we think about manufacturing to provide individual attention to our customers to better meet their application demands," says Dave Lagerstrom, President and CEO of Turck USA. "We understand the economic constraints manufacturers are currently experiencing, and have designed our processes to build custom solutions that may be ordered in small quantities. This allows our customers to customize an off-the-shelf solution at Turck without having it modified elsewhere, effectively removing a step from the supply chain and resulting in a major cost savings. This is also what makes Turck different than our competitors." Combine this with direct support, product flexibility and fast delivery times, and Turck truly is your total solutions provider.

▶ Webcode **more20840u**

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In Turck's BL ident RFID system, interference-free HF and far-ranging UHF technology can be used simultaneously

Freedom of Choice

The expanded BL ident RFID system permits customized identification solutions for production and logistics processes

While RFID has been used in industrial production in only a number of systems over the last two decades, today, the contact-free identification technology has become more and more of a standard in production technology. The development of different technologies and standards has contributed to this increase considerably. In the beginning, in addition to proprietary solutions (frequencies around 1.5 MHz), only systems with 125 or 250 kHz were used as the open standard. However, users are now spoiled for choice between numerous frequencies. Each has its specific strengths for certain applications.

Production example: In the candy machines from Winkler and Dünnebier, RFID guarantees that there is an overview of all forms used at all times

Logistics example: The RFID system ensures transparency in the organization and the consignment of goods at the Brax-Leineweber Logistics Center

Different frequency ranges

The single standard frequencies – the only ones for years - in the range of 125 and 250 kHz were most familiar to manufacturers because almost every inductive sensor had been working in this frequency range for decades. The limited selection made it easy for many users to make the "right" choice, even if compromises were necessary in the process. Today, RFID systems function in a range from 125 kHz to 13.56 and 433 MHz - even up to 5.8 GHz in accordance to the most varying standards. This makes selecting RFID much more difficult and requires considerable technical expertise. All of these variations are justified – depending on the respective application. For the right selection, the user or system integrator should take a close look at the application in order to decide which system is the right one. Depending on the frequency, there are different criteria that have to be observed.

First of all, if you take a look at the ratio between the maximum transmission power permitted and the possible disruptive factors, the decision lies in selecting high frequencies in order to avoid possible mutual influence. In this case, we are referring to solutions in the UHF range between 400 and 900 MHz, as well as in the microwave range with 2.45 and 5.8 GHz. Depending on the design, the high frequencies can permit ranges of up to 100 m.

Long range has limitations

In the case of many applications, however, high frequencies lead to considerable difficulties. Therefore, the higher the frequency, the more energy is absorbed through the polar fluids, such as water (that is precisely why a microwave oven is ideal for heating up). This means its use in the food and beverage production - or better said, anywhere where moisture develops – is considerably limited or even impossible.

Other problems could occur in a metal environment. Here, the waves are reflected and partially bundled so that the originally desired data carrier card reader is shifted physically and fragmented which can lead to incorrect readings due to falsely addressed data carriers. Systems in the HF range (13.56 MHz) are clearly advantageous in this case. They may offer ranges of "only" a maximum of 100 cm, however, they are largely insensitive to moisture. The absorption of field energy through a metallic environment does have an adverse effect on these frequencies, but some designs, including the one by Turck, provide data carriers that are equipped with ferrite foils and can be mounted directly onto the metal. Alternatively, it is sufficient to mount conventional data carriers with sufficient distance to the metal (minimum 20 to 30 mm).

Systems in the 125 kHz range can be used particularly effectively in a metallic environment. Here, there are even a few special designs that can be used to read out and write the data carrier straight through the metal. The disadvantage with these systems, however, is the low fluctuation voltage distance

Quick read

RFID systems offer many options for handling logistics and production processes more efficiently – if the system is working in the frequency range that is optimal for the application. With the current expansions of its modular BL ident RFID Systems, Turck now permits parallel use of interference-free HF and far-ranging UHF technology.

Data carriers for special uses at high temperatures in engine production, in autoclaves and on metal (from left)

because many emissions in the industrial environment occur in this frequency range. Thus, many inductive sensors work with similar frequencies and with the same outputs, which can lead to the stronger one winning out.

Another disadvantage of the LF systems is the relatively low transmission rate. For fast applications or so-called "on-the-fly" read and write operations, in which the processes are executed in motion, these systems can only be used to a very limited extent. In order to be able to realize extremely short cycle times and high processing speeds, the data carrier must be wrote and read in the shortest time possible. For such applications, systems in the 13.56MHz range are indispensable. Due to the higher frequency, considerably more information can be modulated on the carrier wave so that the volume of the data to be transferred per second increases.

BL ident combines frequencies

The designs show that the selection of an appropriate RFID system is not trivial for certain applications. If different requirements are to be combined, up to now, the user frequently had to be satisfied with compromises. With the current expansion of its BL ident RFID systems, Turck is now offering the option of combining the benefits of HF and the UHF technology into one system. The kicker: An expensive configuration is not necessary for parallel operation; it is sufficient, for example, to connect a UHF reading head to an existing HF system. The considerably increased range of up to three meters expands the application spectrum enormously. If BL ident has been primarily used for production control, the large ranges and the ability to detect groups now also permit its efficient use in distribution and logistics, as well as in the entire supply chain management. At the SPS/IPC/Drives trade show in Nuremberg, Turck introduced the first two UHF read heads, measuring 260 x 260 mm for ranges up to three meters, as well as 80 x 80 mm for ranges up to one meter.

Universal RFID components

The option of being able to use a second frequency, in addition to the 13.56 MHz frequency optimal for industrial production processes, is the result of the continual advancement of the BL ident package in close collaboration with the customer. The RFID system launched in April 2006

RFID frequency and areas of application

Frequency type	Frequency range	Range	Areas of application
LF low frequency	100-135 kHz	up to 2 m	Logistics, access control, distribution, animal identification
HF high frequency	13.56 MHz	up to 1 m	Logistics, intralogistics, packages, high frequency packaging, automotive, production, automation
UHF ultra high frequency	865-868 MHz (Europe) 902-928 MHz (USA)	up to 10 m	Automotive, production, goods logistics, EPC code automation
Microwave	2.45 GHz	up to 12 m (passive) up to 100 m (active)	Automobile toll systems

The BL ident RFID system can be easily integrated into the automation structure via the BL67, BL20 and BL compact I/O systems

has been routinely expanded with application-specific modules that provide users with the solution to their identification issues.

For example, in addition to standard data carriers for temperatures up to 120 °C, Turck data carriers are available for up to 210 °C. This means that the data carriers can accompany a skid through the oven during the paint baking phase in automobile production. Additional special solutions are available for use in autoclaves. The screw-in data carriers withstand the combination of heat, moisture and pressure. Among the newest developments are the FRAM data carriers with a memory of 8 kbyte, as well as data carriers that can be mounted on metal.

BL ident provides an extensive selection of standard read-write heads, ranging from a sensor housing to application-specific solutions, like for use in gravity roller conveyors. The Q80 fits precisely in the space between the rollers of an 80 cm wide standard roller conveyor. The Q80 can also handle "group detection," in other words, it is able to identify numerous data carriers simultaneously.

The BL ident product family is based on the modular I/O systems: BL67, BL compact and BL20C, and consists of connection technology and gateways in addition to data carriers and read-write heads. Thanks to its modular design, the RFID system can be easily integrated into existing Turck I/O solutions. Depending on the expansion phase, two, four, six or eight channels are available. Fieldbus interfaces are available for Profibus DP, DeviceNet, EtherNet/IP, PROFINET I/O and Modbus TCP.

Compact control in gateway

As an expansion to the interface components, Turck is offering programmable gateways. The compact control systems can be programmed in accordance to IEC 61131-3 with CoDeSys and support the growing demand for decentralized automation solutions. The heart of the gateway is a 32-bit RISC processor with 512 kbyte program memory, which processes 1,000 AWL commands in less than a millisecond. As a programming interface, an RS232 interface is also available in addition to the 10/100 Mbit Ethernet.

