SICK insight MAGAZINE

: FOCUS **INTEGRATION AND CONNECTIVITY**

SEAMLESSLY NETWORKED

FOCUSING ON THE RIGHT SOLUTION

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Dear Readers,

The future of industry is characterized by networked production and control processes within complex machine environments. Already today, we support dynamic, real-time-optimized, and self-organizing industrial processes with the intelligence of our sensor systems. Our sensors detect real operational states, convert them into digital data, and automatically make these available to the process control system.

Sensor Intelligence is the prerequisite for the highly complex processing of physical signals into sensor information: With additional knowledge on the respective applications and ambient conditions we can take physical raw data and use it to generate robust and reliable data for the entire industrial process chain. In the past, interfaces were a limiting factor in the exchange of further information. With the arrival of Ethernet-based fieldbuses it is now possible to enable direct communication with data processing systems such as databases or cloud services. For this purpose we supply, for example, our OPC server on the software side. It recognizes our devices and can speak their language, then translating it into the fieldbus protocol language.

We even go a step further with our AppSpace technology: The SICK AppSpace eco-system offers system integrators and OEMs the freedom and flexibility to develop their application software directly on the programmable SICK sensors appropriate for the specific tasks. Thus, customized solutions can be implemented to meet individual customer requirements. This simplifies the link between sensors and the application itself.

The current issue of our customer magazine presents a cross-section of already realized and potential possibilities for exploiting, together with our customers, the opportunities offered by digitalization.

I wish you an informative and exciting read.

Dr. Robert Bauer
Chairman of the Executive Board of SICK AG

SENSORS INTELLIGENTLY NETWORKED

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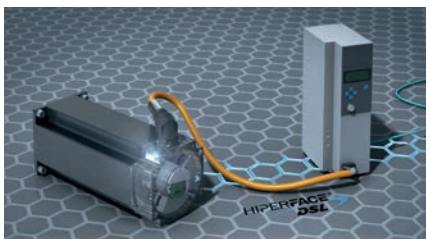

Imprint

Issue 3/2017

Publisher:
SICK AG · P.O. Box 310 · 79177 Waldkirch, Germany
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Fax +49 7681 202-3863
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INLINE BOARD MEASUREMENT ELIMINATES NEED TO SEPARATE BOARDS FOR MEASUREMENTS

SicoCam with SICK AppSpace: cutting-edge technology for more efficient chipboard production

Costly manual measurement of raw chipboard is a thing of the past. The SicoCam inline board measurement system from Siempelkamp Logistics & Service now measures wooden composite boards in a continuous cycle. It includes four programmable InspectorP65x high-performance cameras from SICK and SICK AppSpace. They supply measured values for calculating the board size and adjusting the saws. This increases the quality of the manufactured boards, decreases the amount of rejects, and boosts productivity. In addition, workplace safety improves.

>> Each year, at the Fritz Egger GmbH & Co. OG chipboard factory in the Austrian town of St.-Pölten-Unterradlberg, around three million cubic meters of wood are turned into 40 million square meters of coated chipboard. That is enough to cover half the earth's circumference when lined up end-to-end. The company's chipboard is supplied to industrial businesses and specialist stores. Egger's list of clients contains every well-known Austrian furniture manufacturer. Raw boards are produced by pressing the strands of board and then making the necessary cuts with multi-diagonal saws. Typically, these steps are followed by a measurement of individual boards in order to correct any possible dimensional deviations. Up to now, this was a task that had to be performed manually by removing "acceptable boards" from the production line or by measuring boards in the plant, e.g., in the star cooler.

The project team from left to right: Markus Gropp (Siempelkamp), Martin Hinterhofer (Fritz Egger), Dr. Frank Otto (Siempelkamp), Mohamed Hassoun (SICK), Mathias Köhl (Fritz Egger), Christian Beede (SICK).

Safety solution needed, greater automation gained

For a long time, both Siempelkamp (a plant engineer and equipment installer) and Egger wanted to find a technical solution that would eliminate the serious safety drawbacks inherent in the existing approach.

"The existing technical solution for measuring the boards after the multi-diagonal saw was not consistent with the latest technology," says Dr. Frank Otto, Project Manager at Siempelkamp Logistics & Service GmbH, in regard to the initial situation faced by the two companies. "To make matters worse, the multi-diagonal saw in our high-performance systems has been doing more of its cutting in tandem, triple, or quadruple mode, in other words with two or more saw units. Combined with the manual correction of cutting parameters where dimensional deviations are found, the manual board measurement process has proven too complex and too long for our customers, not to mention the safety shortcomings involved."

Previously, separated boards were checked by hand using a tape measure and moved to the reject pile. If deviations were found in the measured values, the operator on the saw had to enter and confirm the necessary correction parameters. By this time, a number of boards with incorrect dimensions would have already made their way into the plant. No sooner had the saw been adjusted than the operator would have had to manually remove another board and measure it to determine whether or not the desired results had been achieved.

If the board failed to meet the specifications, the operator had to adjust the saw yet again.
This process could take anywhere from fifteen minutes to a half hour.

“Now that the board-measuring system is located within the machinery, the saw can be corrected immediately after any dimensional deviations are found,” notes Martin Hinterhofer, Technology Manager at Fritz Egger GmbH & Co. OG.

“With the new system, we can also respond quickly to process changes in order to stabilize our processes and ensure consistent quality of the finished product.”

Measuring the board geometry

In chipboard manufacturing, the forming and press line constitutes the most process-critical system unit within the entire plant. As the centerpiece of the plant, it plays a major role in determining the plant’s capacity and the quality of the products. For this reason, the output of the machines located downstream should be coordinated with the line, which will help avoid bottlenecks.

For example, a system for measuring the board geometry should ideally be positioned inline and after the saw if possible. The SicoCam inline board-measuring system from Siempelkamp measures the board length and width, and also calculates the diagonals and the angles in the four board corners. This allows trimming and cross-cutting to be optimized and helps minimize waste.

Siempelkamp adds (another) cherry on top

After being cut to length from an endless strand, the individual boards are measured on a conveyor track as they pass through the system. Above this track, four programmable Inspector65x 2D cameras are mounted on a gantry, with the cameras mounted on a movable sled positioned in the rear of the passage in the direction of transport. With the aid of the sled, the camera system is adjusted to the different board lengths. The setting accuracy is on the 0.01 millimeter scale. A W12-2 Laser small photoelectric sensor provides front-side detection and activates the capture function (triggers the cameras).

SicoCam portal with four Inspector65x programmable 2D cameras.

“We have a conveyor belt or roller conveyor; the SicoCam gantry is positioned above it and the board is measured just as it comes,” notes Dr. Frank Otto in describing the design. “There is no mechanical connection to the existing plant. It’s completely decoupled, and we don’t need to make any modifications to the existing machinery, including functional modifications or decelerating of the boards.”

“This can all be done during normal operation with only a brief stoppage, since we just have to position the system above the conveyor,” says Mathias Köhl, Production Manager Raw Chipboard at Fritz Egger GmbH & Co. OG.

Connectivity

The measured coordinates from each individual camera are transmitted via Ethernet to the programmable PLC that performs the evaluation. The PLC handles the overall evaluation of the measurement result (and factors in the position of the camera sled). A data connection to the higher-level plant PLC is possible. The processed measurement data are stored in a data block. Measurements can be taken within 0.5 seconds.

A screen on the equipment and in the press control center visualizes the mea-

Screen showing measurement results.

surement results, which are archived for a period of four weeks.

The measured values can (after adjustment of the main PLC) also be used for automatic correction of the diagonal saw (length and diagonal correction).

The order data supplied by the higher-level plant PLC are available to the measuring system for automatic adaptation to the relevant product geometry.

SICK AppSpace: freedom to develop customized applications

In optoelectronics, specifically in the area of image processing, configurable products are often pushed to the limits of their capabilities where the implementation of certain functions or performance characteristics are critical. With the SICK AppSpace eco-system, SICK offers system integrators and original equipment manufacturers new freedom to develop customized applications and user interfaces based on programmable cameras and optical sensors.

Measuring board geometries requires height compensation at board transport speeds of up to four meters per second. "The board is tensioned when it leaves the press and sometimes bulges downwards or upwards a little. That has to be taken into account. The only way we can compensate for this is by positioning lasers at each board corner and programming the app accordingly," says Markus Gropp, Branch Office Head at Siempelkamp Logistics & Service GmbH, in describing the challenges faced in this process.

"The entire system doesn't just include four cameras that simply detect an edge. Anybody could do that," adds Dr. Frank Otto from Siempelkamp. "There's a lot more know-how involved."

"The heart of the system is its software. Despite this, the hardware still needs to meet certain prerequisites. Not every camera is capable of the performance, sensitivity, and rapid shutter speed necessary for this task. We now have the ability to measure boards traveling at speeds of up to four meters per second. When it comes to exposure time, we need to be working in the microsecond range. And that's where the camera performs very well, along with all of the shutter technology, so that we get extremely sharp images despite the high speed," notes Dr. Frank Otto, Siempelkamp, enthusiastically.

InspectorP6xx programmable camera

SICK tackles complex image processing tasks with its programmable cameras from the InspectorP6xx product family. Optics, illumination, evaluation, and interfaces – everything is integrated and highly customizable. The pre-installed, high-performance HALCON image processing library and the flexible design of web-based human machine interfaces make it possible to adapt the solution perfectly to specific customer requirements.

InspectorP6xx programmable camera for complex image processing tasks.

> "For systems used in MDF production, we expect to see six-figure savings in euros per year for the annual production of an average board."
>
> *Markus Gropp, Branch Office Head at Siempelkamp Logistics & Service GmbH*

The InspectorP6xx product family consists of three programmable cameras that differ in terms of their design, evaluation speed, and camera sensor resolution. But they all have one thing in common: In combination with the new SICK AppSpace platform, the cameras offer the freedom and flexibility to develop application software for specific tasks. This makes it possible for system integrators and original equipment manufacturers to implement tailor-made solutions and custom apps for individual customer requirements. Because the finished app is tailored precisely to the relevant application, its complexity is greatly reduced. In addition, all of the cameras provide outstanding features, such as aiming lasers, acoustic and optical feedback, and an SD memory card, that make setup and operation convenient and allow simple analyses during use.

