

messtec drives Automation

8 Volume 29
August · 2021

English Edition

Industrial Robot Protection Alternatives to the Safety Fence



The new platform
that combines knowledge.





PLAN B

Where did you go on vacation this summer – a low-risk area, a high-risk area, or maybe even a virus-variant area? The case numbers change so rapidly that one day you think you're safe, the next day you must pack your bags and go home to avoid a multi-day quarantine.

What I would like to say: Planning events, trips or trade fairs is currently more difficult than ever. Should you therefore act overcautiously? No. You should decide wisely and have a plan B in the desk drawer, or rather on the desktop. Maybe we'll see each other at one of the fall trade shows, maybe not.

Over the past 18 months, we have become more comfortable, but also more relaxed. I've gotten used to running in the morning, working in casual outfits, and spending time with my kids, and yes, I feel a little apprehensive about returning to my old life.

However, I will not, we will not, be going back completely. That's because Wiley is moving with the times (and not just in terms of its magazine and digital portfolio). We are going to maintain our flexible working style and continue to be able to work from our desks at home. In the future, our team will be able to meet again and exchange ideas on two fixed days in the office. I'm looking forward to it!

I'm also looking forward to traveling through Germany and its neighboring countries to attend press conferences and trade fairs or to meet up for interviews on site. There are many things that were good before, but there are also things that are better now.

I wish you always a good plan B and an interesting read

Anke Grytzka-Weinhold

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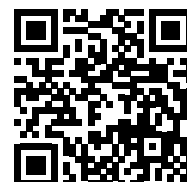


Do not think twice, submit now!

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Until when? 13 May 2022

Who? Every company whose product from the Vision, Automation and Control sector convinces with an innovative approach.



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NEWS

3 Editorial

5 News



TECHNOLOGY

COVERSTORY

SCHMERSAL
THE DNA OF SAFETY

7 AUTOMATION
Industrial Robot Protection
Alternatives to the Safety Fence

10 INSPECTION
The Future of Manufacturing with Cobots
Enhancing Production Efficiency, Flexibility and Quality with the Help of Camera and Vision Technology

12 AUTOMATION
Connecting The World's Largest Illuminated Glass Dragons
Reliable Connection Technology for LED-lit Sculptures



TECHNOLOGY

14 AUTOMATION
Fireproof Baking Worldwide!
Safe Mini Control System Controls and Monitors Gas Burners in the Ovens of Austrian Wafer Machine Manufacturer Franz Haas-Waffelmaschine

17 INSPECTION
The Self-calibrating Printer
Vision System Reduces Rejects on Label Press by 50 Percent

18 SENSORS
Improved Metal Processing
Laser Scanners Optimize Cutting and Welding Processes

20 AUTOMATION
Double the Grip
Worm Gear Screw Jacks Manufactured with Flexible Automation

22 DRIVES & MOTION
All Tight
Modern Servo Amplifiers for Demanding Applications Enable Quick and Precise Screw Tightening Processes



Exciting end or beginning

No matter how you look at it, messtec drives Automation is interesting from all sides. Because issue 8 is designed as a turn-around issue in German and English. It's worth taking a close look!



Messe Stuttgart with halved sales in the corona year 2020

Landesmesse Stuttgart calls the balance sheet for the 2020 financial year the „worst result in the company’s history“. The restrictions of the corona pandemic led to sales being more than halved and a huge drop in earnings. Similar numbers are also expected for 2021. But the organizer of the vision is optimistic that physical trade fair operations can at least start again from September. Since spring 2020, the group has had to postpone or cancel 185 trade fairs and events worldwide. For the first time in its history, the company had to apply for short-time work for its employees. However, no redundancies were issued for operational reasons. As of now, the physical trade fairs should continue as early as September. There are over 20 events on the agenda by the end of the year. These include Vision 2021, which will take place from October 5th to 7th, 2021.

www.messe-stuttgart.de

IDS: Above-average sales growth in the first half of the year



IDS exceeded industry expectations in the first half of 2021. Instead of the 7 percent increase in sales forecast for the machine vision industry by the VDMA, the company has so far more than doubled its growth. The camera manufacturer from Obersulm expects consistently high growth until the end of 2021. The positive order situation and the strong development of international business give every reason to do so, despite the generally difficult procurement situation.

The increase in sales compared to the same period of the previous year 2020 was particularly strong in North America.

de.ids-imaging.com

Balluff: Groundbreaking ceremony for the expansion of the headquarters

Balluff establishes at its headquarters in Neuhausen a. d. F. another office and administration building that should accommodate 530 employees. The building should be ready for occupancy in summer 2023. The planned new building on the existing company premises between Zabergäu and Schurwaldstrasse offers office workplaces for more than 530 people as well as a company restaurant with more than 280 seats. If everything goes according to plan, the shell will be ready by July 2022. The building should be finished and ready for occupancy the following summer. With an investment volume of almost 60 million euros, the construction project for Balluff is one of the largest single investments in the company’s history.

www.balluff.de



Groundbreaking ceremony at Balluff in Neuhausen a.d.F. with representatives from Balluff and the municipality as well as people responsible for construction.

