

Strong Team

Intralox used robust Turck IP67 block I/Os to develop the ISC CAM decentralized logic module for the smart control of its flexibly scalable conveyor technology



TAS – Multitool for IIoT

The TAS Turck Automation Suite offers users a multifunctional toolkit for the installation, service and management of Turck devices



RFID – Seeds in Focus

KWS optimizes its seed production with Turck's BL ident RFID solution for the contactless identification and temperature monitoring of silo boxes

»Digital Added Value«



No, this editorial was not written with AI assistance! As a regular reader of trade magazines, I have read several editorials in recent months that were created by the ever present artificial intelligence, at least in part – some interesting and some rather amusing. In spite of all the relevance and power that this kind of system offers, it is nevertheless apparent that it is simply not useful for many routine practical tasks.

We automation experts have also been involved in the digital transformation for some time now and have been looking for ways to support our tasks and yours with digital processes and make them increasingly more efficient and reliable. An increasing number of devices with »digital added value« have come onto the market, such as those offered with IO-Link. However, the functionality of these systems often also involves greater complexity in installation and operation. Reducing this and offering you the user the simplest possible handling of our automation solutions is also always the focus for Turck, despite all its innovative strength.

In this issue of your more@TURCK customer magazine, we are presenting two software solutions at once that will make your work with our equipment easier. Firstly, the TAS IIoT and service platform, which we make available to you free of charge. The Turck Automation Suite simplifies the management and configuration of Turck devices in industrial Ethernet networks – from the sensor to the controller. Turck’s ARGEE logic software and BEEP IP address management solution are also integrated in the new multifunction tool, as are device-specific apps for applications with IO-Link and RFID. Another example of user-friendliness is the IM18-CCM60 control cabinet monitor, which is equipped with a custom operating system specially developed for this hardware that gives every user unrestricted access to condition monitoring in control cabinets, from stand-alone systems to fully integrated IIoT solutions in the cloud.

Besides new products, this issue also introduces you to customers who explain how and why their production is more efficient today with Turck solutions. These five application stories from Poland, Belgium, the Netherlands, Germany and China also underline our approach as a Global Automation Partner to offer the user maximum flexibility with minimum complexity. Read for yourself how customers have implemented modular machines and logistics systems with the decentralized logic of our robust IP67 block I/O modules, install several RFID readers with temperature measurement in record time thanks to our HF bus mode and preassembled cables, save 15 man-hours a day in order picking for a truck with a pick-to-light system, or ensure efficient cooling of industrial furnaces with flow sensors.

Yours sincerely

Christian Wolf, Managing Director

Content

NEWS

INNOVATIONS for Automation Specialists 04

TECHNOLOGY

SOFTWARE: Multitool for IIoT 08
The TAS Turck Automation Suite offers users a multifunctional toolkit for the installation, service and management of Turck devices

INSIDE

INTERVIEW: »Sensor Fusion – Fast and Extremely Precise« 12
Turck’s new inclination sensors enable unprecedented dynamics with a fused MEMS and gyroscope signal. Product manager Michael Troska explains the advantages of sensor fusion in an interview with messweb creator Dirk Schaar.

TREND

CONTROL CABINET MONITORING: Condition Monitoring to Go 14
Turck’s IM18-CCM60 with the siineos operating system combines hardware and software into an efficient plug-and-play solution for smart control cabinet monitoring – easy to use, intuitive to operate and expandable at any time

APPLICATIONS

SYSTEMS: Full Modularity Along the Line 18
Smart Automation developed a modular production line with decentralized control for an automotive supplier – using a wide range of products from the Turck portfolio, from sensors to multiprotocol I/O modules, pre-assembled connection technology, LED lights right through to RFID



18 Smart Automation has developed a modular, decentrally controlled production line – and used Turck’s extensive portfolio for this purpose



14 Smart control cabinet monitoring: IM18-CCM60 with siineos operating system



22 Sioen Industries optimizes intralogistics processes with pick-to-light system

SYSTEMS: Catch the Light

Sioen Industries optimizes intralogistics processes with a pick-to-light system based on the Banner PTL110 series and Turck’s robust TBEN logic I/O modules

FIELDBUS TECHNOLOGY: Creative Conveying

EV battery manufacturers require easily scalable conveyor solutions – for smart control of the variable systems, Intralox developed the decentralized logic module ISC CAM with robust Turck block I/Os

RFID: Seed Center

KWS optimizes and secures its seed production with Turck’s RFID solution for the wireless identification and temperature monitoring of silo boxes – Profinet S2 redundancy included

22	SENSOR TECHNOLOGY: Ice Cold Optimization Turck’s FS+ flow sensors ensure efficient cooling of industrial furnaces through real-time monitoring of flow and temperature	32
-----------	--	-----------

24	SERVICE CONTACT: Your Fast Route to Turck How, where and when to find us	34
	CONTACT: Imprint	35

28

Dynamic Inclinometers with Switching Output



Turck's QR20 inclinometer generates its signal from the combination of two measuring principles: a gyroscope signal and an MEMS acceleration measurement (Micro-Electro-Mechanical Systems). In this way the sensors combine the benefits of both measuring principles. The QR20 can mask out shocks and vibration much more effectively than with conventional signal filters. The B1NF and B2NF single and two-axis inclinometers thus enable a previously unknown degree of dynamic measurement for moving or vibrating machines. The new QR20 variants switch when a threshold value or switching window is reached. Two switching windows can be set and used in NO or NC operation. The QR20 with switching outputs is particularly suitable for applications in which a simple switching signal in a PNP or NPN logic circuit is sufficient to indicate the reaching of a specific inclination angle and where a measuring inclination angle sensor would be exceed requirements. The "spirit level function" simplifies device installation. The flashing of an LED is used here to indicate the horizontal position of the sensor. This therefore enables the error-free and reliable installation of the sensor without any accessories. The use of translucent plastic for the LEDs eliminates the potential weak points in the housing arising from LED lenses. The devices can also be used for positioning and lifting applications. Turck is adding four more devices to the existing portfolio of the four IO-Link inclinometers: the B1N single-axis and B2N two-axis inclinometers for static applications and the B1NF and B2NF for dynamic applications.

more info
on page 14

Condition Monitoring Platform Expanded

With the IM18-CCM60, Turck has expanded its platform for condition monitoring of control cabinets by a further, particularly user-friendly model. While the IM18-CCM40 and -CCM50 models with the Debian Linux system offer OEMs in particular maximum degrees of freedom to integrate them into existing company structures, the new model comes with the IIoT operating system siineos, which the digitization specialists at in.hub have developed specifically for the CCM platform. Thus the IM18-CCM60 combines hardware and software into a smart plug&play solution that is easy to use anywhere, intuitive to operate, and can be integrated into higher-level systems at any time via MQTT or OPC UA, from a stand-alone system to a comprehensive condition monitoring solution with cloud integration.



Four-Channel Isolating Switching Amplifiers

Turck is presenting the IM18-4DI compact, four-channel isolating switching amplifier for non-Ex areas and IMX18-4DI for Ex areas. With four signals on an 18 millimeter module width, the devices offer a high channel density that can make a tremendous difference with installations in small control cabinets and decentralized or modular automation systems. Users benefit also from the flexibility of the device. For example, the IM(X)-4DI also features a splitter that can be configured as a dual 1:2, 1:3 or 1:4 splitter. The effective direction of the switching outputs is also reversible.

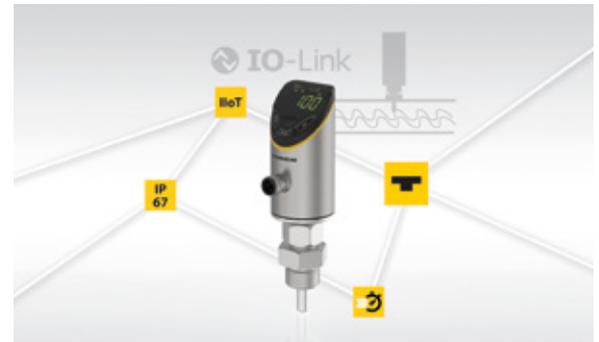




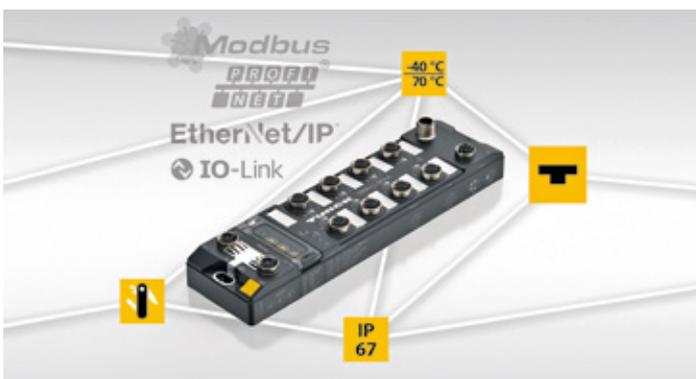
IloT and Service Platform

The new TAS Turck Automation Suite simplifies the management and configuration of Turck devices in industrial Ethernet networks. The batch functions in particular speed up many operations since they can be run simultaneously for multiple network devices. This saves time, for example with firmware updates or the issuing of IP addresses. The software functions of Turck's IO-Link devices such as the Turck Radar Monitor can be executed directly via TAS if the device is accessible in the associated network. Classic IO-Link functions such as setting parameters can likewise be performed directly from TAS. With TAS, Turck is combining for the first time the configuration and parameterization tools of its smart sensor technology with the network management functions of its Ethernet devices centrally in a single software. In the near future, Turck Automation Suite will also integrate extensive IloT functions. Read more on page 8

Flow Sensor with Plain Text Display



Turck has added the FS101 flow sensor to its FS+ fluid sensor family. The new FS+ devices have the same look and feel and are therefore just as easy to run and commission as all other sensors in the family. The four-digit 12 segment display on the devices shows the current flow value clearly as a percentage of the setpoint. The implemented IO-Link smart sensor profile simplifies the conversion of the IO-Link flow sensors of other manufacturers to the FS+ devices since process data, parameters and functions are standardized. The sensors can be used for example to monitor flows in coolant circuits or for dry-run protection in pumps. The FS101 retains the two unique Quick Teach and Delta Flow functions that already simplified commissioning in the FS100 with a bargraph display.



IO-Link-Class-A-Master

Turck has added the TBEN-L-8IOLA class A IO-Link master to its IO-Link portfolio. The Ethernet block I/O module with the robust TBEN-L housing provides eight class A IO-Link master ports. Each of the eight female connectors provide two universal DXP channels, which can alternatively be used as an input or output – so that the universal module offers up to 16 channels. The 2A current carrying capacity on pin 2 of all ports also enables the supply of actuators with increased power requirements. The Ethernet block I/O module is available in two variants: with L-coded M12 connectors or 7/8" 4-pin round connectors. The temperature range is between -40 to 70 °C, protection is IP67 and IP69K.

FOC Converter for Fieldbus Data

The single or dual-channel devices of the FOC series transfer fieldbus protocols such as Profibus-DP or Modbus RTU as light signals along fiber optic cables. The two Ex variants of the FOC couplers are unique on the market as they can be installed in zone 1 and can transmit intrinsically safe signals in accordance with RS485IS. The FOC media converters are able to cover large distances of over 2500 meters, depending on the fiber optic cable used. FO cables are also immune to electromagnetic interference.



Turck Again Awarded as Top Employer



The Turck Group has once more been awarded for its attractiveness as an employer. The automation specialist has thus qualified as the kununu Top Company Seal 2023 placing it among approximately five percent of the most popular employers on kununu. To be awarded the Top Company Seal, a company must achieve a score of at least 3.8 stars from its own employees in the preceding 12 months. 85 percent of employees that have submitted a rating in the past two years would recommend Turck as an employer. In the survey of "Germany's Best Employers 2022", Turck was once more rated "very highly attractive". With a score of 2.59 the company belongs to the ten percent of the highest rated employers in the industrial sector. The nation-wide survey carried out by "Die Welt" rated 3,906 companies from the service, trade and industrial sectors involving over 700,000 citizens in terms of their attractiveness as an employer. "We are very pleased with the awards as they show that the Turck Group continues to be very attractive in Germany as an employer," says managing director Christian Pauli, who is responsible in the Turck Holding for the areas of finance and HR management. "We are particularly pleased with the good ratings given by our employees as well as the very high referral rate."



Programmable Multicolor LED Indicators

Turck is expanding its portfolio of LED lights with the robust LED indicators of the K100 series. The 100 mm beacons developed by Turck's partner Banner Engineering are available in two configurations. The Pro Daylight Visible beacon model offers 12 audible options and has a clear lens that avoids false indications, even in sunlight. It features three color options (green, yellow, and red) for status indication, operator guidance, and other functions. The K100 Pro Indicator model has a diffused lens that appears white when inactive, thereby preventing false indication. It features 14 color options that can be used for indication applications. Animations include options such as flash, intensity sweep, and wave.