With its "intelligence," the gateway relieves the higher-level control system because the RFID communication can be entirely handled directly in the gateway. The functional component necessary for SPS (Proxy Ident Block) is listed on site in the programmable gateway. With the higher-level control system, only the user data has to be replaced.

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Author

Walther Hein is RFID Product Manager at Turck Germany

In the modular expandable automated production equipment from Gefasoft, Turck's BL ident RFID system ensures transparent production processes

Keeping Records

Turck's RFID solution BL ident documents the correct production process in the automated loading and unloading system from Gefasoft

"We used the first RFID systems in 2000 in car body manufacturing at BMW and for VDO Siemens," says Harald Grünbauer, CEO of Gefasoft Automatisierung und Software GmbH in Regensburg, Germany. "We have adopted the use of this technology, right from the start, because in our work, wireless identification is often an ideal addition," emphasizes Grünbauer.

Within the Gefasoft Group, the Regensburg subsidiary is responsible for development, production and sales of complex control systems that are primarily used in the automobile and semiconductor industry. The company also manufactures assembly and automated measuring equipment. Besides RFID, core competencies here include applications with modern image processing and laser systems.

Modular assembly system

For a well-known customer from the semiconductor industry, the specialists from Regensburg have developed an automated loading and unloading system for the manufacturing of multi-chip modules. This system links numerous wire bonders and simultaneously handles quality control of the bonded chip modules. The machine has a modular design and consists of one loading and unloading module with three magazine handling stations, transfer paths on the wire bonder, as well as the transverse and reverse transport routes for the parts carrier. Before handlers transfer the processed chip modules to the good parts magazine, they are checked for correct wiring using RFID and image processing. A reject parts punch marks the defective parts with a hole on a determined position.

Challenge: Project engineer Markus Müller had to house the data carrier in the metal of the part

The loading and unloading station is the heart of the Gefasoft system

The data carrier shows each process step that has been taken or is still outstanding

The parts carrier and the corresponding stations are equipped with the BL ident RFID system from Turck, which is connected to the plant's control system via Profibus DP. Overall, six read and write points are currently integrated in the system: one on the ramp of the loading area, one on each in the maintenance positions in front of the three wire bonders, one with the transverse transport and one in front of the reject part punch. "In the system expansion phase that is now complete, we could also have handled the identification of the parts carrier with alternative technologies," explains CEO Grünbauer, "but precisely because of the modularity and expansion capability of the

Quick read

As a specialist for manufacturing automation, image processing and identification, Gefasoft has made a name for itself among the major manufacturers in the automotive and semiconductor industry. In its use of RFID, the Regensburg-based company also has many years of experience with systems from different manufacturers – and now prefer to use BL ident from Turck for its assembly and automated measuring equipment.

"With what we have experienced, we will also use the RFID solution from Turck in our systems in the future"
Harald Grünbauer, Gefasoft

The complete placement and processing of parts is documented on the data carrier (in the photo under the yellow read-write head) in the parts carrier

system, we decided in favor of the RFID technology. It means that the system can be easily upgraded."

Data carriers in metal

Before making the decision to go with the BL ident system, project engineer Markus Müller tested numerous solutions from several suppliers. "I was very excited at how stably the Turck system operated," explains Müller. "The other systems had continual difficulties both with regard to connecting to the controller, as well as with the stability." One reason for the problems could have been the unusual positioning of the data carrier directly in the metal of the parts carrier. For stability reasons, it could only be made of steel with a hardened surface.

"We have a metal contact between the parts carrier and the data carrier. This should not actually be the case, but due to general construction conditions, the data carrier could not be mounted on its own nor positioned otherwise. And our tests showed that the Turck system had no problem with this issue, it functioned on the first go," explains Müller happily. Turck now offers special data carriers for installation on or in metal. The system has now been working for almost one year in double and triple shift operation and there have not yet been any outages.

Documentation of the process steps

Gefasoft uses the RFID technology in order to document all process steps directly on the parts carrier. The first read-write location is located on the outlet of the loading machine. Here, the data carrier receives information as to whether all designated components were successfully mounted and can be further processed. If the four points in the parts carrier are properly filled, the content of the data carrier is added so it includes the processing release. Information concerning the successful or unsuccessful processing of each component is added on the following processing stations. Finally, on the last RFID station, the data is exported and the individual parts are forwarded by the operator either to the good parts magazine or the reject parts punch, depending on their classification on the data carrier. The production data is archived per batch in a report file.

Summary

For its automated production systems, Gefasoft searched for a stable RFID system that has a modular and expandable design and is easy to connect to the control system. With BL ident from Turck, the Regensburg specialists found a system that meets all the requirements. BL ident was even able to master the challenge of mounting the data carrier. For Harald Grünbauer, reason enough to continue building on BL ident. "With what we have experienced, we will also use the RFID solution from Turck in our systems in the future," promises the CEO.

Author

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TURCK

YOUR **AUTOMATION SOLUTIONS** PROVIDER

DETECTION SENSORS

CORDSETS

I/O STATIONS

INSTRUMENTATION

RFID

INTERFACE MODULES

CUSTOM CONNECTIVITY

MEASUREMENT

ENCODERS

TURCK's **global support** network consists of over 2,800 employees in 27 countries and 60 exclusive agencies worldwide that strive to meet customer expectations. Our sales, support and manufacturing facilities are strategically located across the world allowing us to respond to local market conditions and deliver customer specific solutions on a timely basis.

We are a world leader in **automation technology** with a diverse and broad product portfolio that provides customer specific applications with high performance, reliable and cost effective solutions. The synergy in our product portfolio and customization flexibility are key components of our value proposition.

Our expertise spans across two major industry categories: **Industrial Automation** and **Process Automation**. Each weighs in with its own unique requirements and methods of conducting business. This market centric approach ensures that we develop application specific solutions across a variety of vertical market segments.

Each parts carrier on the overhead track is equipped with a high temperature tag

Just-in-Time

Volvo supplier Tower Automotive increases production with high temperature BL ident RFID system

Since 2004, Tower Automotive has been operating a production facility just 3 kilometers away from the Volvo production facility in the Belgian city of Ghent. It produces parts for the V50 and S40 Volvo models and delivers them directly to Volvo's production facility. Molded parts are delivered by rail from Sweden and then combined in Ghent to form flooring, roofs and suspension components, as well as doors and trunk lids, mainly through welding. The facility has a production capacity of 220,000 parts per year.

"We produce parts for about 700 cars that are delivered to the Volvo facility every day," says Luc Willems, maintenance engineer at Tower Automotive. "Our production is set up for minimum storage and warehousing. We always have to have a sufficient reserve of parts for a production period of 6 hours; overall our warehouse can store a reserve for a maximum of 18 hours." The Volvo parts are transported by trucks that make about 70 deliveries per day. In order to guarantee the necessary flexibility and punctual "Just-in-Time" deliveries, the company must ensure that production runs reliably. To this end, production is primarily automated using more than 180 ABB robots.

Quick read

Tower Automotive ranks among the largest independent auto suppliers in the world. Its factory in Ghent, Belgium, that delivers molded parts to the neighboring Volvo factory, had been looking for a new RFID system that would finally make zero-error identification possible – and found one.

Thanks to the Turck RFID system, Tower Automotive was not only able to increase production at the same cost, but also make it more reliable

RFID modules are integrated into the automation network at Tower Automotive via the BL67 I/O system with PROFIBUS gateway

In a heavily automated facility like that of Tower Automotive in Ghent, the speed of the internal conveyor chain contributes considerably to an efficient production process. Important to this is transparent production, what we call "tracking & tracing". Planners at Tower Automotive planned for this task by installing RFID. The system first used, however, had an error rate of 0.5 percent per shift, which was not acceptable, so a new solution had to be found. "The biggest challenge in our process are the extremely high temperatures that many RFID systems have trouble with," explains Willems. "The parts equipped with tags are ultimately supposed to go through ovens operating at 180 °C. This begs the question of what happens to the electronics of the RFID tags under these extreme temperatures."