Faulhaber Austria will support customers in Hungary directly in the future

From August 2021 Faulhaber Austria will take over sales and service for Hungary. For Faulhaber Austria, Hungary is particularly interesting in the areas of laboratory equipment, medical technology and automation technology. “Hungary is characterized by a very dynamic economic development. We want to develop this highly interesting market even more intensively in the future,” explains Martin Kellner, Regional Sales Manager Faulhaber Austria. “Especially in the areas of laboratory equipment and medical technology, as well as in automation technology, there are many innovative companies, some of which are already our customers. In direct exchange, we can advise these partners and future customers even better and support them in their projects.”

www.faulhaber.de



Change in the management of ABB's electrification division



Torsten Nolting took over the management of the electrification division of ABB in Germany on August 1, 2021. He succeeds Uwe Laudenklos, who became Lead Business Area Manager Northern and Central Europe for the same business area on April 1 of this year. Torsten Nolting (54) has been employed in various functions for the ABB Group and its subsidiary Busch-Jaeger Elektro since 1991. He has been Head of International Sales for Busch-Jaeger since 2007, and from 2015 he was responsible for the Smart Buildings division as Regional Sales Manager Europe. Nolting has been a member of the management team at Busch-Jaeger Elektro since the end of 2018.

www.abb.com



ON Semiconductor changes brand name to Onsemi

ON Semiconductor has a new brand name: Onsemi. With this, the supplier of power supplies and sensors wants to emphasize its continued focus on the automotive and industrial markets. The industrial and automotive markets now account for two-thirds of global greenhouse gas emissions. Energy and sensor technologies are expected to help achieve a net-zero economy, according to Onsemi. This is because climate change not only poses a risk to the environment, but also offers opportunities for innovative business solutions, the group is certain. In addition, Onsemi is committed to using its research and design expertise and adapting its own operations to achieve net-zero emissions by 2040.

www.onsemi.com

Personnel change at DiMotion

DiMotion is expanding sales with a new manager: Ralf Krüger has more than 20 years of sales experience and has been in the field of linear technology for about as long. Now he supports DiMotion with his expertise in setting up new sales channels and customer relationships. After his first practical experience in the field service at a supplier of linear technology, he initially worked for a few years as a self-employed in trade and as a freelance sales service provider in mechanical engineering, but then switched back to the company side in 2016. The sales engineer has been working in partnership with DiMotion for a long time and already knows the company from both suppliers and customers.



www.dimotion.de

Basler with record results in the first half of 2021

The camera manufacturer Basler achieves the strongest half-year in the company's history in terms of sales, profit and incoming orders. Compared to the same period last year, sales increased by 30 percent and profit by more than 60 percent. Compared to the first half of 2020, sales increased by 30 percent to 115.2 million euros. Profit before tax increased by 63 percent year-on-year to 20.8 million euros. Order intake increased by 65 percent to 152.4 million euros. In the second quarter, order intake doubled compared to the previous year.

www.baslerweb.com

Index

ABB	5	DiMotion	6	Landesmesse Stuttgart	5	Pilz	14
B&R	17	Dr. Fritz Faulhaber	5	Micro-Epsilon	18	Sieb & Meyer	22
Balluff	5	IDS	5	Omron	10	U.I. Lapp	12
Basler	6	K. A. Schmersal	Cover, 8	ON Semiconductor	6	Zimmer	20

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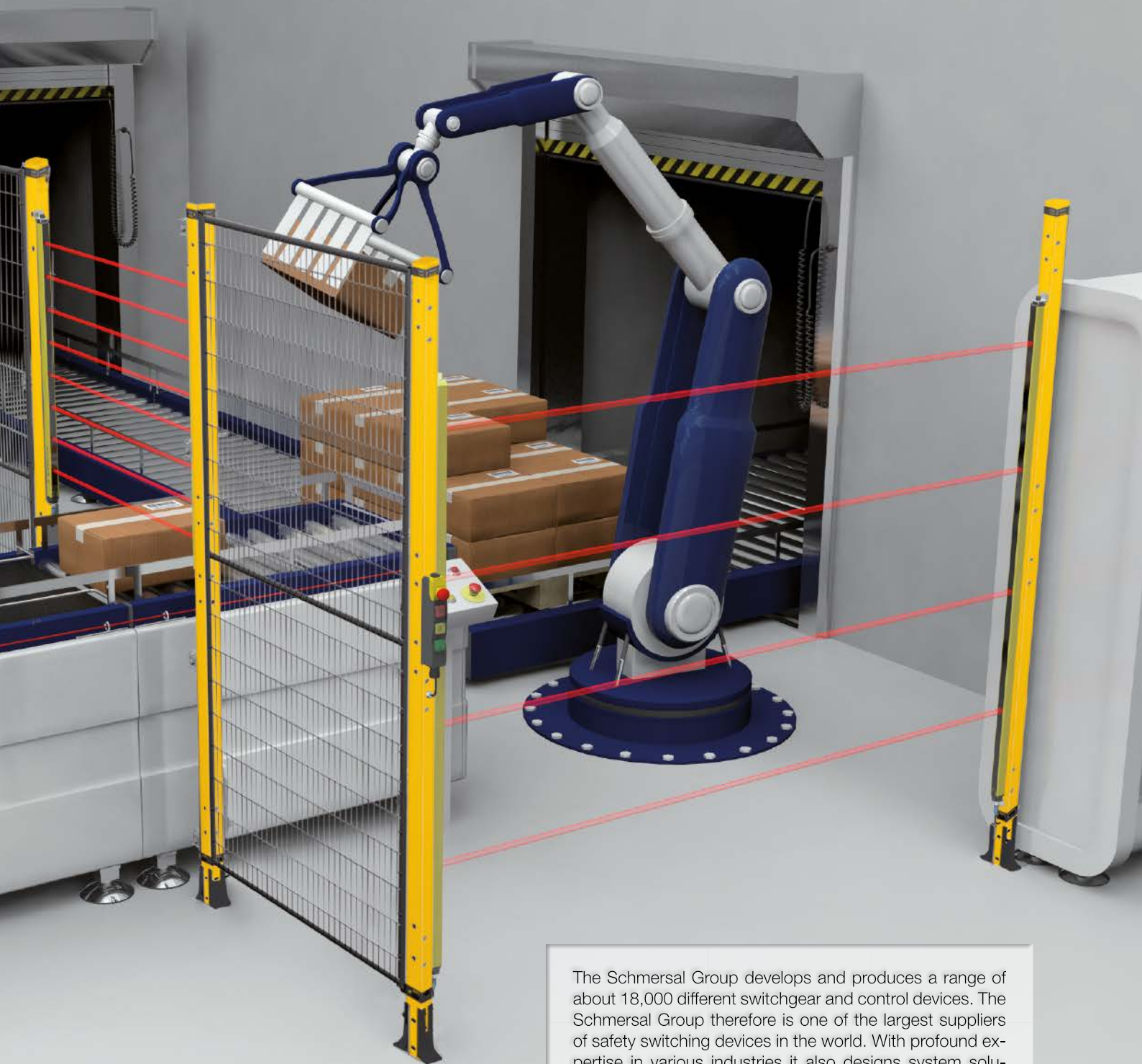
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TECHNOLOGY