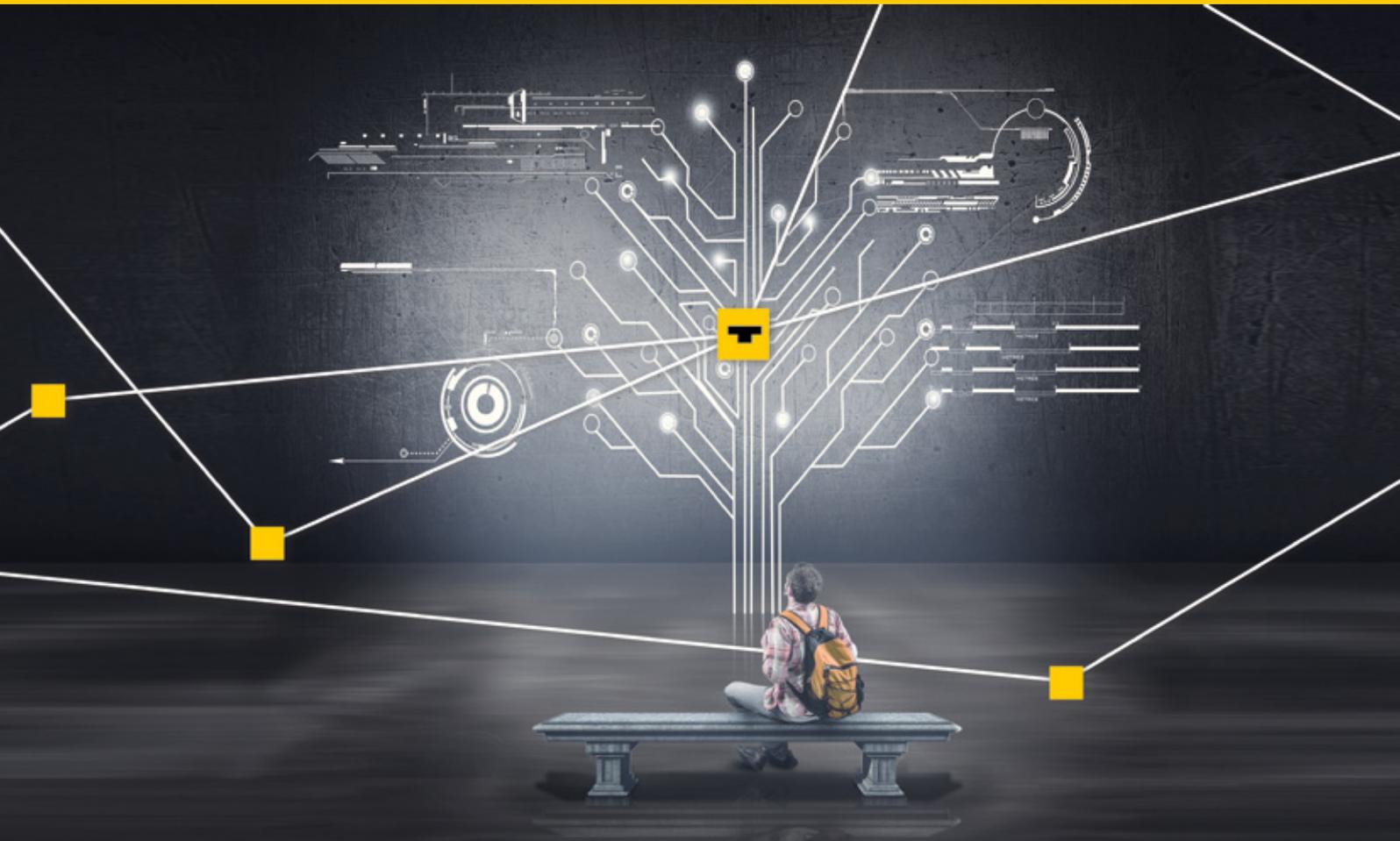
Vibration/Temperature Sensor with IO-Link

The CMVT is a robust vibration sensor with integrated temperature measurement for condition monitoring applications. Vibration and temperature are the key characteristic values for detecting machine faults early on, such as those caused by the imbalance of rotating parts. The CMVT detects vibration on three axes and evaluates them internally. It outputs a warning signal directly if the set limit values are exceeded – either via IO-Link or as a switching signal. The switching output is particularly suited for setting up retrofit and standalone applications since it can be used directly as a trigger for an indicator light – without the need for integration in existing control systems.



Your Global Automation Partner

TURCK



Digital Innovation Park

Discover exciting automation trends and the latest innovations for Industry 4.0 and the IIoT – with news, webinars, white papers and more.

LEARN MORE



www.turck.com/dip

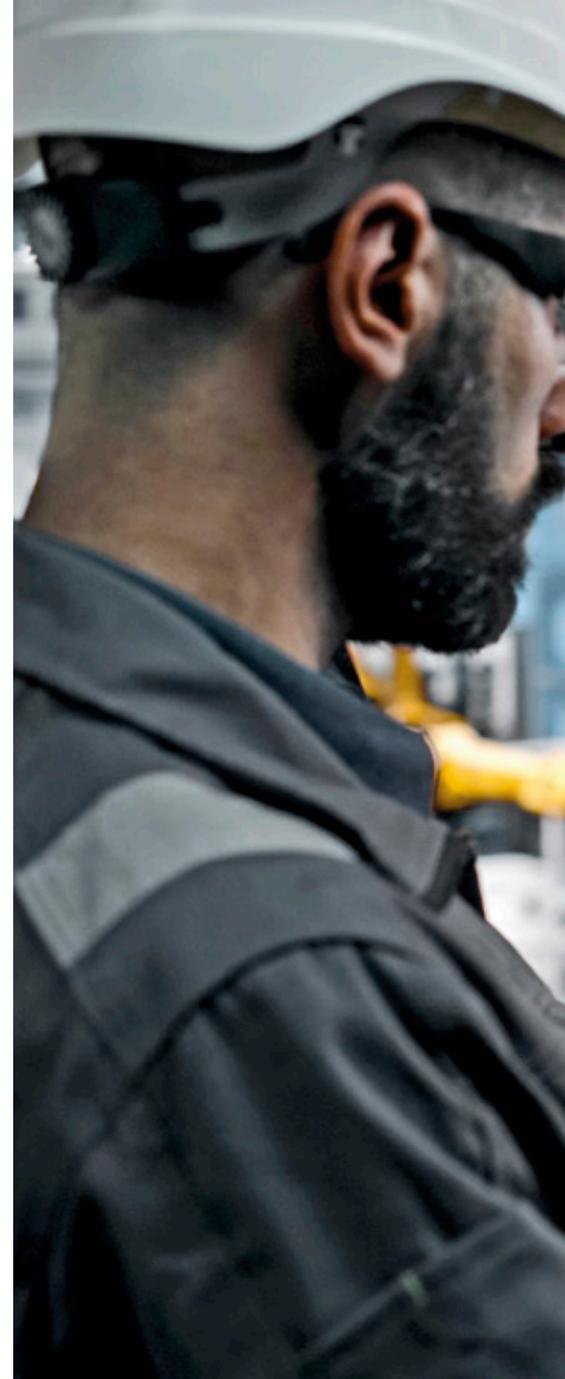
Multitool for IIoT

The TAS Turck Automation Suite offers a multi-functional toolkit for the installation, service and management of Turck devices in automation networks

With its IIoT functionality, the TAS Turck Automation Suite is the central place for the efficient management of Turck devices in Ethernet networks

In the age of digital transformation, software is also playing an increasingly important role in automation technology, as it forms the basis for controlling and monitoring automated processes. Software platforms and networked systems provide automated processes for faster and more efficient production. The software used in automation technology has to control and monitor complex processes, and so the requirements placed on it are high. On the one hand, it must be reliable and secure, as a failure can involve considerable costs. At the same time, it must be flexible and adaptable to meet the ever-changing demands of production. For all its functionality, the software should above all be simple and intuitive to use.

Besides network management and control technology, users also benefit from software solutions provided by automation suppliers, as they make the smart functions of previously simple devices such as sensors and actuators easy to access. A proprietary software also offers the user the chance to use a common ecosystem for all the automation solutions



of a manufacturer and not to have to work with the different tools.

TAS IIoT and service platform

The Turck Automation Suite, or TAS for short, provides a new software platform that users can download free of charge and use directly in the web browser of any Windows PC without installation. TAS gives users a central tool to use and manage all the functions of Turck devices – starting with the sensor, to the fieldbus devices right through to edge controllers and PLCs. The devices can thus be set up and managed easily and quickly in industrial Ethernet networks. TAS also integrates an IODD configurator and provides access to all IO-Link functions of the Turck devices. The software suite thus combines a host of functions that were previously provided by individual programs, as well as many new functions, views and apps, such as the IO-Link View for an overview and management of the IO-Link masters and all connected IO-Link devices.



Batch functions for rapid commissioning in industrial Ethernet networks

The Network Scan function finds all available Turck Ethernet devices in the network and displays the relevant device information directly. Network View also enables the issuing of IP addresses and passwords as well as the execution of firmware updates for all devices in the network. The device specific web pages of all Ethernet devices can be accessed directly from TAS.

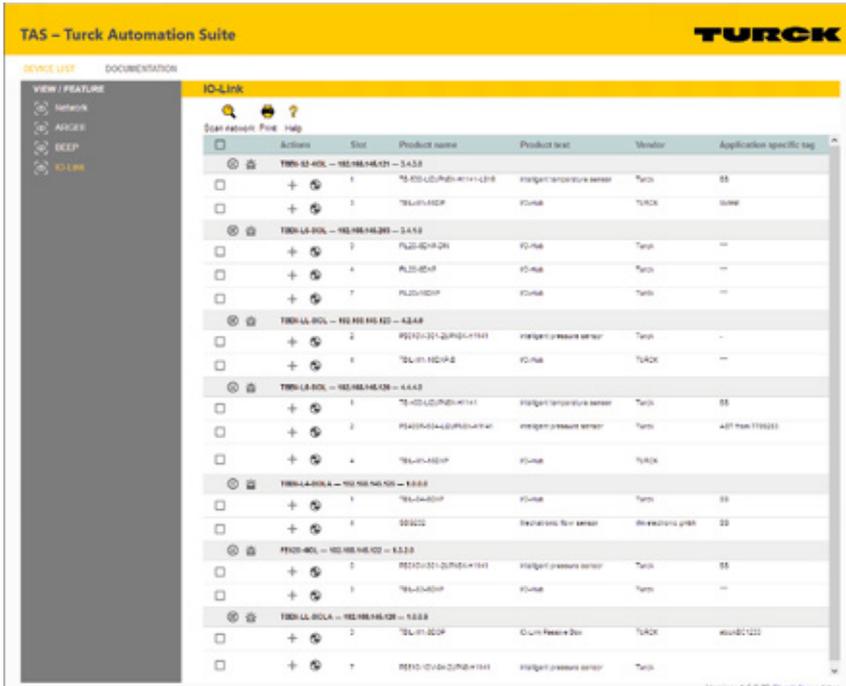
Many of the Network View functions can also be performed as batch functions. This allows many devices to be updated and processed at the same time, thus saving a lot of time when commissioning and maintaining large networks – and all this without a PLC or a third-party software. The ability to export device networks in CSV format also simplifies documentation, collaboration and management.

As a software suite, TAS integrates different functions that can be selectively activated in the platform in the form of apps. These are executed at device level

and are simple plug-and-play functions that start without any additional installation required. TAS currently features a range of apps for IO-Link sensors, such as for radar and vibration sensors, inductive couplers as well as RFID apps for HF and UHF applications.

QUICK READ

Turck's TAS IIoT platform guarantees an easy-to-use and uniform overall solution for commissioning and managing Turck devices in Industrial Ethernet networks, from the sensor to the controller. Turck's ARGEE logic software and BEEP IP address management solution are also integrated into the new multifunction tool, as well as device-specific apps for applications with IO-Link and RFID. TAS is regularly updated and extensive IIoT functions will be added for services such as condition monitoring or edge control on PCs or local servers.



IO-Link View shows an overview of all IO-Link masters and devices available in the network

them centrally. TAS also simplifies the management of BEEP configurations. Turck's Backplane Ethernet Extension Protocol reduces the number of IP addresses required in industrial networks and simplifies the application of the TBEN and FEN20 multiprotocol block I/O modules. BEEP makes it possible to connect networks with up to 33 TBEN modules to the PLC via a single IP address in Profinet, Ethernet/IP and Modbus TCP networks. Through the reduction of the IP addresses, the user can quickly create high density I/O networks and also connect them with low cost controllers.