High temperature challenge

After researching the market for suitable products, the decision-makers at Tower Automotive went for the BL ident RFID system from Turck, which can withstand extreme temperatures of -40 to +210°C. "In addition to temperature resistance, a deciding factor for us was that BL ident is an open system that can work independently of a PLC and was developed particularly for industrial automation," comments Willems. BL ident works with a frequency of 13.56 MHz. "This worldwide standard on a very high, low-noise frequency fit perfectly in the concept of the entire system."

After negative experiences with the first system, the Turck solution was thoroughly tested in advance. "As part of the testing process, we hung the tags for ten days in an oven at 180 °C. Even after this hardness test, the system functioned perfectly," describes Willems. And while other solutions first had to cool down, the Turck tags can be read and written directly after leaving the oven. For the heat-resistant tags, Turck developed a special housing that is easy to assemble and disassemble. Turck guarantees a service life of ten years if its products are used in accordance to the specifications. Currently, a total of 240 tags are in use at Tower Automotive.

BL ident is an open system that can communicate with all traditional fieldbuses. Turck offers interfaces for PROFIBUS DP, DeviceNet, Modbus TCP, Profinet and EtherNet/IP. Each interface has its own data memory and adapts automatically to the respective application. Due to its modular design, a BL ident station with 2, 4, 6 or 8 channels can be used. The RFID modules can also be additionally adjusted in terms of software so that each channel works with a read/write head separately in parallel/multiplex mode. This is particularly important for applications where two read/write heads are located very closely to one another, like when a conveyor chain splits into several chains.

Increase in efficiency

Adds Willems, "Where many traditional RFID systems only permit static writing and reading, with the BL ident system, both reading and writing are possible while the tags are in motion (on the fly). This issue was important to us." The FRAM memory (ferro-magnetic RAM) used in the factory make faster data transmission possible and requires very little maintenance. Depending on the tag and the data volume, the BL ident system can process read and write cycles at a speed of 10 m/s. "We were able to reduce the read-write time per station by almost two seconds using the FRAM tags, which enabled us to speed up the conveyor chain – because stops for reading and writing are no longer necessary," resumes Willems, "this naturally resulted in higher production."

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"We were able to reduce the read-write time per station by almost two seconds using the FRAM tags, which enabled us to speed up the conveyor chain because stops for reading and writing are no longer necessary."

Luc Willems, Tower Automotive

Author

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Energy for the Olympics: In the Beijing-Guanting wind park, 43 wind turbines are in operation that were built by VENSYS Energy AG in Saarland, Germany – using inductive uprox+ sensors

Nose to the Wind

uprox+ sensors control the rotor position on VENSYS wind turbines

During the Olympic Summer Games in August 2008, China appeared as an environmentally-friendly host. In addition to the use of solar energy and terrestrial heat, the organizers relied primarily on wind energy, which alone was intended to cover 20 percent of the energy demand of all Olympic event facilities. The electricity is generated in the Beijing-Guanting Wind Park where 43 wind turbines from Chinese wind energy market leader Goldwind are in operation. The wind turbines are provided by VENSYS Energy AG produced 7,000 km away in the city of Saarland, Germany.

Worldwide growth

VENSYS wind turbines that were built and tested in Saarbrücken, Germany, are currently turning in the Canadian Higgins Mountain Wind Plant, as well as in the German city of Grevenbroich. This year alone, Chinese partner Goldwind is planning to put three plants into operation with more than 1,000 wind turbines. Other licensees are implementing innovative development ideas in Brazil, India, the Czech Republic and Spain.

The market opportunities for VENSYS wind turbines are particularly lucrative because the generator design and construction allows for sufficient wind production even in low wind regions, believes Board member Dietmar Knuenz. The exciter field is generated by the permanent magnets made of neodymium-iron-boron (NdFeB) attached directly on the rotor shaft. Therefore, energy normally used to excite the rotor can now be sent to the grid. “In the design of our wind turbines, we rely on constant part reduction by limiting turbine construction to a few high quality and tested components,” explains Knuenz. “The VENSYS generator fulfills all the functions of the classic drive train. We no longer use high-maintenance components that are prone to malfunction, such as transmissions, intermediate shaft and couplings. By using permanent magnets, we no longer need excitation coils, slip ring transmission and DC generation.” The pitch drive with low-wear toothed belts led to further savings, making lubrication and sealing redundant.

VENSYS Energy AG does not only set new standards when it comes to reliability and maintenance-

Quick read

With an innovative generator design, the Saarland-based VENSYS Energy AG made it all the way to Beijing. For the Summer Olympic Games, 43 VENSYS wind turbines – built by the Chinese licensing partner Goldwind – provided environmentally friendly electricity. To achieve this, uprox+ sensors from Turck guaranteed a consistently optimal rotor position.

All VENSYS plants have a second method of independently recording the rotor speed: It involves two uprox+ sensors working together with a toothed washer

Two uprox+ sensors record a special cam to reliably determine the current position of the blade angle

friendliness, it makes no compromises in terms of safety. With regard to safety, the pitch control system is among the most important components of a wind turbine. The system measures, monitors and controls the working angle of the rotor blades on a wind turbine which can change the power consumption. For example, pitch control allows the rotor blades to turn into the wind when starting up. During operation, the output can be held constant despite changing wind conditions by adjusting the working angle. However, if a storm gets up, the pitch control rotates the rotor blades automatically out of the wind in order to prevent damage.

Sensors guarantee reliability

"A malfunction can have fatal consequences," says Dr. Stephan Joeckel, Director of Electro-Technology at VENSYS. No wonder that the reliability of the measurement technology in this field is the highest priority. That is the reason why VENSYS Energy AG decided in favor of inductive sensors from Turck. In each wind turbine, six uprox+ sensors – two on each blade – simultaneously determine the precise position of the rotors. To do so, each sensor records the end position of the rotor blades. A seventh sensor determines the position of the maintenance hatch of the turbine. With the data from all the sensors, the control system then ensures that each rotor blade is in the correct position. The power is transmitted between the motor and the rotor blade via a lubricant-free and maintenance-free toothed belt. In this process, the power is distributed across several teeth, thus minimizing wear and increasing safety and reliability.

In 2007 alone, VENSYS equipped 60 wind turbines with Turck sensors without encountering any difficulties. "So far, we have only had good experiences," confirms Dr. Joeckel. "In addition to the high level of reliability, high quality and an attractive price-performance ratio, the high resistance to the high EMC was also an important factor in the decision in favor of the uprox+ sensors. Because of their direct proximity to the generator of the wind turbines and the risk of lightening, the topic of EMC plays a significant role in this application area."

Resistant and impermeable

Because wind power plants are frequently located in coastal regions with relatively high particulate concentrations, all plant components must meet particularly high requirements when it comes to impermeability. Here, too, the uprox+ series was able to score some points: In the standard design, the sensors are encapsulated in a chrome-plated brass housing with an IP68 degree of protection and meet the high requirements of the VENSYS developers.

Sensors that are to be used in offshore plants out on the open sea have to be even more resistant to aggressive salty and moist air. While those types of VENSYS wind parks have not yet been developed, the Turck sensors are already best prepared for such a scenario. Even today, uprox+ sensors with enormously resistant and especially impermeable stainless steel housings are being used in the food industry where they have successfully withstood aggressive cleansing agents for years.

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"In addition to the high level of reliability, high quality and an attractive price-performance ratio, the high resistance to the high EMC was also an important factor in the decision in favor of the uprox+ sensors."

Dr. Stephan Joeckel, VENSYS

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Markus Renner is a Sales Specialist at Turck Germany

The vacuum traverse from Lubas can lift and move steel sheets weighing thousands of tons

Weight Lifter Extraordinaire

BL 67 I/O system and PS pressure sensors guarantee that the 15 t vacuum lifting systems from Lubas operate reliably

Twenty meters long, almost 5 meters wide and weighing thousands of tons due to their size and weight, the centimeter-thick steel plates produced and processed in steel mills do not necessarily rank among the things that conventional lifting systems are able to move. In order to be able to safely and comfortably maneuver these steel sheets, powerful solutions from specialist companies are required. Among these specialists is Lubas, a German machine and equipment manufacturer that has made a name for itself when it comes to vacuum lifting systems for extremely heavy loads.