COVERSTORY



The Schmersal Group develops and produces a range of about 18,000 different switchgear and control devices. The Schmersal Group therefore is one of the largest suppliers of safety switching devices in the world. With profound expertise in various industries it also designs system solutions for machine safety. In addition, Schmersal's tec.nicum business division offers a comprehensive safety services portfolio. Around the world, more than 1,850 employees work on pioneering safety technology solutions.



Industrial Robot Protection

Alternatives to the Safety Fence

The choice of protective equipment around a robot workstation is made easier if one keeps a close eye on the individual circumstances.

It is a familiar picture in industrial production – a robot workstation or a complete, robot-supported production line surrounded by a protective fence. Guard doors within the fencing permit access to the hazardous area for servicing and cleaning purposes. Safety switches, or more frequently, solenoid interlocks, are used to protect the guard door. This form of robot workstation protection is tried and tested and satisfies applicable directives and standards. But is it the best solution for every application? There are alternatives. Consequently, the designer – whose tasks include choosing the right protective devices – should

look closely at the alternatives on a case-by-case basis.

Is a Safety Fence the Only Option?

If the only purpose of the protective device is to prevent the operator from accessing the hazardous area, opto-electronic protective devices could carry out the same function as the protective fence. Safety curtains and safety light grids ensure an unobstructed view of the process, as well as provide for greater flexibility, e.g. when feeding parts.

If the risk analysis indicates that an emergency-stop button needs to be installed in the

hazardous area, a device from Schmersal's BDF product range is recommended. The BDF 100 is easy to integrate into common enclosures and protective fence profiles.

Distinction Between Man and Material

If the designer opts for opto-electronic protective devices, he can create a distinction between man and material, thus boosting the flexibility of the production cell. This can be achieved with functions such as muting, blanking, and floating blanking: if the operator then reaches into the hazardous area, the protective devices cause the hazardous movement

”

If the designer opts for opto-electronic protective devices, he can create a distinction between man and material, thus boosting the flexibility and efficiency of the robot work cell.

Tobias Thiesmann, System and Solutions Manager, Schmersal Group

“



Easy to assemble and ergonomic:
A combination of control panel
and solenoid interlock on the
safety door of a robot workstation

to stop immediately. On the other hand, the components being processed can be conveyed into and out of the hazardous area without the robot being stopped.

Tactile Protective Devices as an Alternative

If operators need to be present within a robot cell temporarily, the use of safety shutdown mats as a form of area protection can be useful. While the operator is standing on the mat and is therefore present in the hazardous zone the robot will be prevented from starting. When safeguarding large guard doors on robot cells and production lines, pull-wire

emergency-stop switches can also carry out the same functions as an 'all-round' and, therefore, easily accessible emergency-stop button.

Setup Operation with Two-hand Control Panels

Specific safety regulations apply to the setup of machines and systems in view of the need to work with the guard door open (and, for example, the reduced speed of hazardous movements). When carrying out setup work, the use of a two-hand control panel may present a solution, although these were originally developed for the operation of presses and

other forming technology equipment. With their assistance, safety functions designed to prevent robot operation when a guard door is open, can be bypassed in a targeted and safe manner.

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The Future of Manufacturing with Cobots

Enhancing Production Efficiency, Flexibility and Quality with the Help of Camera and Vision Technology

Collaborative robots (cobots) have a key role in current and future trends in industrial automation and production. Recent studies assume that the value of cobots in industrial automation will have reached US\$ 7 billion by 2025. With the average retail price of a cobot being between US\$ 15,000 and US\$ 45,000, their use in this type of automation is also becoming increasingly feasible for industrial manufacturing applications in smaller production facilities and warehouses.