Radars Monitor, IODD Configurator and more

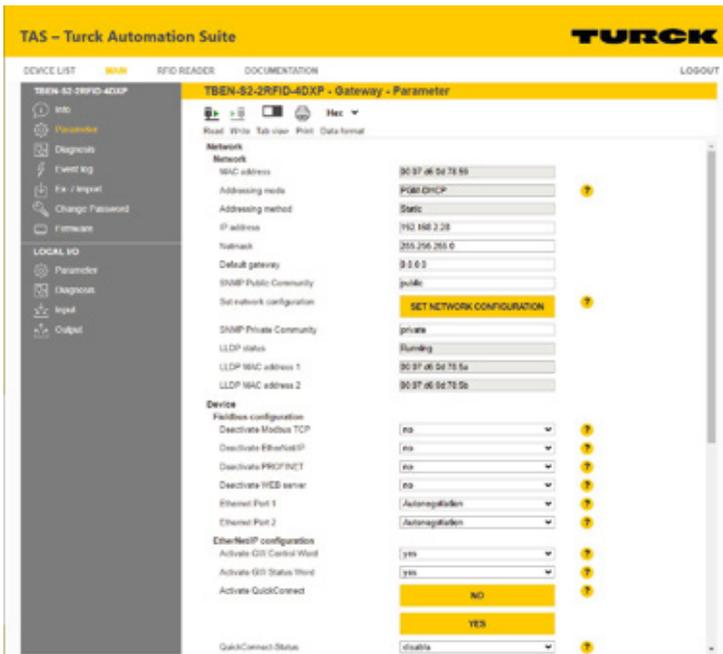
TAS also promises commissioning and management support for Turck's IO-Link apps such as IODD Configurator, Radar Monitor, Vibration Monitor, etc. The user can call up and execute the respective app directly in the special IO-Link View.

The IODD Configurator, for example, can be used to parameterize IO-Link devices from all manufacturers. The app displays IO-Link process data in a graphical history curve, which is very helpful during setup. The user also has access to the plain text of all relevant parameters of the IO-Link devices used.

The Turck Radar Monitor offers similar benefits: It graphically displays the measured values of the Turck radar sensors and simplifies setup with a real-time display of the signal curve – especially when setting filters to suppress interfering signals or in complex mounting situations. Users can adjust filters, measuring windows and other parameters very easily to their particular application requirements.

RFID Apps: UHF demo tools

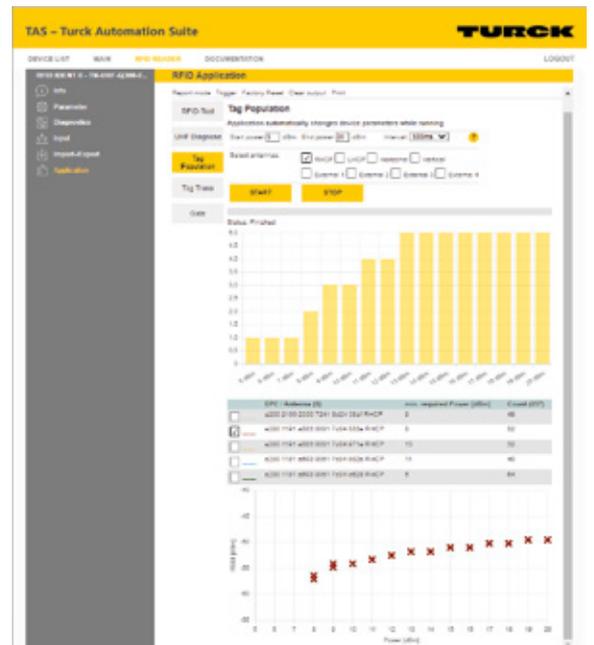
For Turck's RFID devices, TAS provides three UHF demo tools: "Gate Applications" simulates the bulk, i.e. simultaneous, detection of multiple tags in gate applications. The app checks whether all tags have



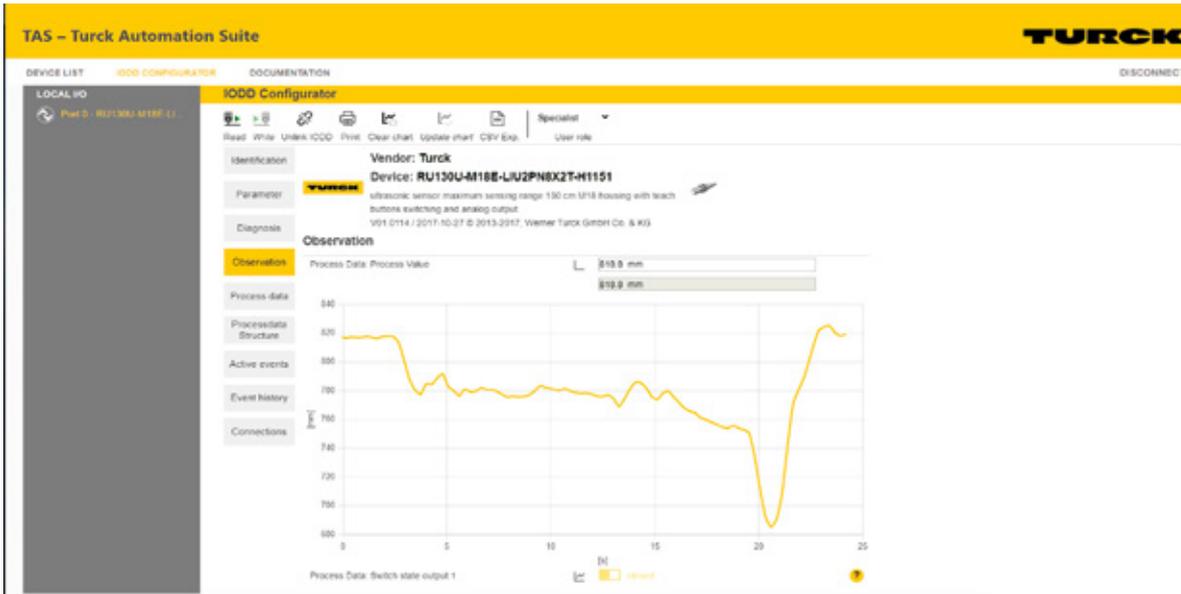
Turck's TBEN modules such as this RFID interface can be conveniently parameterized via the software

ARGEE and BEEP View

The ARGEE logic software turns Turck's Ethernet I/O modules into IP67 logic controllers for cabinet-free operation directly in the field (field logic controller). Conditions and actions are thus programmable in the simplest way without any software installation required. ARGEE will not be able to replace every PLC, but the engineering software opens up new avenues in control technology, as it can relieve networks and higher-level controllers by executing simple logic tasks on site. This function is unique on the market to date. TAS allows you to load ARGEE programs conveniently on a group of devices in a batch process and manage



Tag Population shows the read and write performance of different tag positions



The IODD Configurator can be used, for example, to parameterize the IO-Link devices of all manufacturers

been detected with sufficient certainty. Anyone who has ever had to assess a bulk detection operation manually knows how much time and effort this saves. "Tag Trace" enables users to determine the ideal start and stop times for optimum read and write processes in moving applications. "Tag Population" measures the read and write performance at different tag positions of a static object. For this, the UHF reader continuously increases its power and indicates the minimum power required to reliably read the tag.

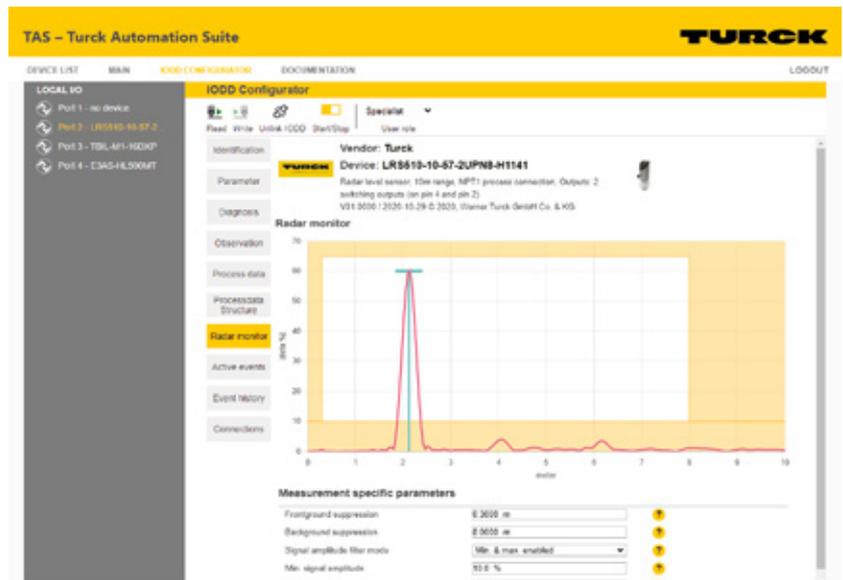
For Turck's HF RFID solutions, the "Tag Actions HF" function enables particularly convenient handling of RFID tags when a user wants to test and execute various functions with an HF reader using the Turck RFID system. This includes creating a list of read HF tags, reading information about the tag memory, and simple editing, reading and writing of data in a user-defined memory area of the tag.

IIoT platform with improved security

TAS improves the manipulation security of previous programs. All device actions have to be enabled with the device password. However, the password is saved for the duration of the browser session and can be applied if necessary to all devices with the same password, thus increasing user friendliness.

The best is yet to come: TAS IIoT platform

TAS version 1.7 is currently available but is only a foretaste of the range of functions of the fully developed IIoT solution. The software platform will be provided with additional functions and more digital services with every update. TAS will be provided with a connector function to the Turck cloud, by which it can be used as a virtual edge controller on a PC or local servers as well as on selected Turck devices. This will considerably simplify the smart evaluation of production data for condition monitoring and for predictive maintenance even beyond plant boundaries. To meet the requirements of an IIoT platform, TAS will also



Radar Monitor simplifies sensor setup through the real-time visualization of the signal curve

support the transfer of data via MQTT and OPC UA to higher-level systems, automatic configuration routines for service tasks and many other features. TAS will considerably increase the connectivity of your production system and thus combine OT data and IT data without any barriers.

Author | Christoph Schmermund is product manager for RFID interfaces
Info | www.turck.com/tas
Web code | more12370e

»When I combine the accelerometer and gyroscope signals using an intelligent fusion algorithm, I get an output signal that is extremely responsive and extremely accurate, even in moving applications.«

Michael Troska | product manager for inclinometers and vibration sensors

MEMS sensors – the abbreviation stands for “Micro Electro-Mechanical Systems” – measure minute changes such as acceleration. The compact allrounders are now used in numerous devices, including Turck’s new inclinometers, which also house a gyroscope and enable unprecedented dynamics with the fused measurement principles. Turck product manager Michael Troska explains the benefits of sensor fusion for the user in an interview with messweb creator Dirk Schaar.

The topic of sensor fusion and the advantages it offers have been discussed in industry for some time. How long has Turck been involved with this?

We have for a long time offered inclinometers for a wide variety of mobile applications, such as construction vehicles, excavators, cranes, wheel loaders or other vehicles, but also in the conventional industrial sector, for example for dancer control in the paper and textile industry. Many tasks can be successfully solved with conventional inclinometer technology, but for certain applications, sensor technologies that are fused are simply better. We have therefore been working on sensor fusion for some time and have now presented the first devices, with IO-Link interface and the fusion of gyroscope and MEMS accelerometer.

What are the limits of conventional inclinometers?

Conventional inclinometers typically use accelerometers that use the earth’s gravity

as a reference signal. If the sensor is tilted, it measures a different acceleration, as it is no longer perpendicular, but this is important for the angle calculation. If we now have disturbance accelerations in the application, for example due to vibration, shock or during acceleration, braking or cornering, the measurement signal is distorted. Most manufacturers use filter functions to smooth the output signal and thus reduce the interference. However, the filters have a decisive disadvantage: They make the output signal very slow and fast movements may not be detected correctly by the sensor because they are filtered out. That’s why we developed the fused sensors.

What are the benefits to the user of fusing MEMS and gyroscope signals?

Besides the MEMS accelerometer, we use a gyroscope that records angular velocity in degrees per second. Key benefit: Gyroscope signals do not respond to acceleration. When I combine the accelerometer and gyroscope signals using a smart fusion

algorithm, I get an output signal that is extremely responsive and extremely accurate, even in moving applications.

For which applications are these sensors especially designed?

I mainly see application areas on mobile machines. Let’s imagine, for example, an AGV, i.e. a driverless transport system that is constantly on the move. If, for example, this vehicle constantly moves in a curve, then you have a constant disturbance present, a disturbance acceleration. A conventional inclinometer cannot filter out this interfering acceleration because it is constantly present. And that’s why I see the best fields of application particularly in dynamic mobile applications that require a fast response time from the sensor.

The high dynamics that can be achieved in moving applications are supported by IO-Link. Another benefit, therefore, for the customer in terms of more precise and faster results? If yes, why?