Inline board measurement.

No board escapes us – potential savings with no end in sight

"It's difficult to put an exact number on the potential savings. It depends partly on the number of order changes and the accompanying allowance for material and cuttings required to ensure that the format produced will work in final production. For systems used in MDF (medium density fiberboard) production, we expect to see six-figure savings in euros per year for the annual production of an average board. These savings are easily feasible for the sole reason that we're able to reduce the material allowance by ten millimeters," says Markus Gropp from Siempelkamp.

Savings are achieved not only by reducing the cutting allowance, but also by producing a higher percentage of A-grade boards. Because the measuring system immediately reports any deviations from the specified size, the saw setting can be adjusted without delay. The result is a lower percentage of B-grade products. And although it does not offset the full material price, this does help reduce costs due to the price difference between A-grade and B-grade quality.

And finally, it is no longer necessary to remove so many boards from the line for manual measurement, since the boards can now be measured inline. This means that significantly fewer boards are rejected per year.

"We could fully automate the plant with this system," says Markus Gropp in regard to the enhancements. "Currently, we have a stand-alone measuring system. The saw is only adjusted when the operator decides it should be. The operator is right there to see how the saw responds and if any correction is necessary. The values needed to correct the saw are fully calculated and available on the saw screen in front of the operator."

SicoCam is a fully automated measuring system for inline board measurement. Using high-performance cameras from SICK, SicoCam captures every board corner that passes by during production. The measurement data undergo software-supported processing in the form of width, length, and diagonal dimensions and can be evaluated immediately. The result is an optimized press line and reliable production quality. SicoCam can initiate format changes in fully automated fashion as a stand-alone measuring system or when used within a control circuit.

SicoCam is an addition to the SicoScan device family from Siempelkamp, which is used to provide quality measurement and fully automated process control in the production of wooden composite boards. *(as)*

DESIGN COMPLETELY NEW SENSOR SOLUTIONS WITH SICK AppSpace.

THIS IS SICK

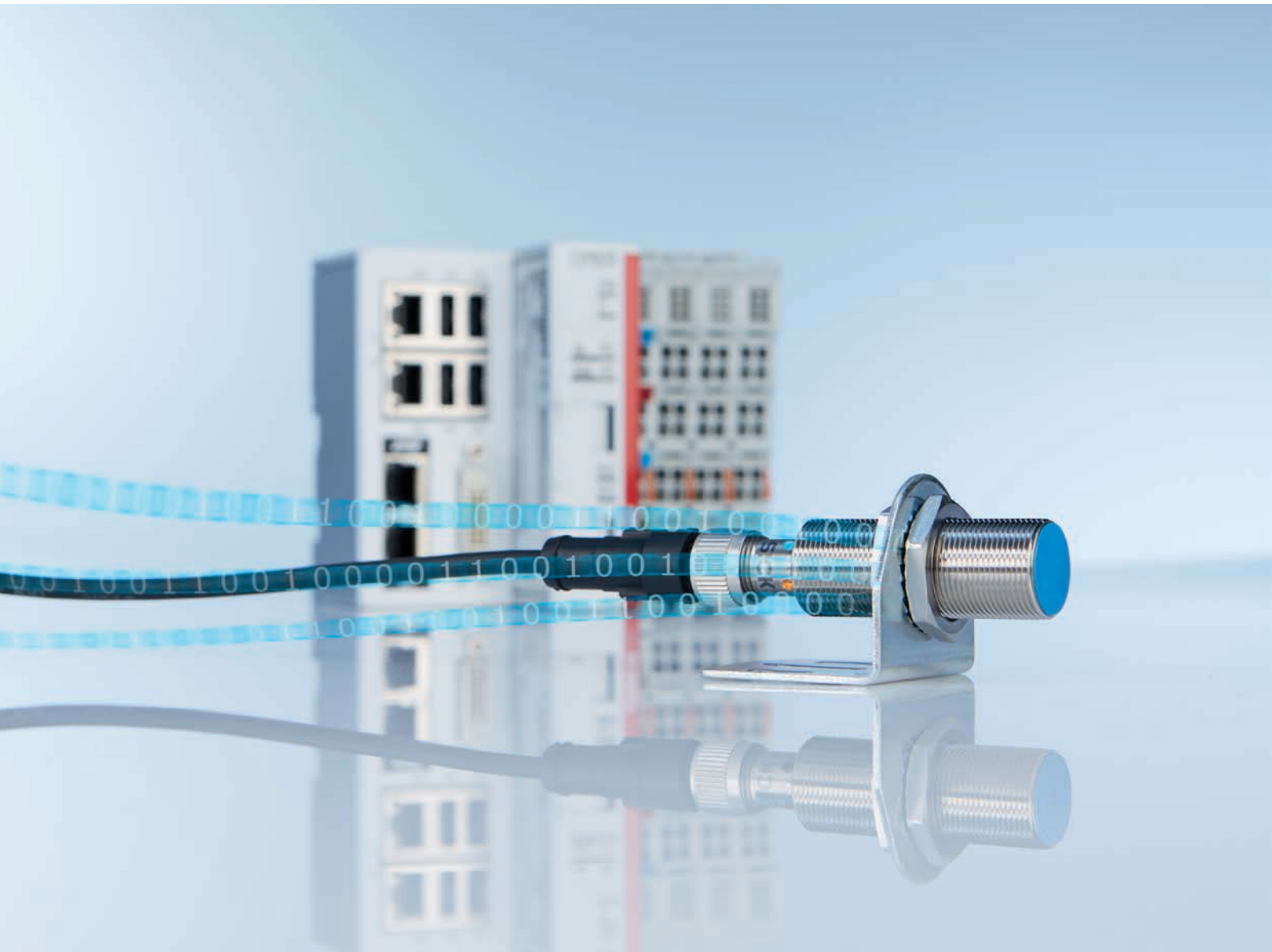
Sensor Intelligence.

Finding a sensor solution that's both tailored to your requirements and easy to operate – sounds time-consuming and difficult, or even impossible, doesn't it? Not with the SICK AppSpace eco-system – where the application developer defines the solution themselves. Intelligent software tools, high-performance programmable devices, and a dynamic developer community create a solid foundation for designing customized sensor solutions. This enables completely new and adaptive solutions for automation applications. With SICK on board, you can take a significant step toward the future and Industry 4.0.
We think that's intelligent. www.sick.com/SICK_AppSpace

IO-LINK – ENABLER FOR INNOVATIVE SENSOR SOLUTIONS

INDUSTRY 4.0 FOR EVERYONE

IO-Link is not just gaining increasing acceptance in an ever greater number of applications – the manufacturer-independent communication technology is also an enabler for innovative sensor solutions and supports the global availability of data and information required by Industry 4.0. Switching devices and simple sensors, in particular, can benefit from this fast and cost-effective method of connecting to the data world.



>> The advantages of IO-Link are readily apparent. Because devices can be integrated via the existing cabling, IO-Link enables Industry 4.0 solutions to be expanded down to even the smallest inductive sensors. What complex sensor systems can accomplish via a fieldbus connection can now also be delivered by simple sensor technology: state and parameterization data throughout the entire plant or factory. IO-Link not only establishes a reliable communication channel, it also allows IO-Link-enabled sensors to be integrated into any existing network.

Flexibility, transparency, and reduced costs

Process data, parameter settings, and detailed diagnostic data via the existing connection: Sensors with an IO-Link interface can supply a wealth of information – in real time. They are also capable, for example, of receiving new parameter sets within seconds – for flexible production right down to a batch size of 1. IO-Link offers continuous digital data transmission, thus superseding the classical method of analog value transmission. It also has significant advantages with regard to electromagnetic compatibility as it also allows standard non-shielded cables to be used, thereby reducing cabling costs.

IO-Link also makes plug and play a reality: The different parameter settings can be visualized, tested, and, if necessary, optimized during integration and commissioning. Furthermore, it is possible to store different parameter sets in the automation system and upload them to the sensor during operation without any delay. This makes it possible to automatically and remotely configure sensors installed in locations that are difficult to access. Machines and plants with frequent changeovers between product variants can particularly benefit from this functionality, which enables changeovers to be performed quickly and with a high level of process reliability. Replacing devices also becomes easier: If a sensor is defective, the most recently used parameter set can be automatically transmitted to the replacement sensor via IO-Link.

More intelligence even in the tiniest of sensors: Thanks to IO-Link, the W2 miniature photoelectric sensor is equipped with a reliable, digital communication interface.

Perfectly networked – a product portfolio for seamlessly integrating sensors using IO-Link

EtherNet/IP PROFINET EtherCAT

IO-Link master
The IO-Link master devices from SICK connect intelligent sensors and actuators to the control level.
The masters for PROFINET IO/RT, EtherCAT® and EtherNet/IP™ are equipped with eight multifunctional IO-Link ports.

Sensor cloning
All relevant parameters can be stored on a SICK Memory Stick for easy replacement of devices.

Visualization via SOPAS
The SiLink2 Master connects IO-Link sensors to a PC, which enables the visualization and parameterization functions of SOPAS and SOPASair to be used.

Seamless integration
SICK also offers suitable functional components for integrating its IO-Link sensors into almost any automation network. *(tm)*

IODDfinder

The IO-Link protocol has been significantly enhanced to open up new possibilities for users. The new IODDfinder service now provides a central database of device description files for almost every manufacturer.