However, companies that are developing innovative and integrated cobot concepts must meet a wide range of requirements. To increase production flexibility, efficiency and quality, they will need to carefully develop the interaction between mobile robots, cobots and other elements – such as integrated apps, support and risk assessment, and camera and vision technology. But what key aspects do companies need to consider and what are the best ways of using smart camera and image processing systems with cobots?

Using Tools to Aid Cobot Movements

For applications in which flexibility and quality are more important than speed, cobots can be combined with user-friendly software tools and integrated sensor functions. Examples include machine vision systems that have localization options. Some cobots can navigate using a landmark tool. The marking is easily recognized by the robot's built-in camera and can be used as a reference point for its movements. This enables it to know how to move

to the correct positions, which is particularly helpful when objects or devices are moved during production, or when the cobot is transferred to another workstation.

Using a Vision System to Improve Quality Control

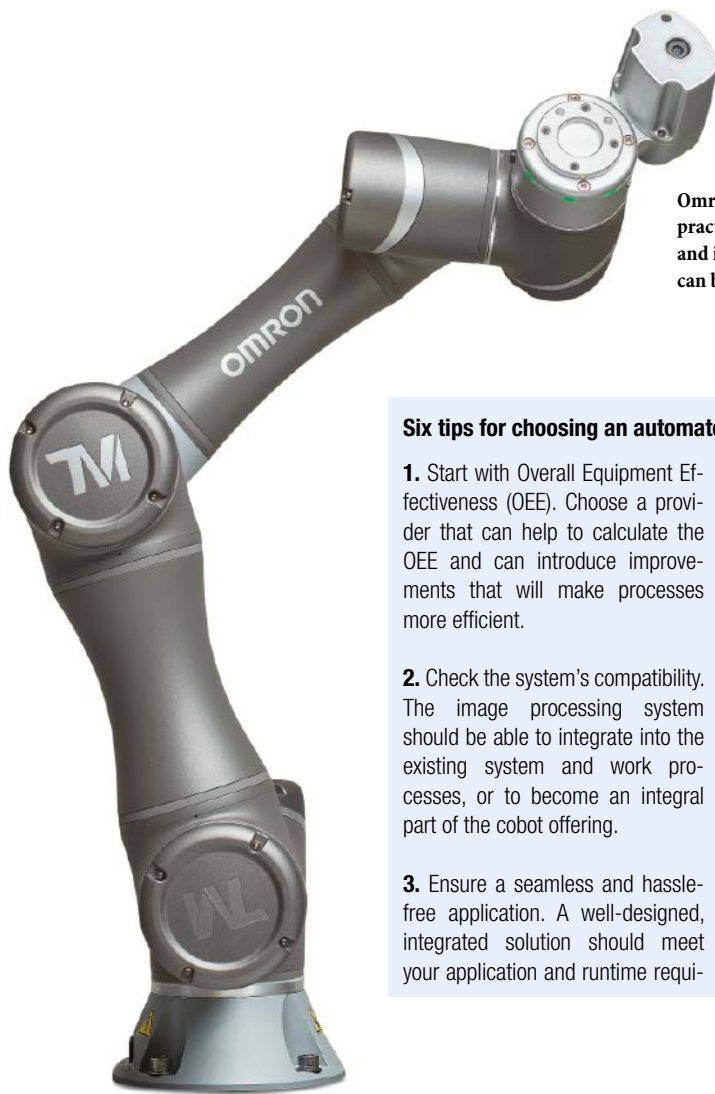
Companies need easy-to-use, intelligent camera and image processing systems that will recognise patterns, carry out quality control, place objects and identify barcodes. For example, organisations in the food and drinks, pharmaceuticals and medical device sectors have to meet both high consumer

expectations about safety as well as strict legal requirements. For instance, one pressing need is for vision systems that can check whether the information on a label or packaging is correct and complies with the consumer's information requirements. When implementing cobots, it therefore makes sense to integrate image processing systems into the cobot to optimize traceability and logging protocols.

An integrated vision system can improve reliability, consistency and precision. Another advantage is its flexible scalability, based on the needs of the user. For example, it's possible to start with a simple integrated system and then expand it as required. Smart systems based on artificial intelligence (AI) or machine learning (ML) can also help to enhance decision-making through the use of data visualization.



◀ Cobots can be combined with user-friendly software tools and integrated sensor functions.



Omron's TM cobot provides a practical example of how camera and image processing technology can be integrated into a cobot.

Six tips for choosing an automated vision system as part of your cobot project:

1. Start with Overall Equipment Effectiveness (OEE). Choose a provider that can help to calculate the OEE and can introduce improvements that will make processes more efficient.
2. Check the system's compatibility. The image processing system should be able to integrate into the existing system and work processes, or to become an integral part of the cobot offering.
3. Ensure a seamless and hassle-free application. A well-designed, integrated solution should meet your application and runtime requirements. The system should include core functions such as image acquisition and processing (vision); software and network communication; and the ability to control all of the devices in the machine network.
4. Select an experienced partner. Choose a provider that understands the branch and market regulations. If you opt for an unsuitable vision system, you'll just spend more time and money-making complex adjustments.
5. Choose the right system speed. It's best to have a system that can process data based on the optimal speed of the production line. This should create added value with planned control and security projects and should have a positive impact on performance and profit.
6. Ensure good data integration. Ensure that your image processing system can be easily integrated into your production control system; and that your control system is well integrated into your business system for data storage and analysis. You need the different systems to interact seamlessly so that the result will be good traceability and reliable documentation.