We generally rely heavily on IO-Link because the protocol can transmit additional information besides the actual user data and has other advantages as well. With our inclinometer series, for example, the temperature is recorded in addition to the angle data, as is the number of operating hours. Furthermore, IO-Link also makes it possible to read out information about the application in addition to the sensor information. This is significantly more than an analog interface with 4-20 milliamps can offer. And because communication via IO-Link is very EMC-stable, the user can use unshielded, three-core cables and thus save costs.

A special feature of your sensor is the so-called LED spirit level. What is the purpose of this?

The spirit level is an installation aid. This means that the user does not first have to link the sensor with the controller during installation in order to deliver the process value. The user simply receives direct feedback from the sensor as soon as it is supplied with 24 volts. The yellow LEDs are permanently lit when the sensor is within a window of ± 0.5 degrees around the zero position.

There are already further developments of these sensors at Turck. What can we expect?

After first using MEMS cells in our inclinometers to suppress disturbance vibrations, we are now also using them in our new CMVT vibration sensors. Here they do the opposite, and accurately capture and output the vibrations. CMVT stands for condition monitoring, vibration and temperature, because this is also measured by the sensor. When users read out the process data of our sensor via IO-Link, i.e. the vibration velocity, they can easily determine a possible hazard potential in their machine. If the vibration value increases gradually over time or the limits of ISO 10816-3 are exceeded, then the user knows that action is needed before greater damage occurs. The sensor data also helps to carry out targeted maintenance intervals, i.e. neither too late nor too early, because that also costs money. The CMVT is also provided with switching outputs in addition to IO-Link. The user can therefore easily parameterize the sensor so that the switching output responds when set limit values are exceeded. You can then, for example, control a tower light that lights up green, yellow or red. All this fully autonomously without any controller integration



required. Our Turck Vibration Monitor simplifies sensor commissioning and operation. The tool visualizes the vibration and temperature data live in any web browser and can be used easily via any Turck IO-Link master – without any additional software required. This allows the user to view the measured vibration information over a

period of time, and if required, the data can be exported to Excel for further analysis.

Author | The interview was conducted by Dirk Schaar, editor-in-chief of messweb.de and GOing
Info | www.messweb.de
Web code | more12330e



The IM18-CCM60 adds a plug-and-play solution to Turck's control cabinet monitor family that is as easy to operate as a smartphone, thanks to its customized siineos operating system

Condition Monitoring to Go

Turck's IM18-CCM60 with the siineos operating system combines hardware and software into an efficient plug-and-play solution for smart control cabinet monitoring – easy to use, intuitive to operate and expandable at any time

It has not only been since issues like sustainability and production efficiency have been hot topics that the temperature monitoring of control cabinets has been a concern for designers and plant engineers. Temperature, air humidity, but also the security of control cabinets are variables that play an important role in virtually any plant concept. Raised or irregular temperature conditions in control cabinets in particular can cause power loss or even the failure of individual devices. Several risks arise at the same time if the components of a control cabinet are arranged so that hotspots build up or hardly any cool air can flow: Precision measuring devices may in some cases lose their accuracy, the lifespan of components may be reduced or in the worst case may fail permanently. Complex systems such as controllers are particularly

susceptible to heat. Most PLCs have a maximum operating temperature of 55 °C. This is just 15 °C above the "comfort temperature" of many control cabinets. Besides temperature and humidity, reliable and traceable protection against unauthorized access plays an important role in many applications, especially in so-called "critical infrastructures" (CRITIS) such as energy and water supply.

Control cabinet monitoring detects anomalies early on

Even with an optimum topology or ventilation with air conditioning systems, however, it makes sense to electronically monitor the climatic conditions in the control cabinet permanently. This allows anomalies to be detected at an early stage and failures to be

avoided – especially when devices are located in more remotely installed control boxes. This applies, for example, to outdoor areas where the weather is an external factor.

Turck has offered its CCM series as an easy to retrofit condition monitoring system for many years. The abbreviation CCM stands for “cabinet condition monitoring” and describes the central task of the compact DIN rail devices, which have three internal sensors for monitoring temperature, humidity and door distance. Depending on the model, data from additional external sensors can also be processed. Turck’s control cabinet monitors impress with their easy-to-use control functions. They automatically detect any door opening by measuring the distance to the door. These devices make every control cabinet fit for use in critical infrastructures without any significant outlay. The monitoring of door closure by the DIN rail device is also more reliable and tamper-proof than door contact switches and far less complex than roller switches.

IM(x)12-CCM with switching contact and IO-Link

The first control cabinet monitors in the CCM series were the IM12-CCM and IMX12-CCM models (with Ex approval). The compact devices are simply clipped onto the DIN rail and send a signal precisely when defined values are exceeded or undershot, for example, when a device is overheated, dew forms in the control cabinet or the door has been opened. The IM12-CCM features an internal data logger with a time stamp and stores data for up to two years. This enables users to also detect creeping changes over long periods and rectify the cause. Two cabinet guards can be operated in master-slave mode via an interface in order to simultaneously monitor correct door closing and the other limit values at two points

QUICK READ

Anyone who wants to monitor the climate in control cabinets efficiently will find a comprehensive range of control cabinet monitors for the DIN rail in Turck’s CCM family (CCM stands for cabinet condition monitoring). The devices automatically detect temperature, humidity and door closure with integrated sensors and are available in several performance classes, from the easy to retrofit IM12-CCM to the IIoT-capable Linux solution for OEMs, which can be seamlessly integrated into users’ automation networks via Ethernet. Turck’s IM18-CCM60 is a new member of the family with an app-based operating philosophy that is just as capable as a stand-alone system as it is in the cloud. This is made possible by the specially designed siineos operating system from the Chemnitz-based digitization specialist in.hub.

in the control cabinet. The master processes the data of the slave and sends a signal to the controller. The standard IM12-CCM comes with two switch contacts and an IO-Link interface. Quick teach mode enables the user to set the limit values easily in the field. Alternatively, parameters can be set via IO-Link or an FDT framework such as PACTware.

IM18-CCM: connecting factory level and IT world

Following the proven devices of the IM12 series, Turck has built the bridge to the IIoT with the IM18-CCM. The devices can not only display the condition monitoring of control cabinets in the field, but also transmit the data to the IT world. The slim 18 mm device sends the

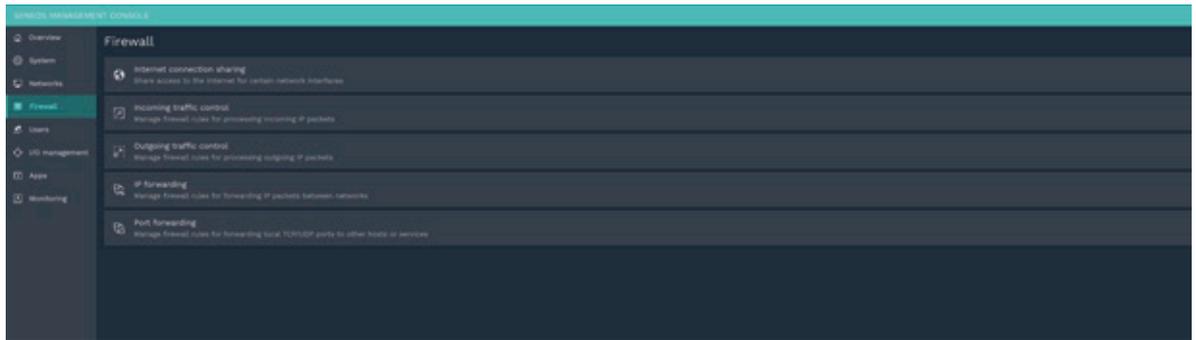
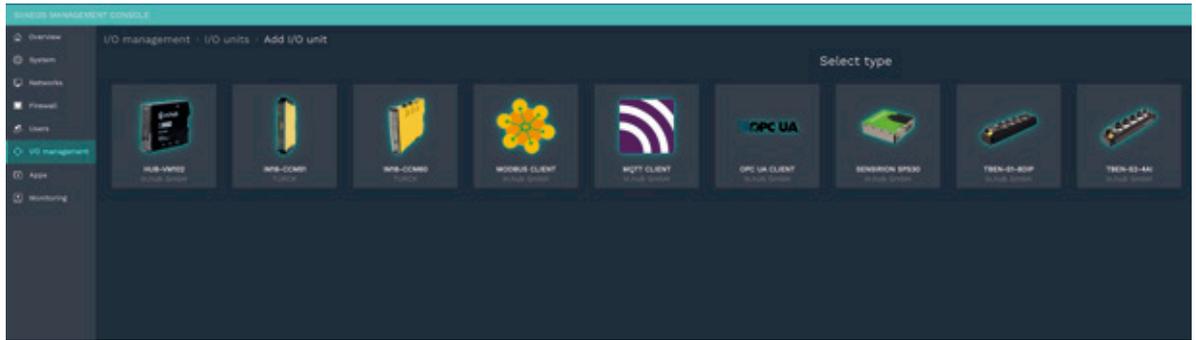


Condition monitoring: The condition data recorded by the CCM control cabinet monitor allows predictive maintenance and thus increases system availability

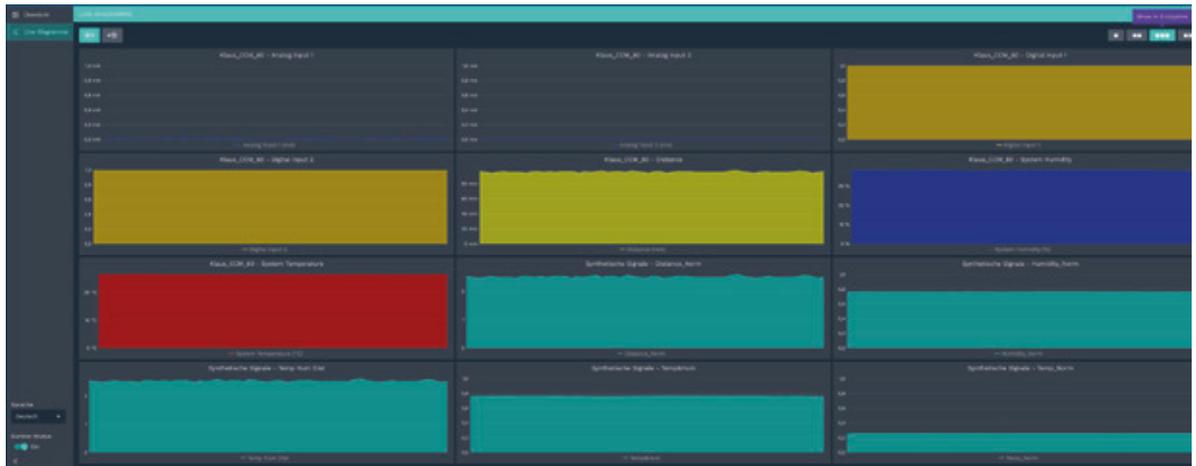


The IM18-CCM transfers measured values via Ethernet to IT networks and can even preprocess them remotely

The siineos operating system, specially developed for this platform, guarantees ease of use and maximum performance



The integrated firewall guarantees secure communication with the IT world



Climate in view: The graphical display of the measurement curves provides a quick overview

measured values of the sensors to higher-level systems via two independent Ethernet interfaces. This can go as far as the cloud, thus giving maintenance personnel access to actual climatic data at any time via mobile terminals. The boundary between the operative level and the IT infrastructure is thus gradually disappearing. As a result, users can analyze factory floor data from their office desk.

However, this not only offers plant builders and users additional possibilities with regard to data output but also for collecting measured values. The RS485 interface (Modbus RTU or CAN) enables external devices such as vibration sensors to be connected to the IM18-CCM if required, in addition to the three sensors installed. For an ideal temperature image of a control cabinet, for example, several temperature sensors can be distributed to different positions. The data from three temperature sensors is often enough

to obtain an accurate overall picture even in large cabinets. An add-on interface allows other devices such as the IM18-CCM51 to be connected for current measurement of 12 AC channels with up to 600 A. The data transfer and power supply of the IM18-CCM modules is implemented via the backplane.

IIOT for condition monitoring

The IM18-CCM series is a powerful IIoT platform for condition monitoring and other IT applications. The IM18-CCM40 and IM18-CCM50 models with their Debian Linux system are designed primarily for OEM use. These have the option of adapting the systems precisely to their own structures and thus creating customized customer solutions. This enables programmers to feed specific routines into the device, for example for detecting a dew point or allowing for natural increases in temperature at the beginning



Turck's IM-CCM (IMX12, IM12, IM18) cabinet guard series offers condition monitoring solutions for end users and OEMs

of the summer months. Some users may likewise wish to upload their own cloud connector – the visualization of trends or the sending of an alarm then take place in the higher-level system. With its two independent Ethernet interfaces, the IM18-CCM provides an effortless connection between the OT and IT world. The device uses the TCP/IP, Modbus TCP and HTTP communication protocols. Other Ethernet-based protocols can be installed later at any time.