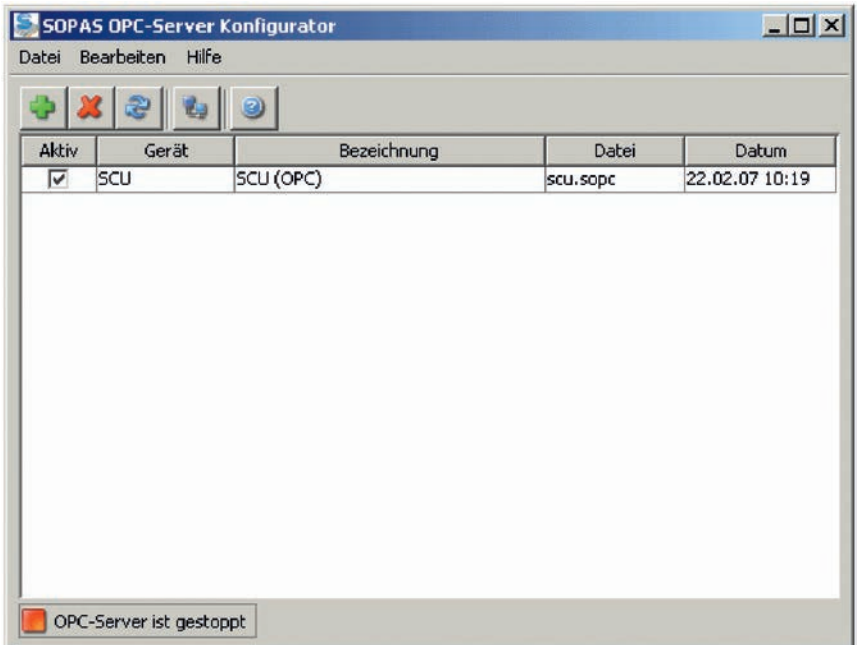
https://ioddfinder.io-link.com

INTEGRATION VIA THE SOPAS OPC SERVER

VERTICAL CONNECTIVITY PAST THE CONTROL SYSTEM

Especially when it comes to Industry 4.0, integration capability and consistency are important features of intelligent and future-proof communication structures. That is why SICK offers several options for integrating process, status, and diagnosis information of SICK sensors into visualization systems and automation networks. One of these integration tools is the SOPAS OPC server.

>> OPC stands for open platform communication. With the manufacturer-independent communication standard for automation engineering, field devices from different suppliers can exchange their data bidirectionally with Windows-based applications within a common network. “With the disappearance of classical automation pyramids in favor of transparent automation levels due to the advent of Ethernet-based fieldbuses, device manufacturers today have the option of making the integration of their device data available in worlds outside the automation systems,” explains Peter Kamp, Head of Industrial Software, Research & Development at SICK. “For example, sensors can be operated without the control using OPC servers. The data can be presented in visualization systems – without having to be programmed in the PLC – and changed there as well. With the SOPAS OPC server, we provide our customers with an integration tool which uses the infrastructure of Ethernet-based fieldbuses to directly access SICK devices from distributed systems and applications.” Thanks to the SOPAS OPC server, it is possible to directly access or even influence the device data of bar code scanners and camera systems, RFID read/write devices, displacement and laser measurement sensors, volume measurement systems, ultrasonic gas flow meters, etc. from SICK via Ethernet-based networks even from higher-level systems.



The OPC server allows read and write access to the device parameters.

SOPAS OPC server: standardized access to all SICK sensors

With the well-known SOPAS ET software tool, all types of SICK devices can be configured, monitored, and diagnosed from a PC, for example. SICK is opening up easy handling and quick commissioning functions with the SOPAS OPC server. “The SOPAS OPC server is used to exchange data between SICK devices with integrated SOPAS platform and Windows-based applications which have an OPC client,” explains Peter Kamp. “The server enables read as well as write access to device parameters, supports all specified and expanded data types, such as device-specific raw image data or methods, and provides the sensor data in HMIs and SCADA systems for visualization.” The SOPAS OPC server currently follows the technological specifications of OPC DA V2.05a. Regardless of the industry or the application, it can thus be used anywhere Windows-based PCs are used.

Direct connectivity to OPC-client applications

With the trend towards Ethernet-based networking, communication takes center stage instead of controls, since more and more information flows past automation systems directly into higher-ranking tools and applications. This direct vertical connectivity to OPC-client applications, as is enabled by the SOPAS OPC server, is also the foundation for the successful implementation of Industry 4.0 and the Industrial Internet of Things. *(as)*

Integration in HMI

SICK offers a wide range of options for integrating process, status, and diagnostic information from SICK sensors into a visualization system. SICK integration tools enable straightforward and fast integration into individual HMI solutions, irrespective of the technology used.

OPC technology is used to exchange data between field devices and Windows-based applications. OPC is suitable only for non-deterministic communication. The SOPAS OPC server from SICK follows the OPC DA specifications and therefore can be used on Windows operating systems. In addition to the standard data types, the SOPAS OPC server also supports methods, thereby enabling unlimited access to the SICK sensors from an HMI.

PAPER PER RUNNING METER

RFID TECHNOLOGY ENSURES AN ACCURATE PRODUCTION SEQUENCE

It is clearly evident that digitalization has left its mark on the paper industry. Does the print media face an uncertain future or will haptic page turning hold its own? Both theories have their proponents. The digital age has long been a reality in paper production. The company Kabel Premium Pulp & Paper and its paper mill are impressive proof of this. Showing no sign of dark clouds on the "print horizon," workers manufacture roll upon roll of high-quality paper around the clock.

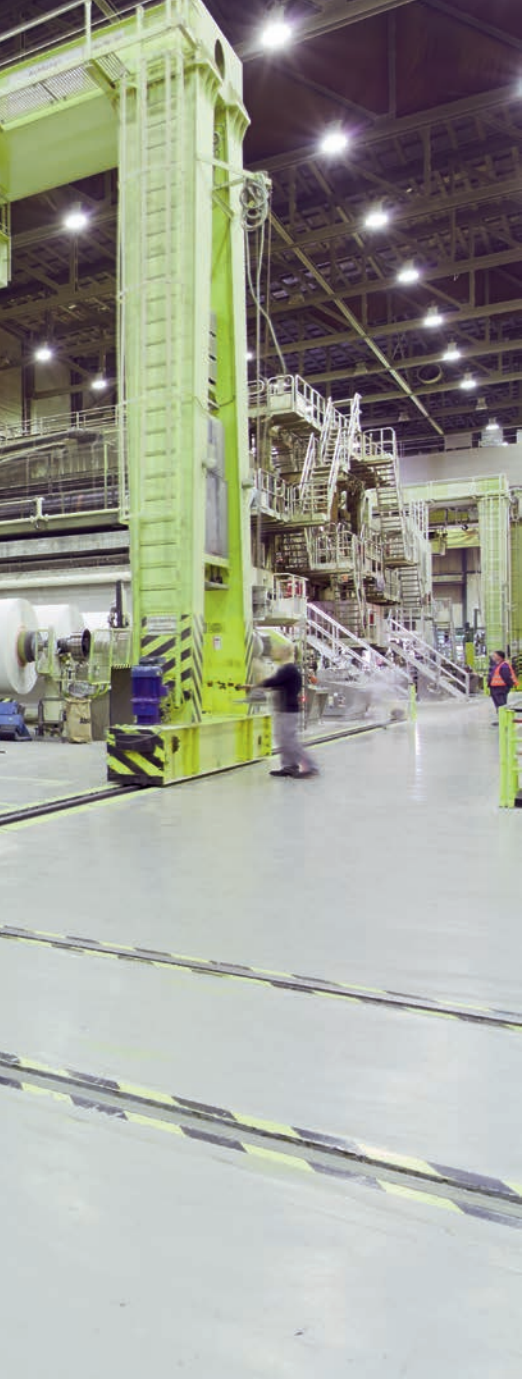
>> To maintain an overview of the multi-step production process, Kabel Premium Pulp & Paper utilizes an RFID-based identification solution, integrated in a high-performance, wireless transmission system with an interface as part of its own in-house IT system. This enables workers at Kabel Premium Pulp & Paper to constantly track which production step is currently being processed by a given paper batch.

Since 1896, Kabel Premium Pulp & Paper has been manufacturing by the running meter for the biggest printing houses in Europe. The Hagen-based company in Germany's Westphalia region initially manufactured newspaper; now it specializes in coated paper for high-quality catalogs and magazines.

Two giant paper machines and 540 workers operating in a three-shift rotation handle a total capacity of around 485,000 tons a year. Wound onto rolls weighing many tons, tens of thousands of meters of paper are made according to client specifications before being delivered to customers in the requested widths.

Paper heavyweight

Anyone who sets foot on the factory floor in Hagen is sure to find themselves in an



impressive world that sees heavy rolls of paper suspended throughout the long hall. Overhead cranes transport them from one processing step to the next. Depending on the particular paper thickness, the rolls measuring 7.2 meters wide carry around 50,000 to 60,000 meters of product and weigh up to 20 tons.

Kabel Premium Pulp & Paper produces each and every roll of paper – a "tambour" in technical jargon – in line with client specifications. The multi-stage paper production process begins with the manufacturing of the base paper. As it is still very rough, it is not suitable for high-quality print products. That is why the paper is smoothed in a second step, i.e., coated on both sides with special chemical materials. Depending on the desired paper quality and surface finish, the tambour then runs through the calendering machine, which smooths the surface under pressure. The calender removes unevenness in the paper so that the contours do not become blurred during subsequent printing. Before leaving the factory, the rolls are cut to the desired individual width on the slitter rewinder to make processing easier for customers.

The company now specializes in coated paper for high-quality catalogs and magazines.

The paper is wound onto metal cores so that the rolls weighing several tons can be transported. These "tambour cores" made of robust metal are hung at their ends at each stage of production and are also transported as such by the overhead cranes. Around a hundred of these tambour cores are in continual use in Hagen.