"Our core business involves crossbeams for weights starting at 5,000 kilograms. But we have also built a crossbeam for a steel mill that can lift steel sheets weighing up to 32 tons," explains Alexia Bockermann, who is responsible for electro-technical planning and installation at Lubas. "There are very few companies in Germany that can build lifting equipment of this magnitude." According to Bockermann, however, the company is unique in Germany because of its high vertical range of manufacturing. What distinguishes Lubas: From steel construction planning to steel girder construction, valve engineering and vacuum vulcanization and electronics,

53 pressure sensors and two BL67 I/O fieldbus stations process the signals from each individual vacuum suction cup

almost all essential services are provided by this one company.

Among the most powerful mass-produced lifting machines from the Lubas product line are the models from the UniTravMega series, which can lift and transport large-scale sheets up to 18 meters long and weighing over 25 tons. Lubas is currently constructing two UniTravMega crossbeams with a lifting capacity of 15 tons each. These crossbeams are equipped with over 51 large vacuum suction cups arranged in 3 rows and attached to a massive weight-bearing body. The vacuum of each individual suction cup is recorded by Turck pressure sensors from the PS series and shown directly on site via the display. Lubas has installed two BL67 I/O stations to record and forward the measured values to the controller.

Temperatures in the limit range

The sheer weight of the steel sheets to be transported is not the only challenge faced by the vacuum lifting systems from this machine manufacturer. When it comes to compensating for the oversized sheets, meaning re-heating in industrial ovens and subsequent specific quenching in cold water, temperatures of over 200 °C develop directly on the sheets. These temperatures can damage not only the vacuum suction cups, the steel structure, but also the hose connections and the overall electronics of the lifting systems if they are operated too long without protection. While the special vulcanized elastomers of the vacuum suction cups can withstand temperatures of up to 250 °C, the electronics built into the top side of the steel structure are considerably more sensitive. “It isn’t just that the crossbeam is permanently positioned above the broiling hot sheets, but you have to account for an average temperature of 60 to 70 °C,” explains Bockermann. “This already places a high demand on the electronics.”

For this special environment, Turck has provided the right solution with the BL67 remote I/O station and pressure sensors from the PS series. “We are building the decentralized concept with the BL67 stations for the first time. We used to do everything using terminal boxes in the control cabinet. Rapid installation using M12 plug-in connectors and electronics modules is a considerable advantage,” says Bockermann, when explaining the company’s decision to use Turck products. The compact fieldbus stations are an additional advantage: For the BL67, Turck also offers Ethernet gateways that can be used to connect the lifting systems to the operator‘s company network. “This gives our customers the opportunity to monitor via their own company network how many tons the crane has moved or how many pipes have gone into production.”

Both BL67 stations used in the UniTravMega record the signals from the 53 pressure sensors installed above the vacuum suction cups. Their pivot and swivel displays make it possible to easily and directly check each individual vacuum suction cup and conveniently program them using only 3 push buttons, this makes laptops or other external programming devices redundant. “For security and maintenance of the crossbeam, it is very important to see whether a vacuum is established on each suction cup. Without the pressure sensors and the displays, each suction cup would have to be checked using a test plate. The customer can spare this expense and effort using pressure sensors,” explains Bockermann.

In addition to its impressive sensor and fieldbus solutions, Turck’s excellent customer service played a central role in the cooperation between Lubas and the Mülheim-based automation specialists. Confirms Bockermann, “we wanted to avoid suppliers who go by the motto ‘sell the product and forget the customer’. With Turck, we know that we can get help at any time in case of problems.”

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“We wanted to avoid suppliers who go by the motto ‘sell the product and forget the customer’. With Turck, we know that we can get help at any time in case of problems.”

Alexia Bockermann, Lubas

▶ Quick read

Vacuum crossbeams from Lubas lift heavy steel that other lifting systems had to give up on long ago. With two modular BL67 fieldbus stations and 53 pressure sensors from the PS series, Turck has developed both a rugged and easy solution that monitors the vacuum of any suction system.

Author

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Quantum Tubers mini-tubers plant growth is monitored in a lab setting to ensure a controlled atmosphere

Exponential Growth

Wisconsin seed potato producer uses Turck technology to slash propagation time

You may not know that the potatoes you enjoy for dinner this evening took six to eight years to land on your plate. There are thousands of varieties of potatoes. Characteristics like size, color, solid-matter content and starch type can all vary depending on potato type, and are appealing to producers and consumers for their respective characteristics. For instance, some varieties are more desirable for the production of French fries or potato chips, while other varieties are best served as baked or mashed at dinner. It can take decades to bring a new variety of potato to the consumer market. In fact, it can take five to seven years just to produce the amount of seed needed for a potato farmer to grow his crop to support a commercial demand. Thanks to a company in Wisconsin, all of this is about to change.

Quantum Tubers Corporation, www.quantumtubers.com, has spent the past ten years developing a methodology for creating minitubers for seed potatoes that can be produced with drastically shortened propagation times and, consequently, lower produc-

Turck representative Larry Jacob helped Quantum Tubers design a custom-made relay panel

Turck's modular BL67 remote I/O system is used to monitor Quantum Tubers' proprietary biomanufacturing system

tion costs. Quantum Tubers' patented technology was developed in conjunction with NASA, and also the University of Wisconsin's Plant Pathology Department utilizing their greenhouse and Biotron facilities to provide isolation and controlled atmosphere conditions for growing minitubers. This research resulted in a methodology that produces viable minitubers as a pathogen-free seed source year round in an intensive culture of high-density sterile stem-cuttings in a soilless media. What does this mean? Instead of spending years propagating seed potatoes that will be susceptible to degradation and pathogens (due to tubers being repeatedly recycled for seed), a new variety of seed potato can be ready for the commercial market in as little as two years. The minitubers are planted in open field conditions to directly propagate pathogen-controlled seed stock tubers, effectively skipping several generations of costly field multiplications. The Quantum Tubers technology is designed for industrial capacity in large scale commercial production using a proprietary system of biomanufacturing.

Quick read

A lot more goes into seed potato production than most people realize. Very expensive and very long propagation times have been drastically reduced by Quantum Tubers – with the help of Turck's modular BL67 remote I/O system, relays, flow sensors, power supplies, cables, and more.

Turck's digital read-out flow monitor is used to detect liquid nutrients in the Quantum Tubers system

The use of minitubers is not new to the potato industry; however, minitubers have traditionally been very expensive to produce and companies have not been able to produce the quantities needed for viable commercial market demand. To address this, Quantum Tubers developed its own proprietary automated commercial propagation system for the production of pathogen-free, nuclear stock minitubers. In this system, minitubers are harvested in 40 to 50 days depending upon variety and size requirements making it possible to harvest up to 9 crops per year. Following harvest, all tuber production is placed in induced dormancy in cold storage for future seed stock to be used by seed producers.

Precise control

What makes a commercial biomanufacturing system from Quantum Tubers so appealing is the very short generation period for the tubers. "It normally takes up to160 days to grow a potato plant. We can now do this in as little as 50 days," says Bob Britt, President and CEO of Quantum Tubers. But achieving such short production periods requires the growth conditions to be extremely precise. Factors like humidity, light, temperature and length of the day all have to be measured and monitored. To do this, Quantum Tubers has incorporated advanced technology and components into their commercial biomanufacturing systems.

Britt had been using a flow sensor to detect the amount of liquid nutrients being applied to the plants during production, but it was failing to provide the data accuracy that he was trying to achieve. While flipping through a magazine, Britt saw an advertisement for Turck USA's digital read-out flow sensor and immediately picked up the phone. After consulting with Larry Jacob of MTECH Wisconsin, Inc., a Turck representative, Britt learned that Turck's advanced flow sensor could be used to detect the liquid nutrients much more accurately than the technology Quantum Tubers had in place. The digital read out flow sensor was connected to the water supply that fed into the chambers, and proved especially useful when it detected that a solenoid switch had broken down and was draining the supply tanks.