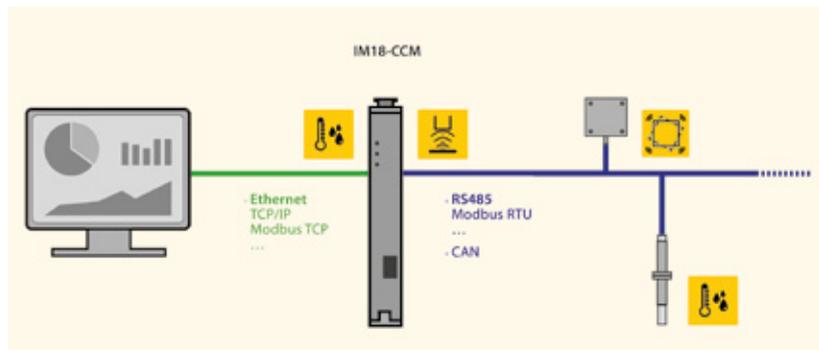
As a flexible, open and attractively priced condition monitoring solution, the IM18-CCM40 is the first Choice device especially for simple application scenarios. The IM18-CCM50, with additional digital and analog inputs and larger working memory, covers all requirements beyond these.

IM18-CCM60: plug-and-play solution for smart condition monitoring

Turck is now offering the IM18-CCM60 as another model in its series of control cabinet monitors that now makes the capabilities of the CCM50 platform available to users without any programming knowledge. For this purpose, the new model is equipped with the siineos IIoT operating system, which the digitization specialists at in.hub developed specifically for the CCM platform. The IM18-CCM60 combines hardware and software into a smart plug-and-play solution that is easy to use anywhere. It is intuitive to operate, and can be integrated into higher-level systems at any time via MQTT or OPC UA – from an autonomous stand-alone system to an extensive condition monitoring solution with cloud integration.

The IM18-CCM60 enables users to solve condition monitoring tasks very efficiently by performing all configurations and parameterization intuitively via the browser-based, graphical interface. If you want, you can also use a terminal user interface such as PuTTY to program your own applications. The InCore framework integrated in siineos offers a wide range of ready-to-use components for easy operation of

Seamless connection between OT and IT: The IM18-CCM makes it possible to connect external sensors and transfers measured values to higher-level systems via Ethernet



the integrated interfaces and sensors as well as all standard network and industrial protocols.

Besides the existing apps, you can also create your own programs and apps or load them like on a smartphone. The web-based wizard accompanies the setup, so that even users without prior knowledge can handle the IM18-CCM60 without any problems. This also allows easy access to the internal sensors for temperature, humidity and door distance and the parameterization of diverse interfaces. A knowledge of programming is not required.

Besides performance and user-friendliness, IT security was also a focus during development. A sophisticated firewall therefore allows full control of traffic into and out of the device. Furthermore, the IM18-CCM60 can also be set up as an OpenVPN client. This guarantees secure remote access to the device as well as optionally to connected machines.

From the PoC to cloud integration

Since the IM18-CCM60 does not require any mandatory cloud or service accounts, users can also perform tests or proof of concepts offline without any effort. The recorded measurement data stays on the device and the user still has access to all available functions, such as database systems or graphical dashboards (Grafana). The device is then accessed directly via Ethernet or USB. In this way, test installations can identify sources of error and potential savings at an early stage. If desired, the installation can be integrated into larger condition monitoring solutions in the real production environment at any time, whether in local IT infrastructures or cloud-based systems.

Author | Klaus Ebinger is director product management for interface technology

Web code | more12371e

Building Block Boom - Full Modularity Along the Line

Smart Automation developed a modular production line with decentralized control for an automotive supplier – using a wide range of products from the Turck portfolio – from sensors to multiprotocol I/O modules, pre-assembled connection technology, LED lights right through to RFID

Modern production plants for industry require increasingly more flexible solutions. Whether it's changing production volumes, dynamic demands placed on the shape and size of the parts to be produced, and the need for rapid changeovers for new products, manufacturers in many industries are faced with the task of efficiently mastering the new challenges. The challenges are also causing machine builders to rethink their approach. Hierarchically structured machines with a central control system had been state of the art for a long time. Today, many requirements can usually be implemented much more efficiently with modular machine and system concepts, which make it possible to decentralize the control of individual modules.

Polish system integrator Smart Automation is a specialist in the automation of industrial processes and has many years of experience in various industries, including the furniture, food, chemical, pharmaceutical or automotive sectors. The company, headquartered in Olsztyn, Poland, relies on innovative approaches for its customer-specific solutions based on Industry 4.0 technologies. Smart Automation developed a production line for valve covers for a tier 1 automotive supplier, based on modular machines and decentralized control. This modular concept enables more flexible and efficient production, allowing a faster response to changing market conditions and customer needs.

Modularity on multiple levels

The development of the modular production line was a particular challenge, because of the customer's need for flexibility on the one hand and its size on the other. Never before had Smart Automation designed and implemented a production line on such a scale. The



The supplier's extensive production line has a modular design and can therefore be flexibly adapted to future requirements

QUICK READ

Polish system integrators Smart Automation developed and implemented a new production line for valve covers for a tier-1 automotive supplier. The modular concept of the production line and the decentralized control was able to meet all the customer's requirements. Components from the Turck portfolio, which boasted a host of features including Ethernet multiprotocol functionality and the ARGEE decentralized onboard logic, provided the flexibility and reliability of the dynamic line.



»Turck's extensive portfolio enabled easy handling of a wide variety of signals, from standard digital and analog signals to RFID, which have been used for both operator logging and process tracking. By working with Turck, we were able to achieve a high level of modularity along the entire line.«

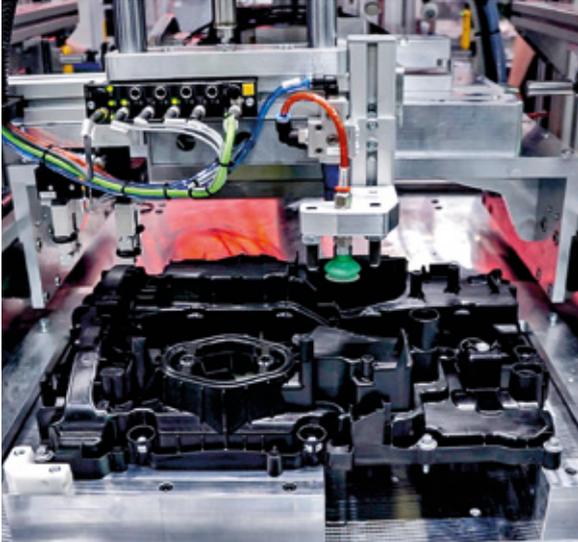
Cezary Zakrzewski | Smart Automation

line combines modules for numerous tasks, including the UV laser printing of data matrix codes for traceability, induction heating, assembly and measurement of aluminum inserts, and robot-based deionization and surface cleaning for rubber sealing. Numerous measurements and leak tests also had to be carried out,

from diameter and roundness to leakage, flow and pressure drop tests. Each workstation consists of three submodules for transport, process and construction. With the modular structure of the workstations, Smart Automation was able to achieve standardization at the design, assembly and programming levels, which



The RFID read/write devices in the line record all goods carriers and thus allow seamless process documentation



Turck's Ethernet multi-protocol I/O modules ensure efficient data communication along the plant

greatly simplifies any changes that may be necessary later in the life cycle of the machine. To implement this highly flexible line, the system integrator chose Turck as its automation partner. "Turck was already involved in the concept phase of the project," recalls Cezary Zakrzewski, sales manager at Smart Automation. "This helped us to discuss the optimal solution together with the customer and facilitated the subsequent phases of project preparation."

Future-proof thanks to standardized device integration

A key requirement for the production line was the use of different Ethernet protocols. With their Ethernet multiprotocol functionality, Turck's BL67 and TBEN series I/O modules were therefore the ideal solution for this project. They combine the three Ethernet protocols Modbus TCP, Ethernet/IP and Profinet in a single device and can be run automatically in any of the three networks. This enabled the number of device variants required to be effectively reduced. The identical planning of machine and plant sections with different Ethernet protocols also allows standardization in the integration of devices with different communication standards. A future reconfiguration of the plant can therefore be implemented without any major effort.

The Turck I/O modules used in the line also support the decentralized control approach with their ARGEE onboard logic. This field logic controller functionality can handle small to medium control tasks without placing any burden on the central controller. This means that when I/O modules are changed or replaced, the program in the central controller does not need to be adapted and the individual modules can be tested independently beforehand. They

therefore provide considerable support for the modular machine design principle, as Zakrzewski confirms: "By working with Turck, we were able to achieve a high level of modularity for the entire production line. As a result, we are able to easily redesign the process as needed."

Flexible process monitoring with RFID

To fully monitor the manufacturing process, Smart Automation has implemented an RFID-based tracking system in which Turck's TBEN-S module and HF read/write devices play a central role. All parameters and measured values of the manufacturing process are recorded for each individual part and stored in a database on a server and in the cloud. This solution makes it possible to flexibly design the manufacturing process, for example by skipping individual steps or reworking certain elements at any time.

Factor 1 sensors with maximum switching distance for all metals

The company chose Turck's uprox series for the inductive sensors required. As factor 1 sensors, the uprox devices detect all metals reliably and with the same switching distance, thus standardizing sensor selection – another benefit in machine design. The uniform use of these sensors enables an easier integration into the plant, since differences in distance and target material do not have to be taken into account. Installation and maintenance are also less complex. This makes the production of the plant more efficient.

Production in view with LED technology

In such a large project, it is very important to display the current status at the various production stages. The company chose the WLS27 programmable LED strip



WLS27 LED line lights display the respective status of a module by color



With their compact design, the TBEN RFID interfaces can be easily mounted almost anywhere

lights from Turck's optical sensor partner Banner Engineering to indicate the status of the machine in each module using different colors. K50 illuminated touch buttons were used for intuitive communication with the user.

Fast and error-proof: pre-assembled cables

Another challenge with the complexity of this line was the connection technology. But Smart Automation has also found a solution for this in Turck's extensive connectivity portfolio. Pre-assembled cables of various lengths were selected during the planning phase and passive hubs were used where necessary. This not only enabled connection errors to be ruled out from the start but made it possible to significantly accelerate assembly and commissioning of the individual modules.

Conclusion

The combination of modular machine building and decentralized control offers multiple benefits with regard to the increasing production requirements in the automotive industry. Thanks to the solutions used, it was possible to reduce the number of operators and the amount of cabling, as well as the time required for

the installation work. This would not have been possible with classic centralized control technology. The modular concept also increases system availability, as only one module needs to be replaced if it fails. Ultimately, the modular design offers easy expansion options for the plant to also meet future requirements. This increases flexibility and ensures long-term cost efficiency. "It was very important to us that manual operations could be easily automated if the customer requested it at a later date," Zakrzewski said. "Turck's extensive portfolio enables easy handling of a wide variety of signals, from standard digital and analog signals to RFID, which have been used for both operator logging and process tracking. By working with Turck, we were able to achieve a high level of modularity along the entire line."

Author | Przemysław Joachimiak is sales engineer at Turck Poland

Customer | www.smartautomation.pl/en

Web code | more12350e



Turck's TBEN-S multiprotocol I/O modules ensure reliable communication between the PTL110 and the WMS

Catch the Light

Sioen Industries optimizes intralogistics processes with a pick-to-light system based on the Banner PTL110 series and Turck's robust TBEN logic I/O modules

The employees place the carton on the displayed pallet and acknowledge the action via the touch button of the PTL110

Anyone who works in challenging and potentially dangerous environments needs quality protective clothing that protects against injury or accidents, whether they are firefighters, welders or arborists. The Belgian company Sioen specializes in technical textiles and protective workwear and produces more than three million pieces of protective clothing at 22 sites in 20 countries worldwide. Sioen employs around 5,000 people worldwide and generates sales of around 700 million euros. At the Mouscron site, the family-owned company operates a large shipping and distribution center in addition to four production plants. Garments produced worldwide are processed, stored and picked there so that they can be shipped to customers quickly and efficiently.

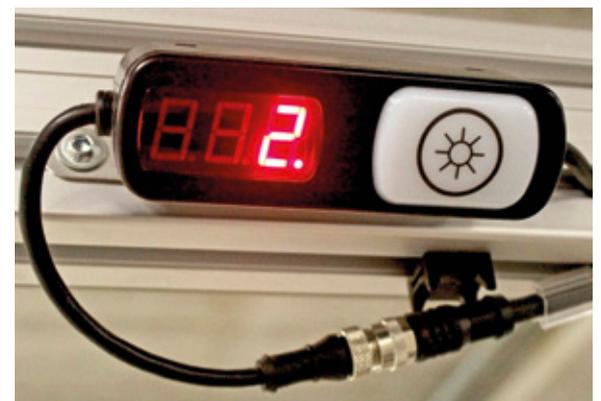
Previously, the inbound and outbound processes were largely carried out manually. After delivery, the pallets were transported to a coworker who scanned the individual cartons and placed them on defined pallet positions. These positions were reserved for specific goods – whether they were present or not. This took four to five coworkers around five hours to process a truck.