Every roll in sight

In circumstances such as these, production faults in Hagen can mean tens of thousands of meters wasted. To reliably keep a close eye on the production of each individual roll, Kabel Premium Pulp & Paper uses a custom-made RFID solution from system integrator Intelligent Data Systems (IDS) with 26 RFID read/write devices provided by the sensor expert SICK. "We required a solution to ensure the automatic detection of tambour cores in the production flow," explains Johannes Broer, who is responsible for IT at Kabel Premium Pulp & Paper. "Our requirements include, among other things, reliable system components and wireless data transmission to our IT system. The components used are exposed to process-related contamination, dust, and heat. They must be able to withstand contact with chemicals or machine oil. We had to rule out optical detection-based solutions due to the risk of contamination. This was also the case for visual markings which do not stand up to contact with oil, for example."

In addition, a solution with very short read times was required, since the tambours are constantly in motion. “We mark our tambours with an eight-digit number, which comprises both the date of production as well as the year. The tambour cores feature a three-digit number. Apart from the fact that the reading stations can be hard for our workers to reach, the long numbers can also result in manual input errors. Automated detection allows us to ensure accurate tracking and relieve some of the burden on our workers,” adds Broer.

This is why the tambour cores are marked with passive RFID tags, which are read at the individual stations. When the tambour is rolled out for the first time, the system records which tambour core the batch is assigned to, and from this point on, all stations will accurately read out via RFID which tambour core the paper is being wound onto and which from.

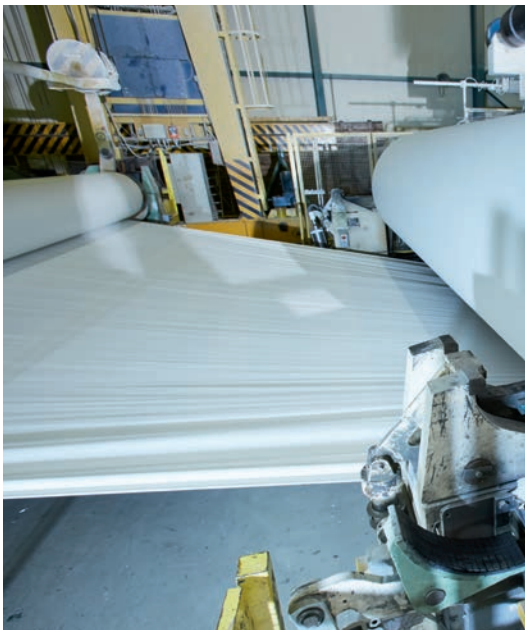
A total of 26 UHF RFID read/write devices from SICK are being used at the factory in Hagen in order to decipher the passive tags on the cores. Depending on the reading distance, RFU620 are used for read ranges of up to one meter and RFU630 for larger read ranges. Passive RFID tags have no energy source of their own that would require regular inspection and are more reliable than active tags when it comes to processing. They are the ideal option for objects that come under heavy mechanical strain such as the tambour cores.

Digital system on site

To optimally align systems to the individual application, the application specialists from SICK always carefully inspect the situation on-site at the factory. It goes without saying that they did this in Hagen too. This is because a number of aspects had to be observed in this case: Metal reflects radio waves and can result in system faults. It is for this reason that the RFID tags on the metal cores had to be strong to a point that close proximity to metal would not pose a danger.

IDS integrated the read/write devices from SICK into its roll online tracking system, known as “Rolf”, which it had developed itself. The system collects all results directly from the RFID read/write devices, visualizes them, and makes the data available for further processing.

To monitor the production of each individual roll reliably, Kabel Premium Pulp & Paper uses a customized RFID solution with 26 RFID read/write devices.



The read devices were integrated into the roll online tracking system “Rolf”. The system obtains all the results directly from the RFID read/write devices, displays them, and makes the data available for further processing.

This means that all process data can easily be viewed in the productive database at Kabel Premium Pulp & Paper and each tambour directly assigned. “It was a tall order and we are happy to have found the right partner in SICK,” explains Rainer Marchewka, Managing Director of IDS. “We have been working with SICK for 15 years now. And we know that we can rely on them and also that long-term system support is guaranteed.”

In order to keep installation outlay at the factory low, IDS first built the entire system, including all RFID read/write devices, true to scale at its own premises, where it tested and optimized the system processes, and then finally delivered the pre-configured system to Kabel Premium Pulp & Paper for installation.

The RFID-based roll tracking has now been in operation for over a year. “We are happy that we opted for this solution. In truth, we have worked with RFID-based identification solutions previously, although with active tags. These are indeed advantageous when it comes to reading range, but the battery runtimes were too short and also the tags were too susceptible in this environment. We are very pleased with this solution and the collaboration with IDS and SICK,” says Johannes Broer.

Quite in keeping with the development towards Industry 4.0, Kabel Premium Pulp & Paper is laying foundations for the intelligent factory of the future with the RFID-based “Rolf” system in Hagen. The company is testament to how proven production machines and state-of-the-art networking technology can be brought together to function harmoniously and efficiently with the right system solution. *(hs)*

The RFID-based roll tracking solution has now been in operation for over a year.

INTELLIGENCE AND THE ABILITY TO COMMUNICATE AT FIELD LEVEL

SMART SENSORS TRIGGER A PARADIGM SHIFT IN PRODUCTION

The Smart Factory is a world where sensors monitor themselves. Workstation sensors and actuators coordinate their processes and functions. And production structures consist of autonomous, self-organizing, and self-optimizing units. Making this a reality calls for a paradigm shift when it comes to implementing manufacturing and intralogistics processes. It requires both intelligence and the ability to communicate at field level – requirements that can be met by using state-of-the art sensor technologies from SICK.

>> The intelligence and communication capabilities offered by Smart Sensor Solutions release vast potential for greater machine productivity. For instance, various parameter settings can be visualized, tested, and optimized right from the integration and initial commissioning of the sensors. You can also store various parameter sensor parameter sets ("recipes") in the automation system and then load them to the sensor during operation without wasting any time. These can be stored on an order-, format-, or recipe-specific basis. Machines and plants with frequent changeovers between product variants (such as different packaging sizes or lots) can particularly benefit from this functionality, which enables changeovers to be performed quickly and with a high level of process reliability. Flexible settings can be made for any number of sensors simultaneously by downloading parameters directly from the control, such as the sensing distance, hysteresis, or switching threshold. This saves time, eliminates errors, and means that the settings can be documented at any time. Also, if a Smart Sensor informs the automation system that it is – or is about to stop – functioning correctly, it can be replaced in next to no time: Once the replacement sensor has been connected, it is checked and confirmed by the automation system. The application-specific data from the previous sensor that were last valid are then transferred directly to the new sensor automatically. No further manual settings are required, meaning that the machine can be restarted very quickly with barely any downtime.

Optimizing availability: Self-diagnostics make predictive maintenance possible

Automation components in a production environment or in intralogistic plants are constantly subjected to environmental influences such as dust, material from cardboard abrasion, humidity, or vibrations. Not only do sensors from SICK have exactly the right mechanical, electrical, and optical properties to cope with the harshest ambient conditions, but their self-monitoring functions also improve machine performance and availability – even with heavy loads and high throughput. The diagnostic data can be used in machine-level analysis tools as

Diagnostic data can be processed using analysis tools in the vicinity of the machine or in the cloud.

well as in cloud-based ones with a view to anticipating potential faults in good time and avoiding them by carrying out predictive maintenance. Service intervals can be optimized in line with the cycle, e.g., by using scheduled machine downtime as an opportunity to carry out sensor cleaning or maintenance. As a result, sensor condition monitoring has a direct impact on overall machine availability. In addition, Smart Sensors from SICK can also display their operating data and settings visually for the benefit of the machine operator.

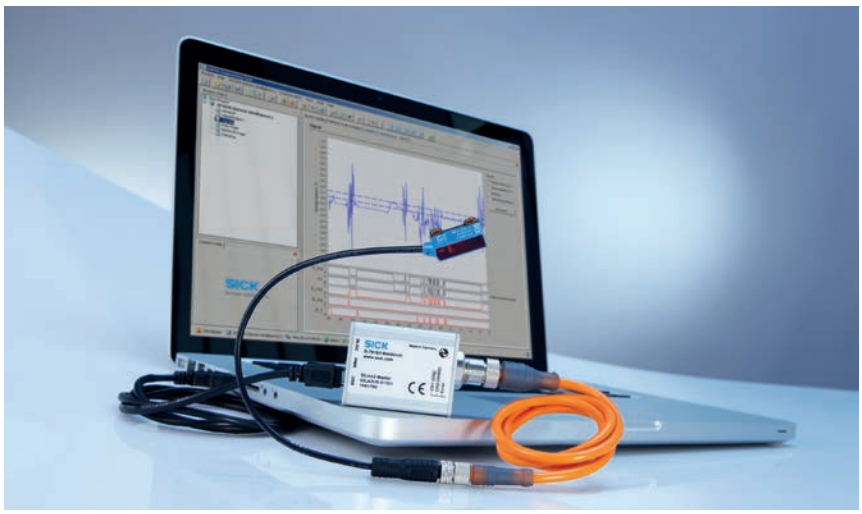
The intelligence and the communication capabilities of Smart Sensor Solutions offer significant potential for improving machine productivity.

Autonomous operation (almost) without an automation system

Within the context of realizing Industry 4.0, cyber-physical production systems (CPPS), e.g., in the form of intelligent equipment, enable decentralized production and logistics control that is both responsive and adaptable. This can only be achieved by making greater use of remote sensor information to perform tasks such as setting up local control loops that are specific to the situation concerned. Thus, the Smart Sensor Solutions concept may be described as an "enabling technology" for the self-organizing factory. By using the components in conjunction with other intelligent and communication-enabled sensors or actuators, self-contained functions can be executed. If, for example, a smart photoelectric proximity sensor detects the presence, direction of movement, and speed of a device, it can send this information directly to an intelligent gripper, which picks up the part dynamically and repositions it for the next processing step. Then, nothing more than an I/O signal has to be sent to the automation system in order for the next process step to be initiated. However, this means that the automation system is no longer burdened with having to control the autonomous detection or gripper function itself.