Special designs

Britt also discovered (with the help of Jacob) how

other Turck products could help Quantum Tubers improve the processes involved in the commercial propagation system. Over the next two years, Jacob helped Britt design and implement a system specific to Quantum Tubers' commercial biomanufacturing needs that included the use of Turck's modular BL67 remote I/O system with analog input modules that obtained measurements from humidity, temperature, light, CO2 and the Turck flow sensors. Also contained in the BL67 system are digital output modules controlling fluid valve solenoids for CO2, humidity, and for adding liquids to the chambers used in the spray system. "Working with Turck saved us at least a year of development time," notes Britt.

The BL67 system is also used to control light banks, circulating fans and the cooling circuit within the propagation system. This is accomplished by both 4-point output modules and 16-point output modules interfaced through a relay panel employing Releco by Turck relays that was specifically designed for Quantum Tubers' power and space requirements. The relay panel uses both standard C10 relays for fans and the unique C10-A15X electronic lighting ballast relay capable of withstanding short duration, severe inrush currents of 125 Amps for 20 milliseconds to handle the special demands of their lighting banks. "Before using Turck products, we had a series of breakers in a 5 by 2 [foot] panel chocked full of electrical equipment, and electrical fires were not uncommon because of proximity to wet conditions" adds Britt. "Unlike BL67, the system we had before was difficult to work with and almost impossible to make any changes."

Direct support

Another feature of the system that appealed to Britt is the IP 67 rating carried by the BL67 system and many other Turck products. This allows their placement in the washdown environment that occurs in a Quantum Tubers commercial propagation system. According to Britt, "Turck has been helpful in making sure we have the right components for our system, and has been there to help us iron out all problems."

Quantum Tubers also implemented quick-disconnect cables from Turck to transfer data from the sensors to the BL67 system. This included Ethernet cables, conduit adapters, power cabling and field-wireables for fan connections, along with an IP 67 rated power supply and associated cabling. Britt adds that "Implementing this system saved us six months of hands-on time putting the system into a big box."

"The best part about the system is that it can easily be put into the hands of a 3rd party for installation, and they will be able to implement it quite easily." This factor is particularly useful in countries that have no seed potato producers and are forced to import potato seed that may contain disease from other countries. For example, if a country in Africa purchases seed that contains brown rot from another country, it can devastate their crop and severely cripple that nation's potato supply. In these situations, a country can use a Quantum Tubers' commercial biomanufacturing system to locally produce a potato variety that's tailored to its particular growing region, while ensuring that the tubers are pathogen free – and at the same time, getting new potato products to the market at a much faster rate.

What is next for a system that seemingly does it all? Quantum Tubers is now investigating the use of RFID tags to monitor the contents of growth chambers, including plant trays.

Quantum Tubers Corporation solved a really big development problem for controlling its proprietary biomanufacturing system. "Without the personalized help that Larry Jacob and his MTECH Wisconsin/Turck team provided, we would have lost countless man-hours of development time, and would not have the bullet-proof, customized controls system that we enjoy on our technology today," adds Britt.

▶ Webcode **more20860u**

Author

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Compact intelligence: The BL20 I/O System ensures not only signal distribution, but also houses the CoDeSys control software

It's all in the Coating

Programmable gateway in BL20 I/O system guarantees down-to-the-degree coating temperature control in printing machines

Whether matt black, glossy color or metallic glitter, perfect coatings on magazines, brochures or packaging is not just a matter of individual taste. They attract attention to the magazine on the shelf and give the publication a certain air of authority. The greatest challenge in working with such coatings – mostly UV or dispersion coatings – are the varying processing temperatures with which the coating has to be applied to the print material. Due to the large-volume coating containers used in the industry, the contents can only be slowly brought up to the target temperature, which is a time consuming process. In addition, the coating cools down again as it travels the often long routes between the coating container and the processing. This means that in the end it can no longer be processed in the optimal temperature range.

In a small space in the control cabinet, the Bricort system combines a touch panel with a flow path temperature control device in which the coating is heated up or cooled down

With the newly developed Bricort mobile coating temperature control device from Industrie-Automation Vertriebs-GmbH (IAV), based in Rodgau, Germany, these problems are now a thing of the past. The starting point for the development o f this product were repeated attempts by print machine manufacturers to build a device that offered considerable benefits compared to the relatively imprecise and energy-intensive method of preparing coatings, explains Guenter Jung, the technical manager of IAV. "We found that there existed among print machine manufacturers a certain pent-up demand with regard to coating temperature control. This is a gap that we have now been able to close with our Bricort system."

Together with the Institut für Druckmaschinen und Druckverfahren (IDD) [Institute for Print Machines and Print Processes] of the Technical University of Darmstadt, automation and engineering specialists spent three years developing a compact temperature control device that can be easily integrated into existing coating systems. The kicker: The system called Bricort measures the temperature of the coating to be processed very close to the finishing location, directly on the so-called "anilox rollers" from which the coating is transferred to the printing substrate via a roller system.

Innovation:
The coating temperature is recorded using the PT100 directly on the anilox roller (trade show model shown here)

For this purpose, a PT100 temperature system is mounted in the connection nozzle to the anilox roller which continuously reports the output temperature to the controller. This system ensures that there are no temperature fluctuations because of supply piping that is too long. “With the help of Bricort, for the first time coating technicians are now able to maintain narrow temperature tolerances of only ±0.5 °C and adjust the temperature as well as the associated viscosity of the coating,” explains Jann Neumann, a research scientist at IDD and responsible for the development of the control system.

“Positively surprised”

In a small space in the control cabinet, the Bricort system consists of an “on-top” multi-lingual, built-in touch panel for entering the desired processing temperature, as well as a flow path temperature control device in which the coating is heated up quickly or cooled down by switching on a cooling device. “This design has a a cooling efficiency of only one kilowatt, which is completely sufficient.” This represents an incredible energy saving compared to conventional devices with a cooling efficiency of 3 kilowatts and more,” says Guenter Jung.

Due to its compact and modular design and the option to integrate additional electronics modules in the system in any sequence, the Turck BL20 remote I/O station quickly turned out to be the ideal solution for developers. “We had mainly been looking for hardware that was compact and could be programmed with CoDeSys,” describes controller specialist Stefan Globig. “In addition, we wanted to protect the programming know-how that was used to create a control system that can maintain the temperature precisely within a range of only 1 °C. The compact controller in the BL20 gateway perfectly protects the CoDeSys program from unauthorized access.”

Neumann and Young developed the system’s prototypes using control components from National Instruments. “Though the NI components are powerful, they are also too large and expensive for use in mass production,” explains IAV technology head Jung, who hired the engineering company of Stefan Globig to handle the electronics and controller design. “The Turck controller in the BL20 gateway is not only very compact, but also ideal for use in mass production in terms of the cost/benefit ratio,” explains Jung. “You also can’t forget that Turck provided the development software with a large range of finished functional components license-free which enabled us to write the first programming lines within just a few minutes,” adds Stefan Globig. “I was positively surprised how well and how quickly the integration of the display from a third party manufacturer functioned in the system.”

Heart of the system

In the IAV temperature control device, the BL20 remote I/O station combines sensors and actuators with the gateway’s own controller. Thanks to the TCP modbus protocol, the temperature control device is also directly connected to the control unit in the print machine so that the print and coating process can be controlled using one unit. “Together with the touch panel, the BL20 station functions as the heart of the machine,” summarizes Globig.

But the development of Bricort is not the end of the IAV developers‘ work on fluid automation in coating machines: “We are already thinking about creating an integrated solution that can combine in one machine all components such as coating preparation, coating supply and the associated piping components and parts,” explains Jung.

“The Turck controller in the BL20 gateway is not only very compact, but also ideal for serial use in terms of the cost/benefit ratio.”
Guenter Jung, IAV

Quick read

With its compact coating temperature control device – Bricort - the German company Industrie-Automation Vertriebs-GmbH (IAV) has developed an energy-efficient and cost effective solution for maintaining and controlling the exact temperature of printing coatings. The system’s core is the modular BL20 I/O system from Turck.