A coworker in the outbound area would receive a pick list for each customer and go through the stores in order to collect the goods. "This was obviously not an efficient way of working," recalls Filip Vanwymebeke, head of logistics at Sioen Apparel. "We therefore looked for a system that could handle the challenges of both the inbound as well as the outbound logistics." We finally implemented a powerful warehouse management system (WMS) to solve this problem, in combination with an error-free pick-to-light solution based on the PTL110 series of Turck's optical sensor partner Banner Engineering.

Inbound: pick-to-light as a playmaker

In the incoming goods area (inbound), employees lift the cartons from the pallets onto a conveyor belt. A scanner automatically captures the labels on the cartons as they pass by. Depending on the label, they are then directed to one of six conveyor belts. If the label cannot be read, the carton is conveyed to a designated belt for manual processing. Once a coworker at the end of the conveyor belt has scanned the delivered carton, the WMS immediately indicates via the pick-to-light system which pallet it must be placed on. The coworker places the carton on the appropriate pallet and acknowledges the action via the touch button of the PTL110 device located above the pallet. The PTL110's three-digit display immediately shows the number of cartons on the pallet.

The pick-to-light system provides several signal states. A green signal indicates that the system is ready



The versatile PTL110 with touch button, optical sensor and three-digit display is especially suitable for reliable operator guidance

»Where it used to take five coworkers up to five hours to handle a truck, it is now handled by three coworkers in two to three hours. This corresponds to a time saving of up to 15 hours per truck per day.«

Filiep Vanwymelbeke | Sioen Appareel



for use, while red indicates an operating error. In addition, a purple signal indicates that a mixed pallet must undergo quality control. When the pallet is complete and can be removed, the LED of the PTL110 finally lights up blue.

Outbound: reliable order consolidation

Two streams of goods converge on the outbound conveyor: Cartons with standard contents and cartons with a mixture of different goods that vary in height depending on the contents. At this point, the pick-to-light system becomes active again. The coworker scans the carton, whereupon the WMS determines the pallet on which it is to be placed, according to the customer or carrier. The PTL110s indicate the correct location of the pallet by means of simple color signals. "We are very satisfied with this way of working," says Vanwymelbeke. "We're thinking about doubling the number of PTL110 devices in the outbound area to serve even more customers and carriers at the same time."

Multiprotocol I/O module ensures reliable operation

The communication of the PTL110 devices with the WMS is crucial for the optimal operation of the solution. All PTL110 devices are connected for this purpose via Turck's TBEN-S multiprotocol I/O modules. The robust IP67 modules can be mounted directly on the conveyor line without a control cabinet and feature as standard the web-based ARGEE field logic controller software. ARGEE allows the module to be used as a small control unit by using standard communication protocols (ModBus registers).

Communication with the WMS can be easily configured by using PickIQ. In this way, the ARGEE software sets up a connection between the PTL110 and the WMS without the need for extensive programming. The customer's IT personnel do not need any special knowledge of automation software for this. PickIQ uses a serial bus protocol that uses a common ID to avoid latency or delays when polling multiple devices. This allows the system to operate without delays even during peak hours.

Error rate reduced to zero

The versatility of the PTL110 devices is demonstrated by their application in both inbound and outbound systems. The multifunctional displays with touch button options, optical sensors and three-digit display with clear signal indication enable simple and reliable monitoring of the number of cartons on a pallet. The PTL110 devices stand out on account of their fast response time and flexible installation options, which allows for easy customization and expansion of the system. The M12 connectors enable fast and safe installation of multiple devices. The display also has the ability to show up to 14 colors, combined with several animation functions to distinguish different states.

"The inbound error rate has dropped to virtually zero," Vanwymelbeke notes. "Where it used to take five coworkers up to five hours to handle a truck, it is now handled by three coworkers in two to three hours. This corresponds to a time saving of up to 15 hours per truck per day. In this way we are able to use our employees for other tasks."

Author | Hans De Craemer is marketing manager at Turck Multiprox in Belgium
Customer | www.sioen.com
Web code | more12351e

QUICK READ

Sioen Appareel is a specialist in technical textiles and protective clothing, and develops, produces and sells yarns, fabrics, nonwovens, textiles and garments for various applications worldwide. To optimize inbound and outbound processes at its distribution center in Mouscron, Belgium, Sioen has implemented a high-performance warehouse management system in combination with a pick-to-light solution based on the PTL110 series from Turck's optical sensor partner Banner Engineering and Turck's TBEN IP67 I/O modules. By using the cascable display modules with optional touch button and optical sensor, error rates have been drastically reduced and sorting and picking processes significantly accelerated.



»The ISC CAM solves many of the problems that classical automation structure raised.«

Lazlo Kleczewski | Intralox



Creative Conveying

EV battery manufacturers require easily scalable conveyor solutions – for smart control of the variable systems, Intralox developed the decentralized logic module ISC CAM with robust Turck block I/Os

E-mobility is currently shaking the global automotive market. Car manufacturers aren't alone in feeling impact of the increasing demand for alternative drive concepts, of which battery-powered electric vehicles are currently the most important. The whole supplier structure is challenged to meet changing demands. First and foremost the production of lithium ion batteries needs to keep up with the pace set by demand for electric vehicles. "We have customers that need to scale their operations very aggressively in order to meet the demands that the electric vehicle makers are going to need," says Martina Costa, Business Development Analyst for the Automotive Team at Intralox in Amsterdam, a company specialized in conveyance and material handling technology for numerous industries. "Battery manufacturers won't be able to do that just by building new greenfield plants. They will need to increase the throughput of their existing facilities."

The EV battery conveying solution: scalable, flexible, and pallet-free

Besides the increasing demand for scalability Intralox identified two other criteria that would separate the wheat from the chaff when battery producers look for the conveying solution to be installed in their next battery production plant: First and foremost is flexibility since the number of different types of batteries will

increase dramatically over the next five years. Plants need to be able to handle a large number of different types on the same intralogistics system. The equipment transporting the batteries through the production line needs to be able to handle a variety of weights, dimensions, and other differing properties. The third demand that Costa identifies is that manufacturers will need a solution without pallets and workpiece carriers, which increase complexity and the cost of the production line as the pallets need to be collected, returned, and checked continuously. Manipulating batteries directly on the conveyance surface reduces investment cost and time to market.

Intralox: conveying innovations

Intralox happens to be an inventor's company in the most literal sense, holding more than 1400 patents in force around the world. With an inventor as its founder, the focus has always been on developing new solutions where the patents add value. This is one reason for Intralox's concentration on technologies like their modular plastic belting for special purposes such as hygienic belts for carrying unpacked food. Their solutions are part of the logistics infrastructure of market leaders in almost any industry.

An example of this inventive spirit is the Intralox Activated Roller Belt (ARB) technology that the company pioneered 15 years ago. With conventional roller



With its demo loop in Shanghai, Intralox demonstrates that decentralized automation solves many problems of equipment manufacturers when integrating automation of their products into bigger systems

conveyors, so-called pop-up belts are used to separate goods or to move them perpendicular to the conveying direction. Those belts pop up between the rollers and are separately motorized to allow for lateral movement of the goods. One downside of this technology is belts in between the rollers do not offer support throughout the whole surface of the product and therefore limit the size of the items being conveyed.

Intralox's ARB technology solves this problem by using a belt in which small rollers are embedded at a certain angle to the direction of belt travel. Especially when high throughput and very sensitive handling and separation is needed, ARB equipment and especially DARB equipment can be a problem solver. DARB stands for a special version of ARB – the Dual-Stacked Angled Roller Belt – which is able to move items up to 90 degrees perpendicular to the line travel.

The DARB technology perfectly complies with the three critical demands for EV battery production logistics stated above: scalability, flexibility and ability to handle batteries directly without pallets. It improves scalability as it is able to increase the throughput of battery lines significantly compared to conventional pop-up belt conveyors by eliminating stop and start times before perpendicular movements. It is also more flexible as full width support removes most restrictions on item dimensions. The only limit set is the dimension of the belt itself. Smaller parts cannot fall in between

rollers like with standard roller conveyors. Finally, DARB equipment eliminate the need for pallets since they support the EV battery over the whole baseplate.

Problem: Central PLC solutions poorly scalable

Some lithium-ion battery manufacturers are already benefiting from the capabilities of DARB equipment in their production, as Martina Costa explains. But the company identified more room for improvement when looking for the optimal conveyor for the growing

QUICK READ

Machine builders that need to integrate their machines into higher-level systems often have the choice between two suboptimal alternatives: either integrating their controls in the main line PLC or building up a separate control cabinet with PLCs on each single machine. Both variants are not only complex and expensive, but also not scalable enough to meet the growing demands on modern intralogistics systems. Thus the belting and conveying specialist Intralox developed the Intralox Smart Carryway Automation Module (ISC CAM), an autonomous IP67 unit to control conveyors like the DARB Series 4500. Turck provided its TBEN block modules for the ISC CAM, IP67 PSU67 power supplies and color-coded cables for easy commissioning and cabinet-free installation.

Turck's large portfolio of IP67 I/O modules ensures a seamless, decentralized approach for modular machines and plants



ISC CAM: The decentralized Intralox logic on Turck's robust TBEN-S block modules enables a variable conveyor layout without complex control cabinet installation



Fast cabling, easy installation: The robust PSU67 power supply provides all required voltages directly on site

battery industry. Intralox is the OEM (Original Equipment Manufacturer) but the automation of DARB equipment is traditionally done by the integrator of the intralogistics systems using Intralox guidelines. "We realized that this process is not always efficient as much know-how is lost in communication. We sell DARB constantly, but the integrator only does it now and then. That could become challenging for all parties", explains Martin Benavidez, Intralox Product Manager for ISC. The acronym stands for "Intralox Smart Carryway", an innovative program that aims to develop an automation solution for controlling Intralox machinery, including the DARB product line. Benavidez is driving the project together with Lazlo Kleczewski as Product Design Manager for ISC.

Integrators choose to leverage another PLC available in the line to control the DARB equipment. The main drawback of having one PLC controlling several machineries is that debugging during commissioning and changes in the operation are time-consuming and risky. To solve this problem for the benefit of customers, Intralox expanded its offer to include automation of the DARB system. "We started using a separate PLC to automate the DARB, but is not cost efficient, especially in the small ones. We had to offer different PLCs and build big electric cabinets following many customer requirements and regional regulations. Product development and maintenance is complex because of this", explains Benavidez. He adds that using traditional PLC technology is difficult to scale because of the effort required to engineer and assemble the control cabinet and maintain different PLC platforms that have been established for years in factories. "Scalability is very important for us. Therefore we looked for a solution where we can channel our experience and knowledge gained over many years into a small device that is easy to use and carefree", Lazlo Kleczewski adds.

Solution: Decentralized IP67 controls bring flexibility

The solution is the ISC CAM (Intralox Smart Carryway controlled by a Carryway Automation Module), a small IP67 block module that contains Intralox' software logic to maximize the performance of the equipment without needing an electric cabinet. Turck's TBEN-S provides the hardware platform for the ISC CAM. Thanks to its multiprotocol capabilities, it can service a wide range of customers with minimal product variations. Turck's multiprotocol devices support the Profinet, Modbus TCP and Ethernet/IP protocols and adjust themselves to the Ethernet protocol spoken on the network without user intervention. This allows for an improvement for all parties involved. The integrator only needs to program his PLC to communicate a few basic instructions, thus reducing the effort and risk of integrating and commissioning DARB equipment. The end user will be ensured to always have the latest automation knowledge used in the equipment and can rely on the full Intralox support for DARB equipment. "The ISC CAM solves many of the problems that classical automation structure raised", says Lazlo Kleczewski.

DARB demo loop with decentralized automation

To showcase DARB technology as a key conveying solution for EV battery industry Intralox built a demo loop in Shanghai, where potential customers get an impression of the capabilities of the technology. In addition to that, the loop demonstrates the benefits of decentralized automation. Each piece of DARB equipment has its own ISC CAM for the carryway automation, and other key automation functions in the loop, like motor control and safety are distributed into other simple modules. The result is a high level of modularity of both the hardware and software improving set-up, troubleshooting, and modifications like adding or removing a conveyor.



»We started using a separate PLC to automate the DARB, but it is not cost efficient, as we had to offer different PLCs and build big electric cabinets following many customer requirements and regional regulations.«

Martin Benavidez | Intralox

With this demo loop, Intralox demonstrates that decentralized automation solves many problems of equipment manufacturers when integrating automation of their products into bigger systems. Traditional solutions would require a cabinet for housing the HMI, motor controller and variable frequency drive, power supply, and other components that are not available in high electrical protection degrees. However, the ISC and the wide Turck portfolio of field modular components in IP67 offer solutions to these problems. Allowing the creation of more clean, flexible yet nimble solutions.