Using AI at the Edge to Increase Accuracy

Industry 4.0 and the Industrial Internet of Things (IIoT) enable historical data to be recorded and used for process improvements. However, many AI projects have problems with visualizing new information. Fortunately, control solutions that are linked to predictive maintenance, such as Omron's AI controller, can merge the control functions of production lines and systems with AI processing in real time.

Today's production facilities increasingly require in-depth knowledge combined with data that's generated and collected at the machine level – i. e. at the edge. For example, a machine can learn from its human operators and improve its performance, as well as that of cobot applications. AI-driven technology can predict both product and device failures, based on data from IIoT devices. The analysis of combined data enables the rapid prediction of machine errors, which in turn prevents plant downtime and product quality issues.

The AI controller can support companies by generating and evaluating data that can be time-stamped and easily visualized. Raw data acquisition is fully automated 'at the edge', leading to higher data accuracy and consistency. In addition, the controller automatically creates data models from the correlation anal-

ysis and uses these to monitor the machine's status.

A Peek into the Factory of the Future

Omron's TM cobot provides a practical example of how camera and image processing technology can be integrated into a cobot. It can be used, for example, for applications in assembly, packaging, inspection and logistics. The built-in five-megapixel camera and the integrated vision system provide some clear benefits. The image processing system is designed for pattern recognition, object recognition and positioning, as well as color classification and barcode identification. The task designer software enables users to set up tasks for immediate use without having to install additional cameras or lighting. The Omron TM's integrated camera has an autofocus function that can locate objects in variable fields of view and at different distances. Overall, therefore, the image processing system improves the reliability, consistency and accuracy of the application.

Making the Factory of the Future a Reality

Cobots can bring the flexible factory of the future to life by enabling machines and people to work side by side, and almost hand-in-hand. As part of a complete package that includes

mobile robots, image processing technology, risk management and security services, cobots can bring considerable advantages to manufacturing and industrial companies. The latest cobots are safer, simpler to program and easier to integrate into other systems. They can therefore make a significant contribution to the development of an intelligent and future-oriented manufacturing environment.

Conclusion

Innovative cobots are very versatile and can be used in numerous applications, such as machine assembly, loading and unloading, assembly, adhesive application, testing and soldering. With an integrated and intelligent image processing system, users can benefit from further advantages that will improve production processes and relieve employees from repetitive tasks.

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Connecting The World's Largest Illuminated Glass Dragons

Reliable Connection Technology for LED-lit Sculptures

Cable and connection solutions ensure that two huge crystal dragons are powered and dynamically illuminated by RGBW LED chips.



Saipan is in the Pacific Ocean and is a popular Chinese holiday island, just 22 km long and 9 km wide and famous for its “eternal summer.” And now it has another great attraction. In the casino at the luxury Imperial Palace resort on the island, the Czech design and glass company Lasvit has created the world’s two largest glass dragons. They fight over a pearl and light up. The spectacular project was realized with connection solutions from Lapp. They are the largest glass dragons in the world and are set to be included in the Guinness Book of Records.

The breathtaking sculpture made of stainless steel, gold and crystals was created by the Czech design and glass company Lasvit over three years of construction. The two dragons weigh a combined 40 tons. Each of them is 32 meters long. Their bodies are covered with 2.5 million Swarovski crystals, which were individually fitted by hand. The crystal scales on the dragons’ bodies are illuminated, which means that the dragon can change color at lightning speed. The designers from Lasvit took their inspiration from Chinese mythology. Dragons are popular mythical creatures in China. They are considered gods and the dragon dance is still an important tradition in China today.

Exploring Limits

“This project is the largest installation we have ever created. It helped us extend the limits of what can be done with glass and metal. For the project, we had to combine two traditional crafts – glass making and metalworking. We used in-depth knowledge from the two areas and added the latest technology to make the work even better,” says a proud Leon Jakimič, founder and President of Lasvit.

Dynamic LED Lighting

To cover the body of the dragon, Lasvit produced 13,000 stainless steel scales fitted with crystals. More than 2.5 million Swarovski crystals provide the shimmering decoration. “The light refracts into the rainbow effects that are typical of polished crystals, which is critical for the visual appeal of the dragons. Their entire body is dynamically illuminated using hidden RGBW LED chips, which generate a warm, natural looking glow,” says Táňa Dvořáková, who designed the installation in collaboration with Adam Kohout and the interior architects responsible for the overall design concept. Thanks to the programmed RGBW LED chips, the crystals act like a huge screen that follows the shape of the dragon body. Each light source can change between red, green, blue, and white light. The luminous intensity can also be dimmed. LED spotlights also illuminate the spikes on the back and the fiery tongue.

Connection, Power and Control

The connection solutions for the shining dragon installation come from Lapp. “Just



Lapp supplied nearly 7,000 Epic connectors for the installation, including pre-assembled Epic Sensor M12 connectors with stainless steel knurl for connecting sensors and actuators.

before Christmas time in 2016, a representative from Lasvit called me. We knew each other from our previous job. Lasvit needed urgently help with delivery of pre-assembled Epic Sensor M12 connectors for the new project. We cooperated during the Christmas holidays – agreed prices and negotiated terms and all the details. At the beginning of the year 2017, deliveries started. The delivery successfully reached customer’s needs,” says Vladimír Tonder, sales representative at Lapp Czech Republic. The global market leader for integrated cable and connection technology solutions supplied nearly 7,000 Epic connectors for the installation, including pre-assembled Epic Sensor M12 connectors with stainless steel knurl for connecting sensors and actuators. For the power supply, the halogen-free Ölflex Classic 110 H control cable and the Multi-Standard SC 2.1 power and control cable with PVC sheath were primarily used, along with Skintop cable glands, mostly the Skintop ST-M. It is glass fiber-reinforced and provides excellent mechanical stability.