Webcode **more20855u**

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Peerless Machinery Corporation incorporated substations onto each of their machines to obtain local control on the plant floor

Local Control

Distributed I/O cuts installation time in half for snack food equipment manufacturer Peerless Machinery Corporation

Peerless Machinery Corporation, www.thepeerlessgroup.us, a food equipment manufacturer based in Sydney, Ohio, provides dough mixing and dough makeup equipment, along with cookie and cracker machinery to the baking industry. Whether the machines are used for bagels, muffins, granola bars, cakes or a plethora of other food items, Peerless' mixing machines, bread dividers and dough equipment are vital to the baking and snack food industries. The snack food industry continues to thrive in many nations across the world. According to Daryl Thomas, chairman of the Snack Food Association, www.sfa.org, the snack food industry generates $26 billion dollars in annual sales and is growing at an average rate of 4.5 percent per year.

Product customization

A hallmark of Peerless' continued success is its ability to custom build machines to its customers' specifications, including mixing bowl capacities and the way they are installed in the frames (tilt geometry), the actual frame designs, refrigeration packages and control systems. Peerless also provides integrated systems for its customers, such as dough handling systems that move dough from the mixer to makeup and forming equipment.

Being versatile may be a cornerstone to the success of the company, but customizing machines for individual customers created some serious challenges for Peerless. This is especially true when designing machines that conform to the size requirements found in the food manufacturing sector, as well as customizing control systems.

The first obstacle Peerless faced was standardizing on a network protocol that would synchronize all systems in order for them to operate in tandem. EtherNet/IP was the network protocol that Peerless chose to use because it provides tighter control and helped Peerless streamline operations. "We see EtherNet/IP as the emerging standard, as it is gaining worldwide acceptance in the industrial sector," says Eric Cruse, Controls Engineer with Peerless. "We also wanted a system that would allow expansion of diagnostic information and provide an open platform for our customers." Although implementing EtherNet/IP gave the company tighter control, Peerless still had a centralized cabinet full of drives and PLCs, and was running lines of conduit with hard-wired cables from its machines to the controllers. Because of the layout of the plant floor, the lines of conduit can be up to 250 feet long, and are sometimes routed to a different floor in the plant altogether.

Another challenge for the company is maintaining a clean manufacturing environment without harming the components that keep the plant up and running. Since all of Peerless' applications are used in the food industry, it is imperative that the machines remain sanitary. High pressure, high temperature washdowns, often using harsh cleaning agents, are necessary to maintain a sterile working environment.

Peerless' mixing machines, bread dividers and dough equipment are vital to the baking and snack food industries

"We chose to use Turck's BL20 line because it's easy to troubleshoot at the machine."
Eric Cruse, Peerless Machinery Corporation

Implementing standard I/O

To address these issues, Peerless chose to implement distributed I/O to remove the main control panel away from the potentially harsh environment. The company accomplished this by creating substations on each machine using Turck USA's BL20 EtherNet/IP terminal-wired I/O. BL 20 is an IP 20-rated I/O designed for cabinet installation, and provides the company with the local control it needs on the plant floor without the primary control panel. "We chose to use Turck's BL20 line because it's easy to troubleshoot at the machine," adds Cruse. Peerless also uses Turck NEMA4X rated junction boxes within the distributed I/O structure, and runs all localized sensors and other equipment through these boxes.

Each substation contains one BL20 system that maintains control for one machine, and utilizes Turck fully connectorized cordsets to transfer information from the substation to the main control cabinet. By doing this, Peerless no longer needs to run long lines of conduit and hard-wire each machine to the main control cabinet. "Converting to distributed I/O has cut in-plant installation time in half," adds Cruse.

Quick read

Peerless Machinery Corporation chose to use Turck I/O products within their distributed I/O structure to create substations that puts the control on the plant floor. Turck plug and play technology allows Peerless to put I/O at any point where EtherNet/IP is needed.

Local support and product flexibility

According to Cruse, implementing a standard I/O structure was the primary reason Peerless chose to use Turck's distributed I/O products, because it negates the need for constant firmware updates. "We chose Turck because of the local support and delivery they provide, as well as the availability of products," adds Cruse. "Not only has distributed I/O with a standard network protocol lessened our installation time, plug and play technology has given us the flexibility to put I/O at any point we need to get EtherNet/IP."

Webcode **more20856u**

Author

Robb Black is the Vice President of Turck USA Network and Interface Division

The gas transfer stations mostly look alike in that they are inconspicuous, just like the interface technology that works inside them

Hidden Champions

Interface technology from Turck guarantees the efficient supply of gas for southern German gas supply companies erdgas schwaben and Erdgas Südbayern

There are three primary technologies users may choose to transfer signals from field devices in process control systems: Fieldbus technology (also referred to as bus-to-bus), point-to-bus wiring via remote I/O, or direct point-to-point wiring of field devices with the process control system or controller.

The most modern of the three solution alternatives is fieldbus technology. In this alternative, the field instrumentation is directly coupled to the bus via the communications protocol – either PROFIBUS or FOUNDATION fieldbus. Each field device is an independent subscriber of the communication bus. In the case of point-to-bus wiring, the signals from the field devices are collected at the remote I/O station in the plant, transmitted to a digital protocol and sent via bus cable to the control system. So, instead of needing many analog or digital input and output cards, the PLC or process control system only needs one bus card.

Quick read

Interface devices are “hidden champions” in the truest sense of the word. They are mostly hidden in control cabinets or control rooms. Despite the competition from remote I/O and fieldbuses, interface devices are, in many cases, the most efficient solution for transmitting analog process signals for supplying gas.

Franz Meiser, Erdgas Südbayern, has an eye on everything: "All measuring results are displayed in the display of the 19-inch cards."

Temperatures, pressures and other measurement signals are recorded and transferred to the control room via remote service

Despite all the bus technologies available today, there are still situations in which the use of traditional point-to-point interface technology is still justified. In this method, each signal from each field device is transmitted directly to the control system. The signals are first galvanically separated, then prepared or formed before they arrive from the field to the PLC or the process control system. The purpose of this parting plane is to protect the control system from disruptive signals or undesired transmissions from the field, and to support the explosion protection method. Because each signal reaches the control system separately, it must have the appropriate number of signal inputs and outputs.

Use in gas supply

If only a few field devices in remote satellite stations need to be connected to the control technology, interface solutions are the best option because remote I/O and fieldbus systems would become cost prohibitive. Gas supply is often such a scenario. "We have to constantly keep an eye on the current measurement values of our approximately 160 supply locations. In this case, a powerful but not too expensive interface technology is a decisive factor for efficient plant operation. Fieldbus technology would not be a financially feasible option here," says Karl-Heinz Markut, responsible for network control system at erdgas schwaben GmbH. The company supplies natural gas to 165 cities and communities in all of Swabia and parts of Upper Bavaria, Germany, as well as seven natural gas redistribution companies; a total of 5,000 pipelines are connected. Erdgas Südbayern, a nearby gas supply company, supplies natural gas to 247 cities in Upper and Lower Bavaria, as well as 24 municipal redistributors. This provides southern Bavaria with a modern natural gas pipeline network with approximately 800 transfer stations.

Pre-suppliers, such as Bayerngas, transfer the natural gas to the transfer stations within the network of regional suppliers. Both the pre-supplier, as well as the regional supplier, have installed their measurement technology, including meters, in the transfer gas stations. The measurement values are retrieved

"We have purchased completely configured control cabinets from Turck that our employees only have to connect to in the stations. For us, this represents true added value."
Karl-Heinz Markut, erdgas schwaben

Service-oriented: Turck provides configured, ready-for-connection control cabinets to erdgas schwaben

via telecontrol technology and displayed centrally in the control room.

In the transfer stations, the pressure of the incoming gas – about 60 bar in the winter and about 40 bar in the summer – is reduced to a standard pressure of 0.2-1 bar in homes and 10 bar in commercial properties. Because when forming under pressure, temperatures up to minus 20 °C can occur, the stations have heating systems that heat the pipelines up to a temperature of 10-15 °C.

Measuring and comparing

In order to guarantee smooth operation, certain measured values must be recorded in each station, transferred to the control room and monitored. Among other things, the inlet and the outlet pressure is recorded, the temperature of the gas determined and the impulses from the flow rate sensors for determining the gas volume counted. Additional signals develop when measuring the filling level for the container, the valve position displays and with the dewpoint sensors that permit down-to-the-degree pipe heating. All sensors are installed in zone 1.