Full range IP67 portfolio for decentralized automation by Turck

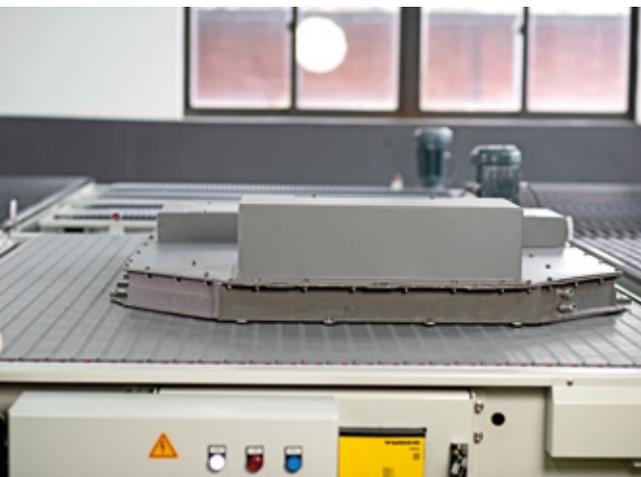
The loops HMI does not have the typical screen on the cabinet. "There is no need for a physical HMI because the loop can be controlled, adjusted and changed thru a 'virtual HMI' that is hosted in the web-server of the ISC. This is easily accessible with a laptop or any device with a web-browser", says Lazlo Kleczewski. The automation of the motors and safety systems in the loop is done decentralized by a combination of field controllers from the Turck TBEN product line. Thanks to the large portfolio of IP67 I/O components for serial and Ethernet communication the demo loop's cabinet is not bigger than a shoebox. It only incorporates some



Fast and trouble-free cabling is promised by the M12 connectors with color-coded rings for poka-yoke connections

safety components. The ability of Turck Ethernet solutions to communicate with either Profinet, Ethernet/IP or Modbus TCP dispenses the development of individual solutions for customers in different regions. Turck's robust power supply unit PSU67 simplifies the supply of the 24 VDC for running the automation components.

There are other benefits of this 'integrated and holistic design' that Intralox proposes. For instance, not having a cabinet reduces parts, but also allows to eliminate cables with loose-ends making the concept virtually plug and play. By using color coding on the connectors, a high level of poka yoke is created thus minimizing the chances of mistakes. Therefore the cabling and wiring of the equipment becomes simpler and intuitive and almost impossible to connect it wrong. "We are trying to demonstrate that it is possible to take these complex systems and make them simple and intuitive. The only thing it requires, is to think slightly different", the ISC team resumes.



Supporting EV battery modules throughout the whole surface is one key advantage of DARB technology as the demo loop in Shanghai shows

Author | Frank de Jong is marketing manager at Turck B.V. in Zwolle, NL

Customer | www.intralox.com

Web code | more12352e



Each shelf location is equipped with an RFID read/write device that reads the RFID tag underneath the box as soon as it is stored

Seed Center

KWS optimizes and secures its seed production with Turck's RFID solution for the wireless identification and temperature monitoring of silo boxes – Profinet S2 redundancy included

As one of the world's leading seed specialists for corn, sugar beet and cereals, KWS Saat SE & Co. KGaA uses state-of-the-art plant breeding methods to increase farmers' yields and further improve the resistance of plants to diseases, pests and abiotic stress. This

requires the seed to be propagated and processed under controlled climatic conditions and to high standards of quality. In the sugar beet seed production facility at its Einbeck site, KWS prepares the sugar beet seed in a highly automated, multi-stage process. The

»This is the perfect solution for us. The measured values are transferred wirelessly and the storage boxes are identified without contact.«

Dr. Joris van Dort | KWS



seed is transported fully automatically into boxes between the individual process steps and stored in a dynamic high-bay racking system. The temperature inside the storage boxes has to be determined and monitored at all times and as accurately as possible in order to ensure seed quality.

High availability thanks to Profinet S2 redundancy

The seed must meet certain requirements, for example, in terms of tolerance to various diseases or drought. The relevant data is exchanged and processed in the system between a server and the controller. "If silo data were lost as a result of a control system failure, it would no longer be possible to track which seed is stored in which box," says Christian Fricke, technical innovations team leader at KWS. "In this case, there would be nothing left to do but dispose of the seed that could not be identified. For a high-priced product that can't be reproduced at short notice, this is obviously not desirable."

The required warehousing system must therefore guarantee maximum availability and data security. Profinet-based systems can be designed for these tasks with a redundant controller, referred to as S2 redundancy in the Profinet specification, and Turck's compact TBEN RFID interfaces with Profinet S2 system redundancy for highly available systems meet this requirement. In the event of a controller failure, a parallel PLC takes over the process control automatically and without any loss of data. Another benefit: The robust RFID interfaces with IP67 protection can be mounted directly in the warehouse without a protective housing.

Wireless power and measured value transmission

A robot takes over in the treatment process the dynamic removal and placement of the boxes on the appropriate shelf location. As a result of the production team's previous experience, the new solution focused on contactless power and signal transmission:



Turck's TBEN RFID interfaces with IP67 protection are screwed onto a metal panel in a cabinet-free installation in the warehouse

QUICK READ

KWS Saat SE & Co. KGaA is the world market leader for sugar beet seed and supplies its customers with seed varieties for conventional and organic farming that are specially tailored to their requirements. To do this, the seed must be propagated and processed under suitable climatic conditions. In this highly automated treatment process for sugar beet seeds, Turck's BL ident RFID solution ensures the contactless transmission of power, address data and measured values from temperature sensors inside silo boxes and ensures high plant availability – also thanks to Profinet S2 redundancy made possible by the RFID interfaces. The possibility of automatic address assignment and Turck's unique HF bus mode for connecting up to 32 HF read/write devices per port guarantee fast installation, efficient storage and easy device replacement for service tasks.



»The fact that the Turck solution uses HF bus mode suited our requirements perfectly. This enabled us to install the RFID read/write devices for a rack without any major effort and we just had to connect the pre-assembled cables with T pieces.«

Christian Fricke | KWS

“In the previous system, signal transmission was via contact pins underneath the box,” Christian Fricke explains the initial situation. “However, any contamination on the contact pins or inaccurate placement of the boxes on the pins kept causing downtimes in production, and so we looked for a better solution.”

Turck’s RFID solution provides RFID tags at the bottom of each box with an attached sensor element that measures the temperature inside the storage container. Each shelf location is equipped with an RFID read/write device that reads the tag on the box as soon as it is stored. The read/write device supplies the temperature sensor with power via the voltage induced in the tag. This completely eliminates the maintenance effort required with a battery-powered solution.

Automatic identification of the seed storage boxes with RFID

The boxes are managed by the control system of the high-bay supplier. At the same time, a process control system receives the booking telegrams from the controller. For example, if a box is moved to a new position, the process control system updates the entries in the database. “The storage system remembers where a box was stored,” Christian Fricke explains.

RFID technology enables unambiguous and complete monitoring of all boxes during transport and storage. The ID stored on the RFID tag on the bottom of the box can be used to check whether the box is at the correct shelf location. If there are any discrepancies, a stock reconciliation is carried out. The RFID system thus provides the basis for verifying the



The RFID tag has a sensor connected to it which measures the temperature inside the storage container



Thanks to Turck's HF bus mode, the HF read/write device can be connected very easily to each shelf rack using T pieces, thus considerably reducing wiring effort and costs

database information. "This is the perfect solution for us," says Dr. Joris van Dort, technical innovations manager at KWS. "The measured values are transmitted wirelessly and the storage boxes are identified without contact."

Fast commissioning thanks to HF bus mode

A key requirement for the new system was the avoidance of the complex geometry of the old solution and its large cabling and wiring overhead. Turck's RFID interfaces stand out here with a feature that is unique in the market: HF bus mode. This function allows the connection of up to 32 HF write readers per port. In applications with many write and/or read positions, this considerably reduces the wiring effort as well as costs. Temperature values and IDs are read cyclically. This makes it possible to implement continuous temperature monitoring. The read values can also be assigned to the containers at any time. "The fact that the Turck solution uses HF bus mode suited our requirements perfectly," said Christian Fricke. "This enabled us to install the RFID read/write devices for

a rack without any major effort and we just had to connect the pre-assembled cables with T pieces."

Benefits of automatic addressing

The automatic addressing of the RFID read/write devices proved to be a major benefit of the Turck solution both for commissioning and for service operations. After connecting with the T pieces, the devices are automatically assigned addresses which were activated in the web server. If a device is faulty and has to be replaced, the TBEN registers which read/write device is missing when it is removed. If a new module is connected, it is automatically assigned the address of its predecessor. It is no longer necessary to store preconfigured replacement devices or carry out any time consuming addressing of replacements for service tasks.

Author | Thorsten Enthöfer is product manager for RFID HF systems

User | www.kws.com

Web code | more12353e



Teamwork: Turck's FS+ flow sensors are installed on the inlet and outlet side of each cooling circuit line

Ice Cold Optimization

Turck's FS+ flow sensors ensure efficient cooling of industrial furnaces through real-time monitoring of flow and temperature

A well-known industrial company in China specializes in the research, development and production of high-tech materials and special industrial furnaces for various fields and applications. These include the production of ceramic composites, the heat treatment and compaction of workpieces in a vacuum, and waste incineration or disposal. The materials used, such as metals, ceramics, plastics or minerals, are processed in high-temperature and high-pressure furnaces under extreme temperatures of up to 2,600 °C and pressures of up to 25 MPa.

Closed industrial furnaces are more energy efficient and environmentally friendly compared to open furnaces. However, cooling a closed high-temperature and high-pressure furnace is challenging due to the higher combustion temperatures involved. To ensure the safe and efficient operation of the furnaces, the flow and temperature of the cooling water as well as the energy consumption must be constantly monitored and controlled. Turck's FS+ flow sensors are ideal for this application, as they can monitor the temperature of the cooling medium in addition to the flow.

FS+ all-in-one solution

Knowing exactly how much energy is consumed is the first priority in ensuring the cooling performance of the system and saving energy. This requires the monitoring of both the flow as well as the temperature of the cooling system. As the flow sensors of the FS+ series use the calorimetric principle to monitor liquid media, they also make it possible to continuously monitor the media temperature, in addition to monitoring the flow. Measurement and process data, as well as relevant diagnostic information, is transferred from the sensor to the controller via IO-Link. The FS+ flow sensors were installed at the inlet and outlet end of each line in order to check the performance of the cooling circuit.

With a temperature measurement range of up to 85 °C, a pressure resistance of up to 300 bar and the

QUICK READ

A Chinese industrial furnace manufacturer was faced with the challenge of reducing the energy consumption of closed industrial furnaces and at the same time complying with environmental requirements and improving the monitoring of the cooling circuit. It chose Turck's FS+ flow sensor from the Fluid+ sensor series, which detects both the temperature of a medium and the flow at the same time, and thus optimizes cooling efficiency in real time – while reducing energy consumption. Using IO-Link communication, the sensors ensure end-to-end data transparency, enabling predictive maintenance for the system.



Relevant process data and measured values are transmitted to the controller via Turck's IO-Link master



The sensor housing can be freely rotated by 340°, allowing convenient alignment of the display and electrical connection

ability to measure flow speeds of up to 3 m/s, the FS+ flow sensors meet all customer requirements for this application. The high IP6K7 and IP69K protection ratings of the devices also enable them to be used reliably in harsh environments with high temperatures and dust. Another benefit: The housing of the FS+ sensor can be rotated 340° so that the orientation of the display field and the electrical interface can be optimally adjusted when it is installed. This means that the user always has a good view of the displays in the field, regardless of the mounting situation.

Easy commissioning and handling

The Quick Teach and Delta Flow functionality the FS+ offers two functions that make commissioning easier. Delta Flow ensures that the teach-in is not performed until the temperature probe has fully warmed up and a constant flow is present. The sensor also offers a number of practical functions, such as a locking mechanism that prevents the user from accidentally operating the sensor. The user also benefits from an M18x1.5 adapter on the sensor body. Furthermore, the sensor can be adapted to different process connections with different threads. A wide

range of probe lengths are also available, depending on the pipe diameter.

Predictive maintenance with IO-Link

Processing process and diagnostic information directly in the field reduces the load on the higher-level control system, which improves system efficiency and thus reduces costs. The acquisition and analysis of process and diagnostic information provide the basis for predictive system maintenance so that problems are detected early.

Conclusion

The effective cooling and predictive maintenance of closed industrial furnaces require permanent monitoring of the cooling water including temperature and energy consumption. The FS+ flow sensor is the right solution for these tasks, as it offers the possibility of monitoring flow and temperature simultaneously and transmitting process data and other relevant information transparently to the controller via IO-Link. These benefits of the FS+ sensors and their user-friendly operation and installation concept also impressed the Chinese industrial furnace manufacturer.