All LED modules are individually controlled by a computer, allowing the skin color of each dragon to be changed by clicking on it. The surface of the dragon body acts like a huge screen. During the construction process and subsequent installation of the housing and the internal electrical equipment, the engineers were able to move around inside the sculpture. Some team members spent a total of up to two months on site.

Earthquake-proof

Each dragon is supported by a skeleton made of hollow tubes with circular transverse reinforcement, which forms the complete shape and line of the dragon’s body. This stainless-steel framework construction forms the complete shape of the twisting dragon body.

It satisfies two basic requirements for installation and maintenance – it is accessible (including transportation of the internal control panels) and allows individual scales to be replaced. A further challenge is that the island of Saipan is situated in an active seismic area and therefore the dragons must be able to withstand a possible earthquake. “The structure needed to be flexible and at the same time as lightweight as possible. In their current state, the dragons can withstand earthquakes measuring seven on the Richter Scale,” explained Martin Šikola, Director of Technology and Innovation at Lasvit.

“Glass blowers and metal construction experts contributed know-how from centuries of traditional craftsmanship, with their work supported throughout by a high-tech design process. In this project, we got very close to the limits of what is technically and physically feasible,” says Leon Jakimič. Hundreds of employees from the Czech Republic were involved in the successful project. Installation of the sculpture required complete integration into the architecture of the building, including compliance with strict construction regulations, as Saipan lies in an earthquake region. The load bearing part of the installation consists of a stainless-steel framework construction that forms the complete shape and winds along the entire body of the dragon.

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pictures ©Lasvit

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Fireproof Baking Worldwide!

Safe Mini Control System Controls and Monitors Gas Burners in the Ovens of Austrian Wafer Machine Manufacturer Franz Haas-Waffelmaschine

An industrial wafer baking machine is complex in terms of control technology. The ignition process of the gas-fired long-tube burner alone comprises 20 individual steps. Numerous other process steps are added as the baking process continues. The wafer machine specialist Franz Haas-Waffelmaschine therefore decided in favor of a flexibly configurable, safe miniature control system that can be used to monitor and control not only the functional safety but also the burner control and thus the entire safety technology of the baking machines.

According to industry insiders – whether it's wafer fingers, rolls, or cones – every second wafer manufactured industrially worldwide is baked using a Franz Haas wafer machine developed in the Lower Austrian town of Leobendorf. Production lines for the most diverse wafer varieties – flat and hollow wafers, wafer rolls, ice cream cones, waffles, and wafer snacks – are developed at the Wafer Innovation Center there. As well as being highly flexible as a result of the automation side being modular, these customised plants must in particular satisfy country-specific safety standards in order to meet the applicable norms and directives of the respective target markets. With its new base unit PNOZ m B1 Burner, part of the safe small controller PNOZmulti 2 and specially developed for use in furnaces – including the TÜV-tested burner software module – the automation expert Pilz has created a solution for the safe control and monitoring of the gas burners in the Austrian wafer machine manufacturer's ovens. It's an ideal solution for Bühler because global certification means it can be used as standard.

As a result, the wafer machine specialist is able to implement functional safety as well as burner control, and so all of the safety technology for its automatic baking ovens, using a single, flexible, configurable and safe small controller. What's more, with sophisticated diagnostic opportunities and a

variety of communication options it is easily incorporated into the automation environment, which is usually specified by the customer.

Safety Tasks of the Burner Control System

Company founder Franz Haas invented the first wafer machine as early as the end of the 1940s. In the decades that followed, the plant and machine manufacturer significantly shaped ongoing development of industrial wafer production with numerous other innovations. Since 2018, the company has belonged to the Swiss Bühler Group, with subsidiaries around the globe. 700 people are employed in the wafers area of the Consumer Foods division at the Leobendorf site, working in development, design, and production, as well as sales, service, maintenance, and spare parts management. Customers from all over the world come to the Wafer Innovation Center in Leobendorf to test and optimise production processes for their wafer products.

At the heart of every wafer production line is the oven. This may be up to 35 m long depending on the product and plant configuration. The heating is generally provided by gas-fired long tube burners. "The dough is poured on to individual baking plates, which circulate through the oven at up to 0.5 m/s. The typical baking time for a wafer depends on the product but is around 2 minutes," says Wolfgang Grassberger, outlining the baking process. He's responsible for machinery safety in the wafer division at Bühler. "The burner controller's most important task is to monitor the extinguishing of the flame and if necessary to interrupt the gas supply safely and immediately. In this way we can prevent the escape of unburned gas and, in the worst-case scenario, an explosion." What supposedly sounds simple turns out on closer inspection to be



Burner Management System for Applications in Firing Technology
<https://youtu.be/a7hwvNBKQD0000>