According to the motto "Trust is good, checking is better," Franz Meiser, responsible for the electrical telecommunications technology at Erdgas Südbayern routinely has the measurement values displayed in the control room compared to the results on the measuring points. "For this purpose, we use the Turck interface technology with displays," says Meiser. "We used to have to read each manometer, each thermometer and each and every measurement directly at the measuring point. Today, all results are displayed on the 19-inch cards displays. So there is no need to have the specialist on site, any employee can give the measurement values to the control room by telephone."

Ready-to-connect control cabinets

At erdgas schwaben, Karl-Heinz Markut does not rely on 19-inch cards, but on DIN rail devices. He had this choice because Turck offers most interface solutions both as DIN rail devices, as well as the 19-inch format. In addition to the quality of Turck interface solutions, its extensive product portfolio impressed the Swabian gas supply company. "We have purchased completely configured control cabinets from Turck that our employees only have to connect to in the stations," explains Markut. "Besides the interface technology, the control cabinets also contain telecontrol technology constructed in accordance to our specifications, everything is completely wired and equipped with a circuit diagram, as well as all necessary documents. For us, this represents true added value."

Author

Helmut Ambros is a Process Automation Key Account Manager at Turck Germany

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“Global portfolio”

Turck offers its customers a multitude of interface components for separating, forming, processing, converting and adapting analog signals. The devices are available for DIN rails, as well as European cards for 19-inch racks and an IP67 model in the form of IMC cartridges.

As the Director Product Management Process Automation, Ryan Kromhout is responsible for the comprehensive portfolio of interface solutions at Turck. Despite fieldbus and remote I/O technologies, he also sees a large market for the company’s interface product line in the near future.

Mr Kromhout, aren’t you afraid that interface technology will die out in the future with regard to modern fieldbus technologies?

On the contrary! Many plants in southeast Asia, China, India or Russia will be even more and more intensively equipped with interface technology. For the operator, the advantage is that they do not have to have fieldbus specialists. In interface technology, a multimeter is needed to make a diagnosis, for modern devices you may just look at the device.

In your opinion, what are the special challenges in interface technology?

To offer a product portfolio that can be used globally and that meets all requirements in interface technology will remain the biggest challenge for manufacturers, in my opinion. In growth markets such as the BRIC countries (Brazil, Russia, India, China), the basic functionality of the interface technology must be offered at a shamelessly inexpensive price per channel. Furthermore, the “footprint”, meaning the space required for it in the control cabinet, is becoming increasingly important.

Beyond the basic functions, sustainable interface technology has to offer a noticeable benefit for the customer, for example, simplified planning through universal voltage supply or simplified error detection through an intuitive menu navigation via the display. Turck has invested a lot in this added value. And those who want even more comfort can use the functionality of our DTMs.

You heavily promote the issue of asset management in the physical layer, meaning the connection between field device and process control system. How does the market react to this option?

With our slogan “Asset Management Enabled”, we express the fact that we also consider the physical layer to be an asset or an article of value. Via all three areas of the physical layer – point-to-point, point-to-bus, bus-to-bus, Turck offers the option of subjecting these to an additional diagnosis and integrating them into asset management systems. That is how our interface technology monitors both the connection to the field instrument, as well as to the process control system. Using FDT/DTM, the devices allow for a far-reaching diagnosis – and also for the traditional 19-inch technology.

What direction will the interface market pursue in the future?

The market for interface technology will remain stable, but will be characterized by a geographical shift. As long as the technical level of a service technician in the growth markets does not meet the requirements of fieldbus technology, we will experience reasonable growth. In my opinion, a considerable number of all applications in process automation will also be implemented in traditional point-to-point connection in the future because the benefits of a fieldbus do not justify the additional costs in all applications.

But regardless of how the customer acts today or in the future, Turck offers innovative products for all connection paths in the physical layer – from interface technology to remote I/O to fieldbus solutions.

The extrusion coating process enables the Turck professionals to integrate many customer-specific features into their sensors

From one Cast

Using ingenious extrusion coating technology, Turck integrates maximum technology into minimum size and scale

Swiss cheese, Swiss army knives, Swiss watches – numerous products from the Alpine republic have long been top exports worldwide. They all have one thing in common: They stand for particularly high quality. More than any other, the watch-making industry stands for high quality precision products and its operations are almost exclusively based in the town of Jurabogen, between Geneva and Basel.

This quality was precisely the reason why Turck began developing and producing certain sensor solutions in Switzerland more than 20 years ago. That led to the sensor, fieldbus, interface and connection technology specialist establishing Interprox in 1985 in Delémont, the capital city of the Jura Canton. The company initially focused its Delemont operations on the final assembly of small sensors, however, Interprox quickly evolved and built on its

Turck Interprox has mastered the production steps for producing sensors that would not otherwise exist in this housing

comprehensive know-how in developing and producing these sensors. In doing so, Interprox worked to perfect extrusion coating technology, helping build upon Turck's portfolio, such as the BIM-UNT magnet field sensors. The success of the Swiss company lies in the high range of manufacturing, and the fact that the sensor's electronics are directly extrusion-coated with a plastic housing. Interprox has mastered all the production steps that this process involves. This is

Quick read

Sensor solutions extrusion-coated with plastics are easy to assemble, optimized to their application and may be implemented in previously unimaginable configurations. This coating technology gives the customer the option of having its own specifications implemented in the design.

A rugged sensor is produced from this filigree board, together with the spool, by direct extrusion coating using plastics

because the company not only produces the electronics on site, but also all the necessary tools that extrusion coating requires.

High flexibility

The extrusion coating technology that Turck in Switzerland has perfected offers the highest flexibility with regard to configuration, requirement profiles and installed electronics. There are almost no limits with respect to housing forms. Almost anything that seems reasonable to a design engineer can be implemented. This means that, upon request, housing forms can be changed later on if turns out that a modification further improves the sensors' features.

The extrusion coating technology even makes it possible to integrate mechanical assembly solutions, such as screw holes, thread inserts or – with the use of transparent plastic – easily visible LEDs, directly in the housing. This eliminates additional assembly work and maintenance costs. If the customer wanted a potato-shaped sensor, then Turck would be able to meet this request.

Extrusion-coated sensors not only offer the above-mentioned benefits in terms of construction and installation, they are also enormously resistant to environmental factors such as temperature, moisture, vibration or even aggressive acids or oils. In the end, the electronics are as securely embedded in the plastic as the gold reserves are in Fort Knox.

Balancing the three: Mechanics, electronics, plastics

When so many advantages speak in favor of extrusion-coated sensors, you might ask yourself why all sensors aren't manufactured using this technology. The answer lies in the complex relationship between mechanics, electronics and plastics. For example, the heated, fluid plastic may not exceed a certain temperature while it is being sprayed onto the electronics. Even the maximum pressure in the tool must be aligned with the electronic components used. And finally, the extrusion coating technology works only up to certain wall thickness and size because otherwise the plastic would no longer harden evenly.

When it comes to producing extrusion-coated sensors, the challenge is to find the right balance between mechanics, electronics and plastics, and to optimize everything for the respective sensor application. Even the selection of the right plastic can be the deciding factor between the success and failure of a sensor design. For example, sensor's extrusion coated using the Duroplast method with a low pressure and high temperature are particularly well protected against mechanical and chemical influences. On the other hand, this plastic tends to be brittle, requires complex injection tools and a long production process.

Even though Thermelt plastics take a while to process, they can be placed on the electronics board at a low temperature and low pressure. The

Even the plug-in version of the BIM-UNT magnet field sensor can be assembled directly into the groove of a pneumatic cylinder thanks to a special production method

No problem: Various expansion phases of a sensor

material has a high chemical resistance, but cannot withstand mechanical loads for a long time. That is why it is primarily used to isolate electrical contacts, for example, in automobile construction.

Thermoplasts ultimately have to be processed at a high pressure and a high temperature. Using thermoplasts, extrusion-coated sensors provide mechanical stability and may also be used in food and beverage related production industries.