Smart Tasks – the distinctive added value of intelligent sensors

The decentralization of intelligent functions, i.e., moving them from the automation system to the field devices, represents a future-proof approach to creating more efficient automation networks that deliver better performance. In this regard, Smart Sensors from SICK offer a distinctive form of added value that makes them stand out from the other technology available on the market. Smart Tasks take advantage of the scope for direct communication between sensors and actuators – without having to go via an automation system, which often wastes precious time. A typical function of this kind might be high-speed counting. By using inductive and optoelectronic sensors, for example, it is possible to record and control rotating speeds, identify directions of rotation, or detect and count objects. The signals are evaluated in the sensors themselves – there is no need for any central counter modules. No pulses are output to the control, only rotating speed, speed, or count values that are immediately ready for further processing. Another example of a function that could be decentralized is time and length measurement. Smart Sensors detect and report product dimensions directly, e.g., the length, the size of gaps between singulated objects, or the speed of a conveyor. This all happens without the involvement of the central automation system, which is freed up accordingly; under certain circumstances, even complex automation components can be replaced by Smart Sensors. The positive consequences of this are cost savings with regard to hardware and programming. *(as)*



The Smart Sensor Solutions from SICK can display their operating data and settings for the benefit of the machine operator.

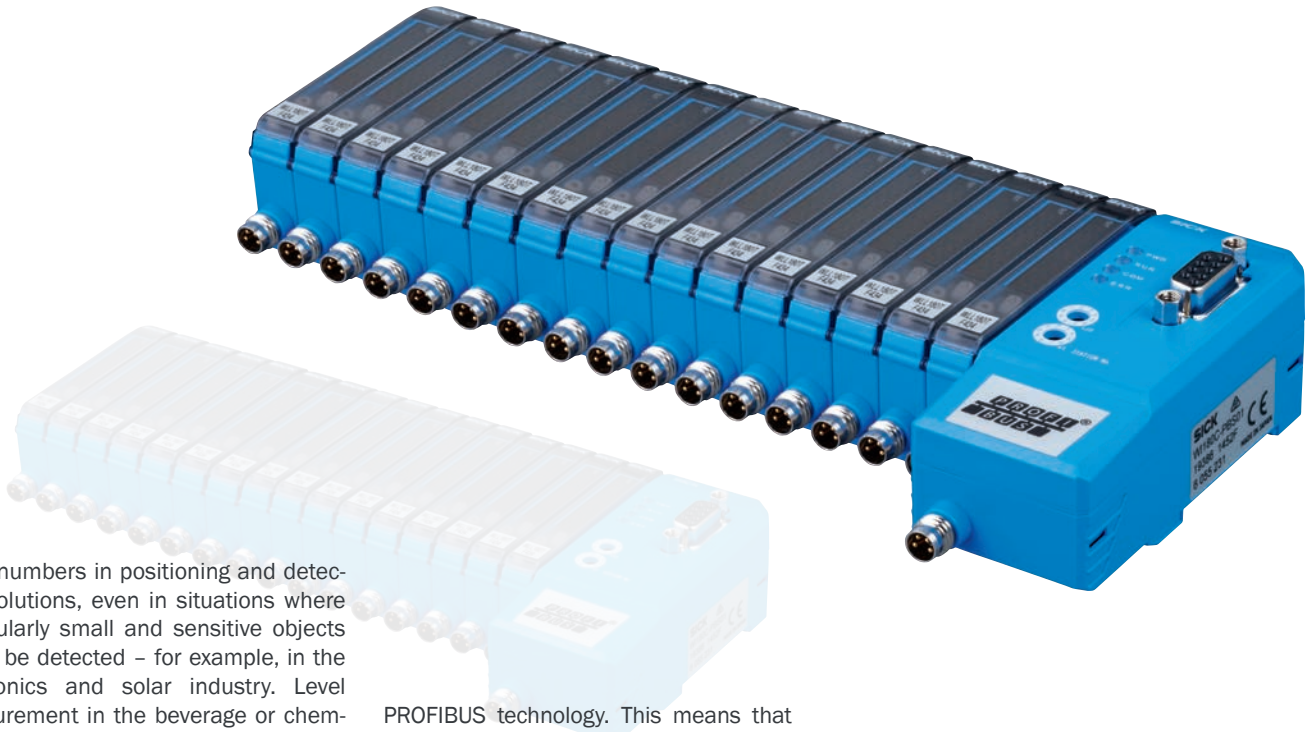
FIELDBUS MODULE FOR FIBER-OPTIC SENSORS AND DISTANCE SENSORS

BUS TRAFFIC ON THE INFORMATION SUPERHIGHWAY

At SICK, sensor data travel by bus: Fiber-optic sensors and distance sensors are connected to a WI180C-PB fieldbus module and integrated in PROFIBUS systems. The communication module enables quick access to the individual sensors and transfers their data to the control system. In automated processes, the module optimizes the transfer of parameters and the integration of the sensors into the machine network. In this way, the WI180C-PB plays a key role in ensuring fast communication between the control system and the sensors in machines and plants.

>> Fiber-optic sensors and distance sensors perform a wide range of tasks in automated production processes. Displacement measurement sensors from the OD Mini product family ensure precise positioning of objects and tools, for example, in the electronics and solar industry, automotive production, and machine tool production. They are also used to check the manufacturing tolerances of processed workpieces as part of the quality control process.

The fiber-optic sensors of the WLL180T product family also perform a wide variety of detection tasks. Fiber-optic sensors detect all kinds of different objects even in fast processes and under difficult ambient conditions without any problems. Furthermore, adapter lenses can be used to produce very small light points so that even the smallest of objects and features can be detected with precision. These sensors are used in



great numbers in positioning and detection solutions, even in situations where particularly small and sensitive objects are to be detected – for example, in the electronics and solar industry. Level measurement in the beverage or chemical industry is frequently performed by fiber-optic sensors as well.

Generally, many fiber-optic sensors and distance sensors are installed – and often in inaccessible areas – for any given application. This results in a large amount of wiring work for each individual sensor and, if the sensors are in hard-to-reach places, means that any maintenance or operating work takes a great deal of effort.

In no time at all: communication between sensors and control

The WI180C-PB communication module comes to the rescue: Connecting the individual sensors to the fieldbus module enables the devices to be integrated into the machine network on the basis of PROFIBUS technology. This means that the configuration and teach-in processes can be performed by the control system via the PROFIBUS cable if the evaluation units are difficult to access. The machine operator can modify sensor settings – e.g., in the event of format changes – centrally via the control system. The integration into the machine network also enables continuous monitoring of the sensor performance: Any deviations can be identified quickly and corrected without delay.

The fieldbus module enables the connection of up to 16 WLL180T devices or 8 OD Mini evaluation units with 2 sensor heads each. The sensors are connected to each other via the bus connecting system on the housing side and are fastened onto a mounting rail on the fieldbus module.

On the information superhighway of the machine, the WI180C-PB communication module acts like an actual public transport bus for the individual sensors: It takes all sensor data on board and transports them to the control system at a speed of 9.6 Kbit/s to 12 Mbit/s. This analogy even goes as far as timetables: Preprogrammed function blocks from SICK enable fast data traffic according to a schedule without any additional programming work. Alongside the significant reduction in wiring from up to 16 cables to just one, universal PROFIBUS solutions also reduce operating and repair costs in the long term, boost plant availability effectively and, ultimately, improve productivity. *(hs)*

deTec4 SAFETY LIGHT CURTAINS

QUICK DIAGNOSTICS VIA APP

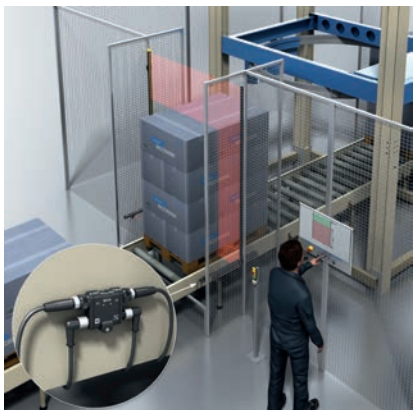
Fitness or health apps read data from fitness wristbands or smartwatches and provide information about the current performance of the user. The apps also provide additional services such as digital manuals for the relevant devices, configuration wizards, and much more besides. In the future, SICK will be equipping the deTec4 safety light curtains with NFC technology (NFC tags) so that device data can be read out via an app.

>> The deTec4 safety light curtains will be capable of even more in future. All functions can still be configured without software. In order to illustrate the functional scope and performance of the light curtains, the SICK app offers quick on-site diagnostics via NFC connection. The customers hold their smartphone with the app up to the light curtain and obtain the device information. The light curtains are the passive part of the NFC connection. In order to send the saved information, they use the energy transferred from the smartphone. Enough energy is transferred via the active transmitter to send the information from the light curtain over a short distance.

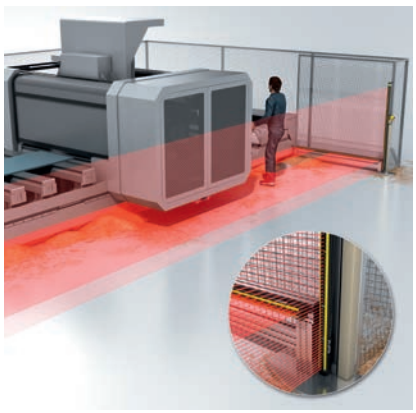
The best part is that the light curtains do not need their own supply voltage for this process, which makes it possible to check deTec4 configurations quickly even if the light curtains in question are in storage. Thanks to an intelligent device concept with function packages that are configured via system plugs, plant manufacturers or operators can keep the basic device length and resolution variants that are relevant to their plant concepts in stock, and they have a flexible way of adding, i.e. simply “plugging in”, extra functions (function packages) as and when required. Thanks to the integrated NFC tag in the deTec4 receiver, the app displays the setting options for the DIP switch in the system plug in the configuration wizard and provides the resulting image for the desired configuration.