Author | Chen Zhao is product engineer at Turck in China
Web code | more12354e

Web and Social Media

Turck promises exciting trends and innovations for Industry 4.0 and IIoT with the Digital Innovation Park - from IO-Link to condition monitoring or track and trace. Turck's digital showcase provides a quick overview of current automation topics and links to webinars, white papers and more. Want to stay up to date? Then subscribe to our newsletter or follow us on our social media channels.

www.turck.com/dip



Trade Fairs

Turck presents current product innovations and proven solutions for factory, process and logistics automation at numerous international and national trade fairs. Be our guest and talk to our experts about your challenges. You will find a current overview at www.turck.com/events.



www.turck.com/events



Sites

With over 30 subsidiaries and more than 60 agencies, Turck is always nearby, anywhere in the world. This guarantees fast contact to your Turck partners and direct support on site.



GERMANY

Headquarters Hans Turck GmbH & Co. KG | Witzlebenstraße 7 | Mülheim an der Ruhr | +49 208 4952-0 | more@turck.com

<p>ARGENTINA Aumecon S.A. (+54) (11) 47561251 ventas@umecon.com.ar</p> <p>AUSTRALIA Turck Australia Pty. Ltd. (+61) 1300132566 australia@turck.com</p> <p>AUSTRIA Turck GmbH (+43) (1) 4861587 austria@turck.com</p> <p>BAHRAIN Al Bakali General Trading (+973) 17 55 11 89 albakali@albakali.net</p> <p>BELGIUM Turck Multiprox N. V. (+32) (53) 766566 mail@multiprox.be</p> <p>BOLIVIA Centralmatic (+591) 7 7457805 contacto@centralmatic.net</p> <p>BOSNIA AND HERZEGOVINA Tipteh d.o.o. (+387) 33 452427 info@tipteh.ba</p> <p>BRAZIL Turck do Brasil Ltda. (+55) (11) 26769600 brazil@turck.com</p> <p>BRUNEI Turck Banner Singapore Pte Ltd (+65) 65628716 singapore@turckbanner.com</p> <p>BULGARIA Sensomat Ltd. (+359) (58) 603023 info@sensomat.info</p> <p>CANADA Turck Canada Inc. (+1) (905) 5137100 salescanada@turck.com</p> <p>CHILE Egaflow S.P.A. (+56) (2) 2887 0199 info@egaflow.com</p> <p>CHINA Turck (Tianjin) Sensor Co. Ltd. (+86) (22) 83988188 china@turck.com</p> <p>COLOMBIA Dakora S.A.S. (+57) (1) 883-7047 ventas@dakora.com.co</p> <p>COSTA RICA Tecnologia Interactiva (+506) 2572-1102 info@tecnologiainteractiva.com</p> <p>CROATIA Tipteh Zagreb d.o.o. (+385) (1) 80 53 628 tipteh@tipteh.hr</p> <p>CYPRUS AGF Trading & Engineering Ltd. (+357) (22) 313900 agf@agfelect.com</p> <p>CZECH REPUBLIC Turck s.r.o. (+420) 495 518 766 turck-cz@turck.com</p> <p>DENMARK Hans Folsgaard A/S (+45) 43 208600 hf@hf.dk</p> <p>DOMINICAN REPUBLIC Suplitek SRL (+809) 682-1573 aortiz@suplitek.com.do</p> <p>DOMINICAN REPUBLIC VZ Controles Industriales, CXA (+809) 530 5635 vz.controles@codetel.net.do</p> <p>ECUADOR Bracero & Bracero Ingenieros (+593) (2) 264 1598 bracero@bracero-ingenieros.com</p> <p>EGYPT Electric Technology (+20) 3 4248224 electech@electech.com.eg</p> <p>EL SALVADOR Elektro S.A. de C.V. (+503) 2243-8542 info@elektroelsalvador.com</p> <p>ESTONIA Osauhing "System Test" (+37) (2) 6405423 systemtest@systemtest.eem</p> <p>FINLAND Sarlin Oy Ab (+358) (10) 5504000 info@sarlin.com</p> <p>FRANCE Turck Banner S.A.S. (+33) (0)160436070 info@turckbanner.fr</p> <p>GEORGIA Formila Company LLC (+995) 555 554088 formila.company@gmail.com</p> <p>GREAT BRITAIN Turck Banner Ltd. (+44) (1268) 578888 enquiries@turckbanner.co.uk</p> <p>GREECE Athanassios Greg. Manias (+30) (210) 9349903 info@manias.gr</p> <p>GUATEMALA Prysa (+502) 2268-2899 alvaro.monzon@prysaguatemala.com</p> <p>HONDURAS Partes Industriales (+504) 2237-4564 orlando@part-ind.com</p> <p>HONG KONG Hilford Trading Ltd. (+852) 26245956 hilford@netvigatort.com</p> <p>HUNGARY Turck Hungary Kft. (+36) (1) 4770740 hungary@turck.com</p> <p>ICELAND KM stál ehf (+354) 5678939 kallikmstal.is</p> <p>INDIA Turck India Automation Pvt. Ltd. (+91) 7768933005 india@turck.com</p> <p>INDONESIA Turck Banner Singapore Pte. Ltd (+65) 6206 5095 singapore@turckbanner.com</p> <p>IRELAND Tektron Electrical (+353) (21) 4313331 webenquiry@tektron.ie</p>	<p>ISRAEL RDT (+972) 3 645 0780 info@rdt.co.il</p> <p>ITALY Turck Banner S.R.L. (+39) 2 90364291 info@turckbanner.it</p> <p>JAPAN Turck Japan Corporation (+81) (3) 52982128 japan@turck.com</p> <p>JORDAN Technology Integration (+962) 6 464 4571 info@tijo</p> <p>KENYA Westlink Limited (+254) (53) 2062372 sales@westlinktd.co.ke</p> <p>KOREA Turck Korea Co. Ltd. (+82) (2) 69595490 korea@turck.com</p> <p>KUWAIT Warba National Contracting (+965) 24763981 sales.wncc@warbagroup.com</p> <p>LATVIA Will Sensors (+37) (1) 67718678 info@willsensors.lv</p> <p>LEBANON Industrial Technologies (ITEC) (+961) 1 491161 info@iteclive.com</p> <p>LITHUANIA Hidroteka (+370) (37) 352195 hidroteka@hidroteka.lt</p> <p>LUXEMBOURG Turck Multiprox N. V. (+32) (53) 766566 mail@multiprox.be</p> <p>MALAYSIA Turck Banner Malaysia Sdn Bhd (+60) 3 5569 7939 malaysia@turckbanner.com</p> <p>MEXICO Turck Comercial, S. de RL de CV (+52) 844 4116650 mexico@turck.com</p> <p>MYANMAR RobAioTric Co. Ltd. (+95) 1 572028 zawta@robaiotric.com</p> <p>NEW ZEALAND CSE-W Arthur Fisher Ltd. (+64) (9) 2713810 sales@cse-waf.co.nz</p> <p>NETHERLANDS Turck B. V. (+31) (38) 4227750 netherlands@turck.com</p> <p>NICARAGUA Iprocen S.A. (+505) 22442214 ventas@iprocen.com</p> <p>NIGERIA Milat Nigeria Ltd. (+234) (84) 485382 commercial@milat.net</p> <p>NORTH MACEDONIA Tipteh d.o.o. Skopje (+389) 231 74197 tipteh@on.net.mk</p> <p>NORWAY HF Danyko A/S (+47) 37090940 danyko@hf.net</p> <p>OMAN Oman Oil Industry Supplies & Services Co. LLC (+968) 24117600 info@oioiss.com</p> <p>PAKISTAN Route One Engineering (+92) 051-5735181 info@route1.com.pk</p> <p>PANAMA Accesorios Industriales, S.A. (+507) 230 0333 accinsa@cableonda.net</p> <p>PERU NPI Peru S.A.C. (+51) 1 2454501 npiperu@npiperu.com</p> <p>PERU Segaflo (+51) 966 850 490 douglas.santamaria@segaflo.com</p> <p>PHILIPPINES Turck Banner Singapore Pte Ltd (+65) 6206 5095 singapore@turckbanner.com</p> <p>POLAND Turck sp.z o.o. (+48) (77) 4434800 poland@turck.com</p> <p>PORTUGAL Bresimar Automação S.A. (+351) 234033020 bresimar@bresimar.pt</p> <p>PUERTO RICO Inseco Inc. (+1) (787) 781-2655 sales@insecopr.com</p> <p>PUERTO RICO Stateside Industrial Solutions (+1) (305) 301-4052 sales@statesideindustrial.com</p> <p>QATAR Doha Motors & Trading Company WLL (+974) 44651441 dohamotor@qatar.net.qa</p> <p>ROMANIA Turck Automation Romania SRL (+40) (21) 2300594 romania@turck.com</p> <p>SAUDI-ARABIA Codcon (+966) 13 38904510 codconest@gmail.com</p> <p>SAUDI-ARABIA Salim M. Al Joaib & Partners Co. (+966) 3 8175065 salim@aljoaibgroup.com</p> <p>SERBIA Tipteh d.o.o. Beograd (+381) (11) 8053 628 damir.office@tipteh.rs</p> <p>SINGAPORE Turck Banner Singapore Pte. Ltd. (+65) 6206 5095 singapore@turckbanner.com</p> <p>SLOVAKIA Marpex s.r.o. (+421) (42) 4440010 info@marpex.sk</p> <p>SLOVENIA Tipteh d.o.o. (+386) (1) 2005150 info@tipteh.si</p>	<p>SPAIN Elion S.A. (+34) 932982000 elion@elion.es</p> <p>SOUTH AFRICA Turck Banner (Pty) Ltd. (+27) (11) 4532468 sales@turckbanner.co.za</p> <p>SWEDEN Turck Office Sweden (+46) 10 4471600 sweden@turck.com</p> <p>SWITZERLAND Bachofen AG (+41) (44) 9441111 info@bachofen.ch</p> <p>TAIWAN E-Sensors & Automation Int'l Corp. (+886) 7 7323606 ez-corp@umail.hinet.net</p> <p>TAIWAN Jach Yi International Co. Ltd. (+886) 2 27312820 james.yuan@jachyi.com</p> <p>THAILAND Turck Banner Trading (Thailand) co., Ltd. (+66) 2 116 5699 thailand@turckbanner.com</p> <p>TRINIDAD AND TOBAGO Control Technologies Ltd. (+1) (868) 658 5011 sales@ctitech.com</p> <p>TUNISIA Codaprint (+216) 95 66 6647 info@codaprint.com.tn</p> <p>TURKEY Turck Otomasyon Tic. Ltd. Şti. (+90) (216) 5722177 turkey@turck.com</p> <p>UKRAINE SKIF Control Ltd. (+380) 611 8619 d.startsew@skifcontrol.com.ua</p> <p>UNITED ARAB EMIRATES Experts e&i (+971) 2 5525101 sales@experts-ei.com</p> <p>UNITED ARAB EMIRATES Indulge Oil and Gas (+971) 2 4957050 sales@indulgeglobal.com</p> <p>URUGUAY Fidemar S.A. (+598) 2 402 1717 info@fidemar.com.uy</p> <p>USA Turck Inc. (+1) (763) 553-7300 usa@turck.com</p> <p>VENEZUELA Turck Inc. (+1) (763) 553-7300 usa@turck.com</p> <p>VIETNAM Viet Duc Automation co., Ltd. (+84) 8 3997 6678 sales@vietducautomation.com.vn</p>
<p>TURCK TURNKEY TRACK & TRACE SOLUTIONS</p> <p>Headquarters Turck Vilant Systems Oy Sinimäentie 6C 02630 Espoo Finland (+358) 10 2350 150 info-finland@turckvilant.com</p> <p>Your contact people in the Turck subsidiaries and agencies worldwide are available to support your inquiries for turnkey track and trace solutions.</p>		
<p>IMPRINT</p> <p>Publisher Hans Turck GmbH & Co. KG Witzlebenstraße 7 45472 Mülheim an der Ruhr, Germany more@turck.com</p> <p>Editorial Staff Klaus Albers (klaus.albers@turck.com) Simon Dames, Ilias Grigoriadis</p> <p>Contributors to this Issue Hans De Craemer, Klaus Ebinger, Thorsten Enthöfer, Przemysław Joachimiak, Frank de Jong, Dirk Schaar, Christoph Schmermund, Chen Zhao</p> <p>Art Direction/Graphic Design Arno Krämer, Britta Fehr</p> <p>All rights reserved. We reserve the right to make technical changes or correct errors. Reprint and electronic processing permitted with written approval from the publisher.</p>		

Your Global Automation Partner

TURCK



D900911 2304



www.turck.com