Bilder © Pilz GmbH & Co. KG

Safe Solution for Worldwide Use

The core element of the base unit PNOZ m B1 Burner from the modular PNOZmulti 2 product range is the burner function block, which was specially developed for the safe control and monitoring of furnaces and is tested and certified in accordance with the relevant European standards such as EN 298 and EN 50156, as well as the North American standard NFPA 85/86. The function block contains the complete sequence program of a burner controller. Each individual step is executed safely – from purging of the combustion chamber prior to ignition through to detecting the flame within a fixed time interval. A base unit PNOZ m B1 Burner can control and monitor up to twelve burners independently. From Version 10.12 of the software tool PNOZmulti Configurator, the new base unit PNOZ m B1 Burner supports project design, configuration, documentation, and commissioning of the controller. Pilz is therefore one of only a few manufacturers of a SIL 3 processor-controlled burner management system. The added value: with this solution users can not only control and monitor furnaces but also cover all plant-dependent safety functions such as emergency stop or safety gates. So, there is no need for complex design adjustments of the burner controller to meet national normative or legal specifications. Application areas for the burner version of PNOZmulti 2 can be found wherever process heat is required, and gas firing is used, so in paper production, petrochemical, chemical and other process industries for example.

With the new base unit PNOZ m B1 Burner from the safe small controllers PNOZmulti 2 from Pilz, it is possible for the first time to manage safely not just the control and monitoring of the burner itself but of the whole furnace.

a complex control sequence. It begins back at the ignition process, which already comprises almost 20 individual steps. “Each burner has two redundant, diverse main gas valves, which undergo a tightness test even before the actual ignition process,” says Wolfgang Grassberger, quoting an example. An ionisation current sensor detects the flame and therefore successful ignition – UV flame monitors may be used as an alternative. “The minimum and maximum gas pressure, the suction function, compliance with the permitted maximum temperature and many more are monitored during firing,” says Wolfgang Grassberger, listing a few more of the burner controller’s safety tasks.

PNOZ m B1 Burner Controls and Monitors up to Six Burners Independently of Each Other

Bühler has been using the safe SIL 3 / PL e compliant small controller PNOZmulti from Pilz to implement functional safety on its machines since the early 2000s. The list of safety tasks ranges from emergency stop and

safety gate monitoring through to the SLS function (Safely Limited Speed) for setup mode. “We maintain an excellent working relationship with Pilz and are already using the second generation PNOZmulti. We particularly appreciate the flexibility that the configurable small controller has to offer, with its numerous expansion modules, wide range of configuration and communication options and outstanding diagnostic functionalities,” says Wolfgang Grassberger, not sparing in his praise. “Of course, it’s a real benefit to us that Pilz has developed its own, TÜV certified burner software block, which is flexible for us

to use with our various, customised machine configurations.” That’s because the PNOZmulti 2 at Bühler now also carries out the tasks previously performed by separate burner controllers – and in keeping with the multi it is more compact and has greater functionality: one base unit PNOZ m B1 Burner controls and monitors up to six burners independently – previously a separate controller was required for each one. “The biggest advantage for us is that we can now standardise all the safety technology for our machines, i.e. functional safety and burner control, with a single system,” says Wolfgang Grassberger in a nutshell.

The ovens are heated by gas-fired long tube burners.

The burner controller’s most important task is to monitor the flame and, if it is extinguished, to interrupt the gas supply safely and immediately.

As a safety component, the burner version of PNOZmulti 2 also monitors this step of the process.



Bilder © Pilz GmbH & Co. KG/Bühler



Bilder © Pilz GmbH & Co. KG/Bühler



The shaping process for a typical wafer – an ice cream cone for example: The dough is poured on to individual baking plates (illustrated), which circulate through the oven at up to 0.5 m/s. At the end of the process the wafer is shaped into a pointed cone.

For Uniform Global Use

PNOZmulti 2 can easily be connected to higher-level automation environments via the communication modules available for all common fieldbus and Ethernet systems – another important aspect for Bühler given that the production lines are supplied worldwide and so must be appropriately diverse to consider the requirements of the different markets. The status and diagnostic data generated by PNOZmulti can easily be incorporated into the respective visualisation system. As a result, the current actual state of the burner can be displayed in individual steps and analysed in great detail. All information and, above all, error messages are visualised in plain text on the operator panel. “That is a real milestone for us and represents clear added value for our customers. So, the days when you had to read and interpret codes from flashing LEDs are well and truly over,” Wolfgang Grassberger explains. Bühler doesn’t rely on the often-preferred integrated safety technology but sees advantages in uniting the standard and safety controller in one system environment. Wolfgang Grassberger: “Using Pilz technology to implement all of the safety technology, completely independent from the standard automation, has many advantages for us. But what’s most important is that we can standardise use of the technology worldwide, because Pilz takes care of international certification, including for the burner management.”

Retrofit Burners Also Included

The new burner version opens up another application area in the retrofit sector, as a replacement for older burner controllers without bus capability. PNOZmulti 2 is suitable here too because, as a modular system with wide-ranging configuration software, the configurable, safe small controller is flexible and adaptable in both hardware and software. This is confirmed by Bühler – some outdated burner controllers on existing installations have already been replaced by PNOZmulti 2: “Our systems often operate for decades. So, the availability of spares is just as much an issue as safety. In this respect it makes total sense to modernise using up-to-date safety technology and so this is an ever-increasing field for us.”

The Austrian wafer machine manufacturer is already working with Pilz on further modularisation of its burner controllers with PNOZmulti: up to 24 single burners are to be controlled individually – for even greater flexibility with regard to the product diversity of users worldwide.