IO-Link for diagnostics and automation

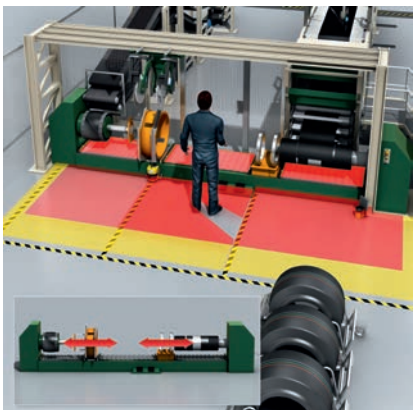
When it comes to diagnostics, SICK is going even one step further: deTec4 receivers are getting a standard IO-Link interface. While the NFC technology provides on-site diagnostics in a snapshot-like



Muting station with height measurement functions via IO-Link: Combining safety and automation brings added cost savings.



Intelligent presence detection: The smart cascade offers high availability.



High levels of flexibility: variable protective field widths during ongoing operation.

fashion, IO-Link makes it possible to read out diagnostic data continuously regardless of location. The data can be visualized via the SICK software platform SOPAS. In addition, beam data can be used in muting applications for tasks such as height measurement and further automation.

Flexible protection for many possible scenarios

The new function package for the deTec4 product family has much more to offer: "Intelligent presence detection" and "variable protective field widths" increase the availability of machines and plants. With the optional "intelligent presence detection" function, the safety light curtain ignores chips, weld sparks, or similar objects that fall into the protective field of the presence detection (guest) within the cascade. It only switches from standby mode to monitoring mode when there is an intervention into the primary, vertical protective field (host). This prevents unwanted shutdowns.

The automated scanning range calibration of the deTec4 safety light curtains is a convenient function for simple commissioning in many applications. For applications where the protective field width varies during operation – for example, because the receiver is moved back and forth on a trolley – automated range calibration can be deactivated. The customer can then choose between three variable scanning ranges with the "variable protective field widths" function.

An IO-Link interface, NFC, advanced diagnostic LEDs, and indicator lights will be integrated as standard in future. New functions such as "intelligent presence detection" and "variable protective field widths" are easy to add with the new system male connector.

The next step for safety

The intelligent device concept of the deTec4 safety light curtains illustrates SICK's understanding of safetyIQ: the innovative approach that opens up new dimensions of productivity while continuing to focus on our key concern – protecting people. *(as)*

The deTec4 safety light curtains are electro-sensitive protective devices that comply with performance level e in accordance with EN ISO 13849 and SIL3 in accordance with IEC 61508.

SAFE NETWORK INTEGRATION WITH microScan3

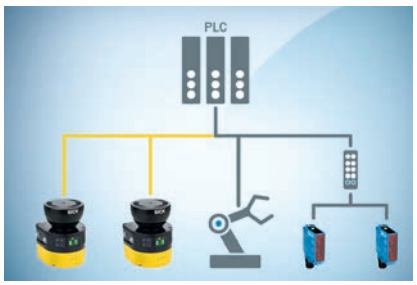
microScan3 FROM SICK: TOO GOOD TO NOT BE NETWORK-COMPATIBLE

Up to now, functional safety technology in automation has mostly been implemented separated from fieldbuses and Ethernet networks. But the trend is moving further towards integrating safety functions into the network. The aim is to share safety signals and non-safe process data over the same network. This opens up new possibilities, e.g., for visualization and for transmitting status information to higher-level ERP and MES data systems. The automotive industry is leading the way in this area. It is there that the S3000 PROFINET IO safety laser scanner – the first scanner at the time to offer a direct interface to the controller – made its debut on a grand scale.

>> After a positive market response, the first member of the new generation of SICK safety laser scanners, the microScan3 Core I/O with the innovative scanning technology safeHDDM®, will now be joined by an additional pair of members: the network-compatible devices microScan3 Core – EtherNet/IP™ and microScan3 Core – PROFINET. All microScan3 variants offer the same optical performance with different integration options, connectivity concepts, and device sizes.

Safe network integration

With these microScan3 network variants, SICK is introducing two additional members to its new generation of safety laser scanners. The microScan3 Core – EtherNet/IP™ is the first safety laser scanner on the market to offer CIP Safety™ over EtherNet/IP™ and is compatible with all commonly used EtherNet/IP™ CIP Safety™ controllers. The microScan3 Core – PROFINET enables safe and reliable bus communication using the PROFIsafe protocol. The PROFINET IO bus connection is used to process all signals from the higher-level controller (fail-safe programmable logic controller). Both network variants can protect multiple hazardous areas at the same time, and provide up to four simultaneous protective fields that allow them to do the job of several conventional I/O scanners. This means that these laser scanners help to reduce purchasing costs while boosting productivity. Integration into existing safe controllers and control cabinets meets current safe-



microScan3: another innovative approach that opens up new productivity options while continuing to focus on the most important objective – protecting people.

ty standards and is hassle-free. In addition, the new variants save users a great deal of time, since the devices can be configured incredibly quickly and easily over the network. As an added benefit, safety laser scanners are protected against tampering. To achieve this, the sensor transmits a checksum of the safety configuration to the control computer, which allows to detect and trace any unauthorized changes made to the field device.

Central access options for straightforward diagnostics and maintenance

Because configuration can be performed from a central operating computer, the entire commissioning process is quicker and easier. The same is also true when it comes to operating and maintaining the sensors. Because all data are stored in a central location, anyone accessing them will always receive the single most current version, resulting in guaranteed data integrity. The days when it was possible for a field device, plant control system, and service technician's laptop to all have different versions of the data are now over.

Diagnostic data available anywhere

The opportunities to use a multitude of data to produce and supply goods in a more efficient and flexible way – while also saving resources and attaining higher quality – ultimately depend on the reliability and robustness of the data that represent the input for the process chain. They therefore also depend on the sensors that detect the real conditions and convert them into digital signals. Even in its most basic version the microScan3 safety laser scanner sets new standards for reliability and robustness thanks to the innovative safeHDDM® scanning technology. With the network variants for direct and safe integration into fieldbuses it is also possible to integrate sensor data into preventative maintenance concepts, among other things. For example, information provided by the sensor about the contamination level on the front screen is automatically reported to the automation system – far enough in advance to prevent potential negative impacts on performance or a safety-related plant shutdown. If problems within the system are encountered despite this feature, any errors that may have occurred can be quickly identified and analyzed from a central location. This means that quick response times are possible – which keeps potential downtime to a minimum. *(as)*

safe HDDM
safe high definition distance measurement

The microScan3 safety laser scanner

Reliability even under difficult conditions starting with the basic version

The microScan3 safety laser scanner provides reliable protection for hazardous areas, access points, and hazardous points. The new generation of safety laser scanners is based on the patented safe measurement principle safeHDDM®. This new technology increases device reliability when dust and ambient light are present in the environment. The status indicators, LEDs, and display are highly visible from a number of different viewing angles. Important diagnostics messages can be selected directly during operation using push buttons, and appear as plaintext on the display. Using the Safety Designer software, the microScan3 can be intuitively configured and conveniently commissioned. Thanks to standardized interfaces, the device's smart connectivity helps cut cabling costs.

Outstanding reliability under challenging conditions, an extensive scanning range, and simple operation – all in a highly compact and rugged housing. That is the microScan3 from SICK.

FLOWgate™ OPERATING SOFTWARE

THE GATE TO ULTRASONIC GAS FLOW MEASURING DEVICES FROM SICK

The new FLOWgate™ operating software for all FLOWSIC ultrasonic gas flow meters and ultrasonic gas flow measuring devices from SICK links diagnostic data quickly and intelligently and presents them already prepared – for consistently easy operation or for clear, needs-based process monitoring. A single software for all FLOWSIC sensors. The integrated solution wizard ensures quick help through the automated evaluation of diagnostic data. SICK developed this software for the challenging requirements of the oil and gas industry on gas measuring technology.

>> The FLOWgate™ software consists of two modules. One is responsible for basic functions such as device administration, communication, and report generation and is identical for all FLOWSIC sensors. The other is device-specific; the user can individually define commissioning, configuration, and diagnostic functions as well as the maintenance function. The software is quick and easy to use and is the same for nearly all devices – the operating processes are similar in the event that there are isolated differences. This means a big advantage for the user: a single software for all FLOWSIC ultrasonic gas flow meters and ultrasonic gas flow measuring devices, which can be easily integrated into higher-level control systems.

Innovative user management

While it was enough to develop a stable and functionally appealing software a few years ago, design, user-friendliness and individualization options are essential today. The aspect of individualization was given particular attention when developing FLOWgate™. User management provides four different user groups ranging from guest to service. A scalable amount of information, data, and tools is accessible for these groups and the complexity can be adjusted according to your needs. In addition, FLOWgate™ offers the option of defining an individualized start page. This saves time when you need to get a quick overview.

The new FLOWgate™ operating software links together diagnostic data intelligently and quickly and provides them in a prepared form.

With FLOWgate™, several communication connections can be created for different FLOWSIC devices simultaneously. This enables monitoring of several measurement systems from a computer at a glance.