More than sensors

The technology of the Swiss Turck subsidiary Interprox is not only ideal for extrusion coating sensors, but can be used in any situation where compact electronic components have to be packaged as ruggedly as possible to be resistant to environmental factors. Especially when special demands are made on the housing, extrusion coating technology opens the door to previously impossible solutions. For example, the Swiss subsidiary is able to manufacture sterile products for use in medical technology – it is embedded in an extrusion-coated plastic housing – that can withstand more than 500 sterilization cycles without damage. Such customized solutions are developed by the Turck subsidiary duotec, which is represented at Turck production facilities in Delémont, Beierfeld and Halver. For more information, please visit www.turck-duotec.de.

Customized designs

The Swiss extrusion-coating experts have launched sensors on the market that are ideally suited to the installation environment – for example, direct assembly in the grooves of pneumatic cylinders – and that considerably reduce assembly time and expense due to integrated mechanical mounting equipment. In addition to the standard products Turck customers can also use the technology and production know-how to design and develop individual customized solutions.

Starting with a quantity of about 3,000 to 5,000 samples per year, Interprox produces individually developed sensors that a customer can optimally plan into the design of its product or machine. This allows sensors to be mounted in areas that are impossible to reach with conventional housing technology. For various expansion phases, there is also the option of installing various housing forms with the same electronics.

▶ Webcode **more20870u**

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Jean-Claude Schaffner is the Managing Director of the Turck subsidiary Interprox SA in Delémont, Switzerland

A flexible modular system permits the application-optimized assembly of temperature measuring points

How Temperature Sensors Work

Our basic series on the design, functional principles and application options of the most important sensor technologies

There are numerous different options for detecting temperatures, ranging from simple diodes to highly accurate thermal noise thermometers. Primary thermometers that detect the temperature without previously calibrating other thermometers are frequently used in labs. However, in the industrial area, users mainly rely on secondary thermometers for measuring temperatures that require calibration. In practice, resistance thermometers or thermo elements are used in industrial applications. Due to the requirements for accuracy and the processing of measurement signals, the following devices have become standard:

Resistance thermometers record the temperature using the temperature dependency of the electrical resistance. Pure metals show the strongest resistance changes, especially very pure pre-

Turck offers many different temperature probes

cious metals. You can distinguish between positive temperature coefficient (PTC) thermistors, whose resistance increases with a rising temperature, and negative temperature coefficient (NTC) thermistors which have the opposite behavior. If the resistance shows an approximate linear behavior, the temperature value can simply be recorded using a polynomial equation. As a rule, resistance thermometers have a measurement range of -250 to about 800 °C. Products from this category include standardized sensors made of platinum (e.g. Pt100 with 100 Ω at 0 °C). They are used for temperature measurements for various applications in which a high level of accuracy is required.

Thermo elements may not be as precise, but they react faster than resistance thermometers. Thermo elements consist of two different metals or semiconductors connected to one another. If there is a temperature difference between both metals, an electrical voltage develops at the junctions. This phenomenon is also called the Seebeck effect. The thermo-electric voltage (also called thermoelectric power) is temperature dependent and, in metals, has the size of several microvolts per Kelvin.

In actuality, a temperature difference between the hot junction and the cold junction is recorded. If the temperature on the hot junction has to be determined, the temperature at the cold junction has to be known, and vice versa. In practice, the cold junction temperature is recorded using a separate temperature sensor. The thermoelectric voltage series permits inference of the temperature at the hot junction (measuring point). The thermo elements are mostly used to determine high temperatures up to 1,000 °C. The precision depends, among other things, on the accurate measurement of the reference junction temperature.

Infrared sensors are suitable for recording the surface temperatures ranging from about -70 to 1,000 °C. The sensors convert the thermal radiation being sent from one object in a wavelength range of 0.7 to 20 µm into an electrical signal that is processed into an evaluatable signal. What is important here is the D:S ratio (distance : spot) that the measuring field diameter indicates at a given distance. Complete coverage of this field by the object's surface whose temperature is to be monitored is optimal.

Turck's diverse product portfolio

Among the greatest challenges in temperature measurement is the fact that the optimal measuring points are often difficult for the operator on site to access. That is why there is a demand for application-specific sensor solutions that can be tailored with highly flexible process connections and whose displays are easy to read in any location. Taking these requirements into consideration, Turck has added intelligent solutions for temperature measurement to its product portfolio in the last few years.

Turck's Pt100 resistance thermometer is IP 67 rated. The housing is made entirely of stainless steel and is highly EM compatible. The electrical connections are metal-armored and offer high mechanical stability and operating safety.

When it comes to temperature sensors, the user has the choice between different sensor lengths and diameters. Furthermore, using protective tubing, the temperature sensor can also be easily adapted to very critical locations. In cooperation with numerous connection options - direct or using an M12 standard cable – and variable output signals, the Turck product portfolio guarantees maximum flexibility in temperature measurement.

Quick read

Temperature ranks among the most frequently queried physical factors. In addition to quality assurance, temperature measurement is very important, especially for the smooth operation of machines and systems (condition monitoring).

Webcode **more20871u**

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Thorsten Evers is a Product Specialist for Pressure and Temperature Sensor Technology at Turck Germany

Turck at Trade Shows

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

Trade Shows in North America

Dates	Name of trade show	City
17.03. - 19.03.2009	Interphex	New York
22.04. - 23.04.2009	SA	Calgary, AB
05.05. - 07.05.2009	Packex	Toronto, ON
27.05. - 29.05.2008	ISA Expo Control	Mexico City
23.06. - 26.06.2009	Expo Pack	Mexico City
22.09. - 24.09.2009	Assembly Tech	Rosemount, IL
05.10. - 07.10.2009	Pack Expo	Las Vegas
06.10. - 08.10.2009	ISA	Houston, TX
15.11. - 18.11.2009	Metalform	Chicago

International Trade Shows

Dates	Name of trade show	City, Country
11.02. - 12.02.2009	Industrial Automation Solutions	Nieuwegen, Netherlands
04.03. - 07.03.2009	Aiemex	Seoul, Korea
10.03. - 12.03.2009	CFIA	Rennes, France
18.03. - 20.03.2009	PTA Sibir	Krasnoyarsk, Russia
24.03. - 27.03.2009	Magyarregula	Budapest, Hungary
24.03. - 28.03.2009	Ipack IMA	Milan, Italy
31.03. - 03.04.2009	Automaticon	Warsaw, Poland
31.03. - 03.04.2009	Amper	Prague, Czech Republic
20.04. - 24.04.2009	Hannover Messe	Hanover, Germany
22.04. - 23.04.2009	Verpackung Schweiz	Zurich, Switzerland
11.05. - 15.05.2009	ACHEMA	Frankfurt, Germany
26.05. - 29.05.2009	Bulcontrola	Sofia, Bulgaria
19.05. - 22.05.2009	MSV Nitra	Nitra, Slovakia
23.06. - 26.06.2009	Oil & Gas Show	Moscow, Russia
24.06. - 26.06.2009	PTA	St. Petersburg, Russia
01.09. - 04.09.2009	Automation Technology	Basel, Switzerland
14.09. - 18.09.2009	MSV	Bruenn, Czech Republic
21.09. - 24.09.2009	MOTEK	Stuttgart, Germany
23.09. - 25.09.2009	PTA	Moscow, Russia
28.09. - 02.10.2009	Elektrotechniek	Utrecht, Netherlands
07.10. - 09.10.2009	Smart Automation	Linz, Austria
13.10. - 16.10.2009	Scanautomatic	Stockholm, Sweden
14.10. - 15.10.2009	Mocon-Hydromech	Brussels, Belgium
20.10. - 22.10.2009	Motion Control Show	Seoul, Korea
28.10. - 31.10.2009	TIB	Bucharest, Romania
10.11. - 12.11.2009	Elektrotechnika	Ostrava, Czech Republic
24.11. - 26.11.2009	SPS/IPC/DRIVES	Nuremberg, Germany
25.11. - 28.11.2009	System Control Fair	Tokyo, Japan

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