Improving gas flow measurement with integrative diagnosis

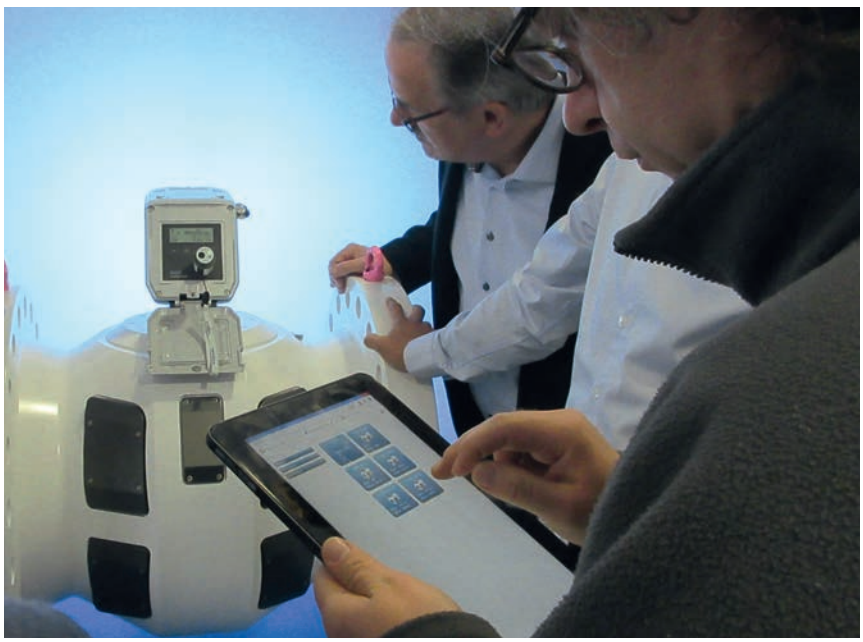
Changes to the system status are quickly detected, for example as a result of contamination, moisture in the gas or disruptive noises. The quick status function provides immediate information about the current status of the application. In order to get a quick overview or analysis, each user can put together measured values and diagnostics parameters as required in the measure value overview, and then amend or save their overview. If a user-defined warning limit is reached, e.g., if limit values are exceeded for speed of sound or turbulence, the gas flow meter reports a warning. The solution wizard developed in the framework of i-diagnostics™ helps analyze the problem at the click of a button. The assistant analyzes the current diagnostic values and compares them with past values for a trend analysis. Fault patterns are identified with integrated logistics. The user receives an interpretation of data and recommendations for action at the same time.

This support greatly simplifies the work of the measurement engineer when identifying and solving faults in the gas flow meter and in the system as well. Changes to diagnostic data of the meter can often be traced back to changes in the process and the system.

The experience gathered in the field is provided to every user on-site using the integrated solution wizard. The solution wizard currently detects five concrete fault situations, such as contamination or blocked rectifiers. Together with the users and based on intensive field data evaluation, the detected fault situations will be broadened and extended in the future.

FLOWgate™ enables online or offline access to the gas flow meter and thereby to all measured value and diagnostic data at all times using a PC or tablet. The graphic preparation of trend analyses simplifies evaluation of the measurement sequence and gives information about changes to the process. If the device data are regularly saved in the database, the device performance of the last few years can be analyzed and compared retrospectively. This offers new possibilities for system monitoring. The software enables creation of compact diagnostic, maintenance, and calibration reports at all times. Different assistance functions, such as for commissioning, considerably simplify device operation.

FLOWgate™ can be extended at any time to include new product variants and new functions. Every additional FLOWSIC ultrasonic gas flow measuring device can be added easily using interfaces. *(as)*



FLOWgate™ provides online or offline access to the gas flow meter and therefore to all measured value and diagnostic data at any time via a PC or a tablet.

INTELLIGENT INTEGRATED SENSOR SYSTEMS

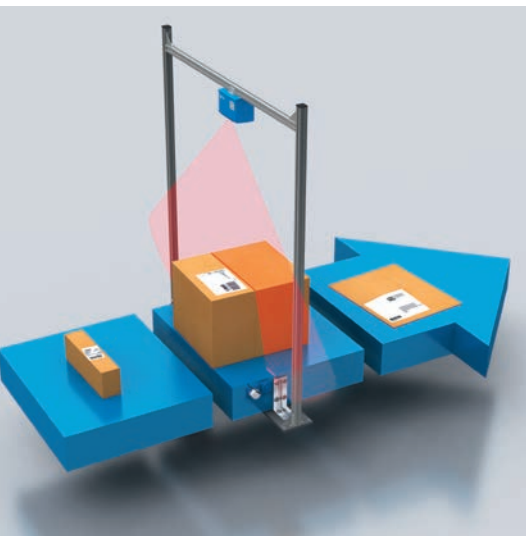
INTEGRATED AUTOMATION REPLACES ISOLATED SOLUTIONS

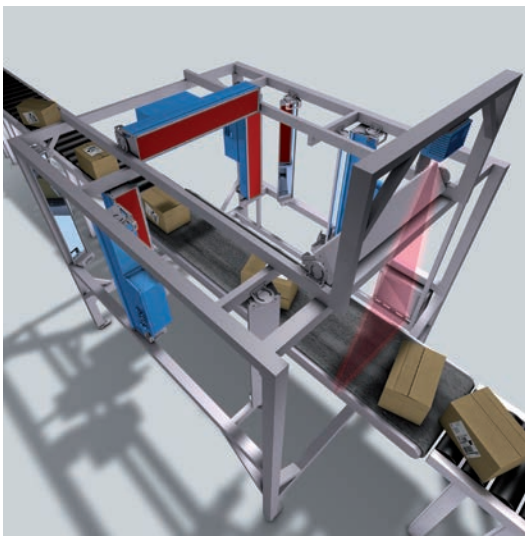
Aristotle was one of the first to recognize that the whole is more than the sum of its parts. His insight accurately describes the benefits of SICK system solutions: Customers receive a fully integrated automation solution that is compatible with all of their interfaces.

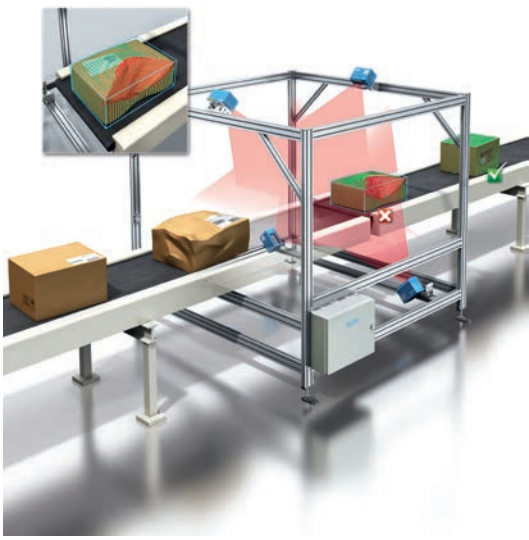
>> SICK system solutions are based on widely used components, comprehensive application knowledge, and an understanding of how the components work together. As the developer of the components, SICK can also modify them to optimize systems on a customized basis. The option of docking additional functionality to an existing system is playing an increasingly important role. What is needed are flexible systems with intelligent connectivity, for example, using smart modules.

System solutions – the logical consequence of extensive knowledge

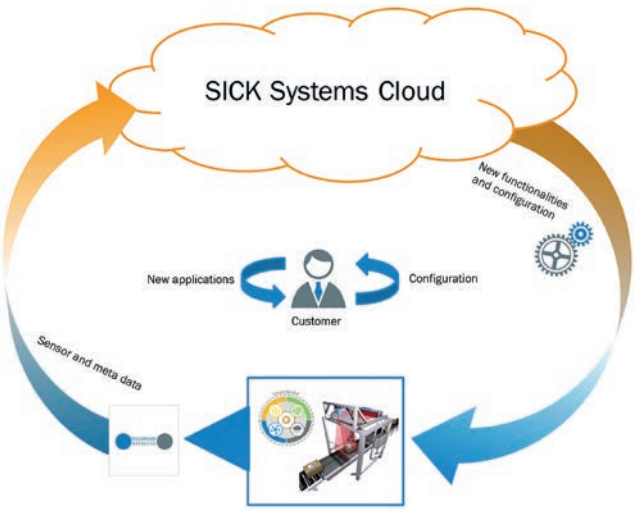
SICK sensor solutions are used in almost every major industrial sector all over the world – from automotive engineering and vehicle manufacturing, handling and packaging technology, storage and conveyor systems, and the food and beverage industry to environmental and process engineering, the chemical and pharmaceutical industry, mechanical engineering, electronics, and solar industry. The company's expert advice, combined with innovation, individuality, and high-quality implementation, enables it to provide solutions for an ever-growing range of tasks – from individual machines to an entire branch of industry. Many companies have been enjoying the benefits of using sensor system solutions from a single source for several years, because this allows them to focus on their own core business. The other advantages include more efficient planning and procurement processes, only one contact and solution partner, and coordinated sensors, all of which ensure high levels of machine and plant availability. With its intelligent system technology, SICK is able to meet the increasingly complex requirements of its customers. The company's business model is based on the principle of providing products, systems, and services as a complete solution. The functions available are no longer simply detection and signaling. They now also include control, regulation, evaluation, and networking. The possibility of identifying an object and its environment with a sensor, using this information to trigger a specific action by the machine, and evaluating sensor data objectively via a control unit in a system solution of this kind means that even the most complex of requirements can be reliably met. This applies equally







to automated check-in systems for air passengers' luggage, security systems for protecting buildings and open spaces, driver assistance systems for industrial trucks, and profiling systems that monitor the entrances to road tunnels. In the case of all of these solutions, the industry management functions, which are central to the SICK organization, play a crucial role by providing support for system implementation.



From VMS to DWS – cleverly combining the advantages

Track and trace systems from SICK identify 1D and 2D codes, read and write to RFID tags, and provide high-resolution images for downstream processes (video coding, OCR, etc.). These systems also supply volume and weight measurements that can be certified if required. In addition, they verify the contours of objects. Any combination of the functions described here can be provided using the various track and trace systems. On the basis of the first volume measurement systems (VMS) from SICK, other systems with additional functions have gradually been developed, for example, simultaneous weight measurement (Dimensioning-Weighing-Scanning systems, or DWS) or contour and deformation detection (volume measurement systems with contour verification) for parcels.

Complex ready-to-go system solutions – from standard to customized

From process automation to factory and logistics automation: System solutions from SICK are based on widely used components, comprehensive application knowledge, and globally available services. From standard to customized: The on-site collaboration between customers, industry experts, and product specialists from SICK results in practical, scalable solutions. To be able to offer the right solution for almost any industry anywhere in the world, you need to have a global presence, application knowledge, and an extensive product portfolio. Ideally, the result of all of this is a complete customized solution that can subsequently be standardized, reproduced, and used in other areas.

SICK is preparing its products and systems for all the new opportunities that Industry 4.0 has to offer by introducing customizable software modules. In future, Industry 4.0 will make it possible to access a wide range of innovations and key technologies via intelligent software functions. However, smart modules are needed in order to be able to offer customers innovative Smart Services, such as predictive maintenance. At the Hannover Messe 2017, SICK has already presented a new concept: a Lector code reader system that can send image data showing a modified hazardous goods label to the cloud. There the data are used to train a software function to detect and classify features of the image that were previously unknown to it. This enhanced function can automatically be installed in the customers' Lector code reader system and modified hazardous goods labels can be reliably detected. As a result, new customer requirements can be met more quickly than was possible in the past. *(as)*

THE DIGITAL GATEWAY TO THE FUTURE

SICK OPENS UP THE HIPERFACE DSL® INTERFACE

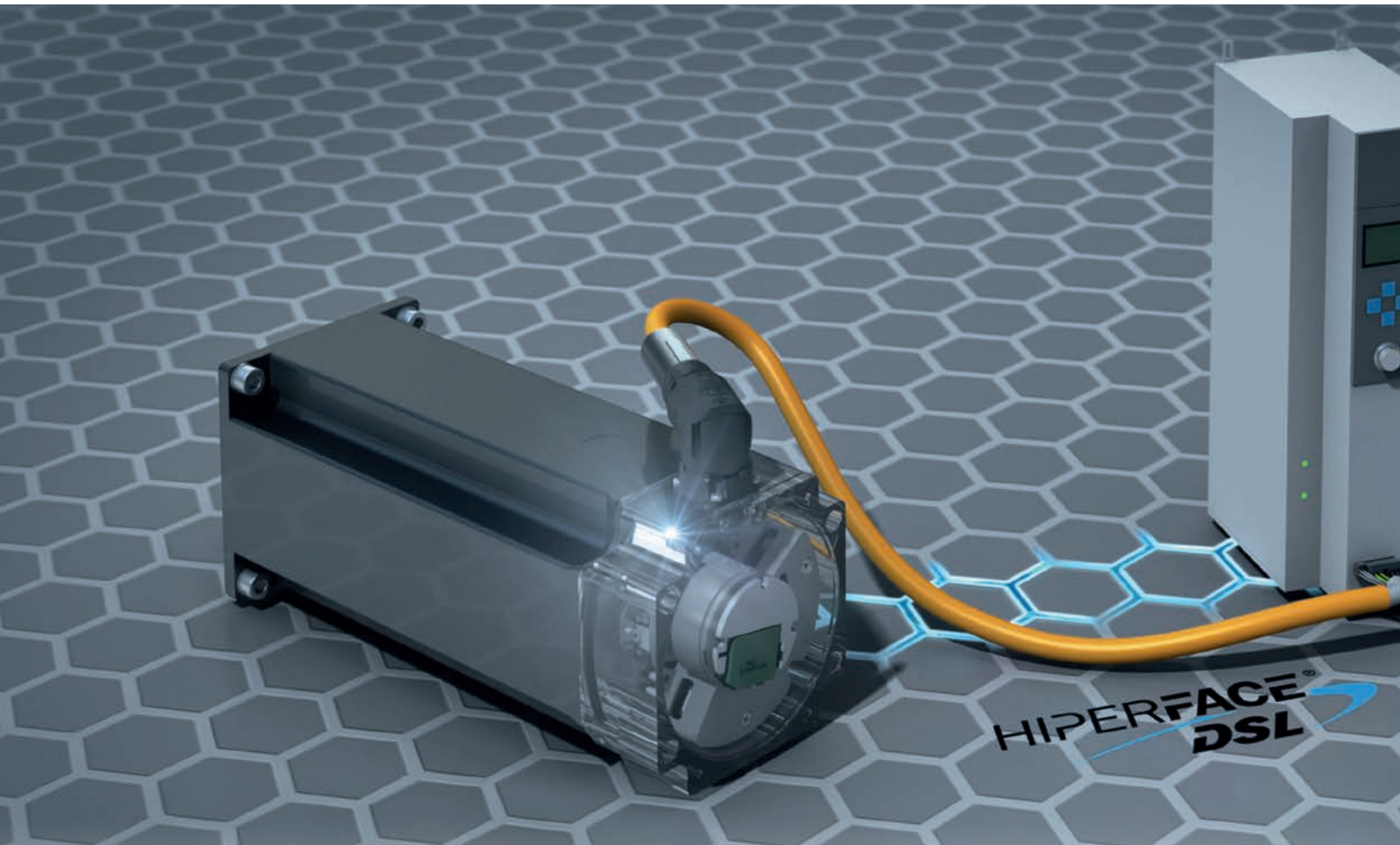
SICK is opening up the HIPERFACE DSL® interface and making the tried-and-tested technology accessible to all users. The idea is to provide the market with solutions that are even more comprehensive. Servo drive technology manufacturers will benefit from a wider product portfolio and the peace of mind that they are using an open and established interface. HIPERFACE DSL® as an open interface combines all the advantages of a digital real-time interface: one cable technology, continuous condition monitoring, and – in turn – huge potential for improved economic efficiency.

>> By opening up the interface, SICK intends to provide motor and drive manufacturers with optimum solutions, particularly within the context of Industry 4.0.

HIPERFACE DSL® is now arguably the leading standard protocol for digital feedback systems in servo drive technology. This has become possible because it offers every market partner – motor manufacturers, mechanical engineers, and end customers – both technical and economic advantages, and also opens up a new business area to suppliers. What's more, the digital interface meets all the requirements for the condition-oriented maintenance of machines in the Industry 4.0 environment. The megatrend has developed into a market standard – so much so that many people are now asking themselves why we ever used two cables to connect a motor and drive in the first place.

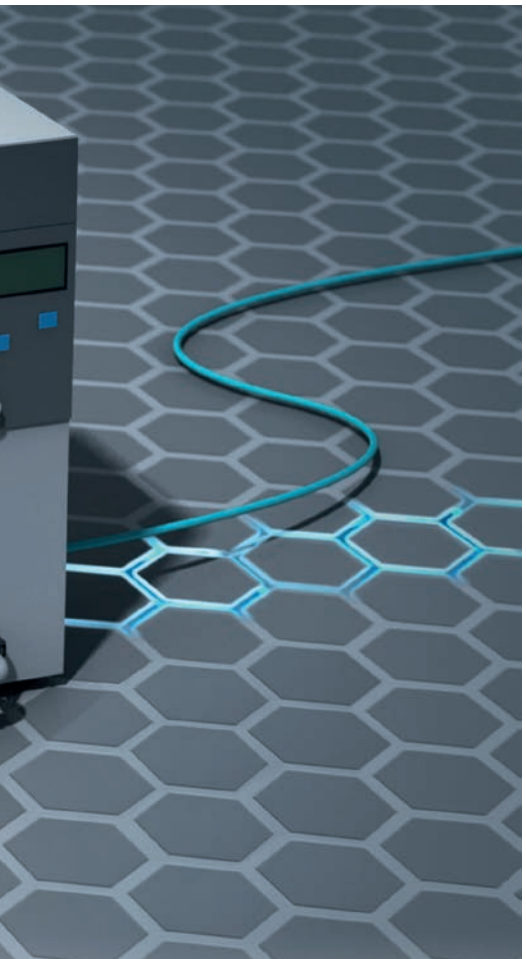
Condition monitoring – not just for the Smart Factory

End users are also vital players in driving forward digital one cable technology: For them, HIPERFACE DSL® opens up the possibility of continuous condition monitoring over the entire machine operating time –, which is usually several years – creating enormous potential for improved economic efficiency as a result.



In the interconnected production world of Industry 4.0, motor feedback with HIPERFACE DSL® plays a crucial role with respect to continuous condition monitoring. This is because digital data and protocols are the key to "peering inside" a machine and looking right down into the motor shaft. A number of interesting insights can be gained here thanks to the wide range of motor data recorded, which includes the operating hours, motor temperature, current consumption, rotation speeds, speeds, and changes in their values. These can all be easily read via the drive in the form of a usage histogram. As part of continuous condition monitoring, this information can be used to derive knowledge about the status and anticipated development of drive and machine conditions and hence for preventative maintenance purposes. This has two main advantages for the user. Firstly, there are the cost savings that can be achieved by using a quick-response safety system (e.g., an emergency shutdown for machine protection) to avoid costly secondary failures. The second advantage is the optimization of machine efficiency in order to achieve maximum production availability and capacity. For example, critical machine elements do not have to undergo preventative checks or be replaced; instead, they can be used to the full throughout the entire service life of the machine. What's more, condition monitoring enables necessary maintenance to be scheduled – and carried out at a suitable point in time.

Motor feedback systems from SICK are HDSL-ready. The EFS/EFM50 product family with the integrated metal code disk is geared toward high-end applications.



Data transmission in the motor cable

HIPERFACE DSL® complies with the RS-485 standard and enables reliable data transfer between the drive and the motor in servo drive systems. The data are transmitted via two wires which are directly integrated into the motor cable measuring up to 100 m in length. Electric drives featuring motor feedback systems and an integrated HIPERFACE DSL® interface have a distinctive outward appearance with just one motor male connector. Hybrid cables that combine both servo and encoder elements are becoming increasingly popular. These also carry signals from other sensors that are integrated into the digital motor feedback protocol. Special processes and the application of pulse transformers ensure that the encoder signal is decoupled from faults in the motor power cable.

HIPERFACE DSL® supports the functionality of the electronic type label for automatic drive configuration. Motor specifications, serial numbers, part numbers, and other data are stored here and used to adjust the drive to the motor parameters automatically and when servicing is required. *(as)*

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Order No.: 8022093