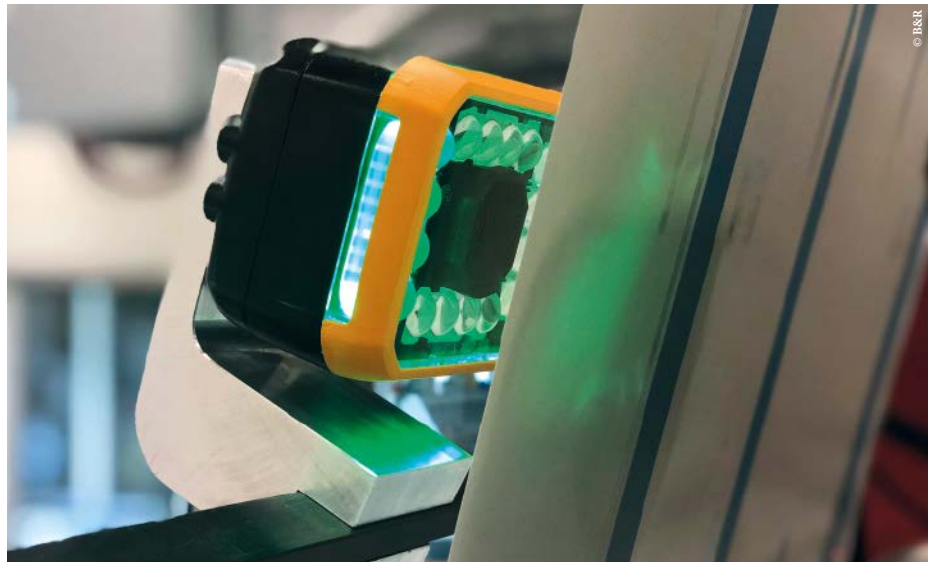
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Large batches are increasingly being replaced by short runs – and this also applies to labels. To keep changeover times and waste low, the Danish press manufacturer Nilpeter relies on a vision system that is fully integrated into the line.



The Self-calibrating Printer

Vision System Reduces Rejects on Label Press by 50 Percent

The printing market looks much different than it did even ten years ago. It has gone from long runs producing big batches to short runs with many changeovers each day. „Today, many customers need only a thousand labels, where they used to need 30 or 40 thousand at a time,“ notes Jesper Larsen, software development manager at Nilpeter. „Every second of production time lost while setting up for a new label type is a painful sacrifice.“

Reducing Misprints

Challenges today's label printers face include shorter print runs, time loss when setting up for new label types, and costly material waste due to misprints.

To keep label printing profitable, it is also important to minimize the number of sheets that go to waste due to misprints. With the web racing through a Nilpeter printing machine at speeds of several meters per second, even the slightest imprecision will leave noticeable

flaws on the printed labels. Such quality issues can cost dearly in terms of waste – something the Denmark-based machine builder knows all too well.

Increased Precision

Nilpeter has been working with B&R for years, developing new solutions for automation and quality assurance. „We immediately recognized the advantages B&R's vision system would have for our printers. The insight it provides into processes like registration control can really help reduce waste,“ says Larsen.

The manufacturer equipped each of its label printer's six units with a B&R machine vision camera. The cameras constantly monitor the position of the labels on the web. If the image processing software detects any imprecisions in the alignment of the colors, the camera alerts the machine control system, and the machine makes any necessary adjustments automatically.

Benefits for Machine Builders and Their Customers

Integrated machine vision makes Nilpeter machines more available and more productive. „You get smart, flexible batch production, and the single-cable solution means OEMs can get their machines to market faster,“ says Jensen, who sees great potential for integrated vision at his workplace. „With material expenses comprising such a large portion of the label printing costs,“ he explains, „it's exciting to imagine what can be gained by cutting waste in half.“ The integrated vision system from B&R makes Nilpeter one of the few companies in its market to offer a performance boost of this magnitude for its machines.

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With material expenses comprising such a large portion of the label printing costs, it's exciting to imagine what can be gained by cutting waste in half.

Jesper Larsen, Software Development Manager, Nilpeter A/S

“

Improved Metal Processing

Laser Scanners Optimize Cutting and Welding Processes

In laser welding and laser cutting, the high degree of automation requires extremely precise tool guidance. The use of laser scanners ensures high product quality in dynamic processes.

Automated processes in the metal industry ensure consistently high product quality and process reliability. Laser scanners from Micro-Epsilon are used in order to meet their high requirements. They intervene even before the cutting and welding work and create precise 2D/3D profiles. Based on this measurement data, exact tool guidance is possible.

Speed, flexibility, and consistently high product quality are required for automated welding and cutting operations in the metal industry. Depending on the manufacturer, the processes can be very individual and complex. Laser scanners from Micro-Epsilon are used to achieve high efficiency. An exact profile of the object to be edited is created before the tool is applied. The tools can then be precisely positioned to carry out the required operational steps.

3D Scan of Components Before Laser Cladding

The laser processing of components is versatile. It ranges from cutting and welding work to coating. Mechanical components are measured three-dimensionally before machining in order to derive the optimum machining processes from the profile data obtained. Laser profile scanners from Micro-Epsilon are used for this purpose.

In laser cladding, a melt pool is created on the surface of the component and a new, pore-free layer is created by adding a powdered filler material. The core task of the sensors is the detection of free forms as well as

the recognition of form deviations before laser processing. The components are scanned with a scanControl laser scanner from Micro-Epsilon. If required by the component geometry, this is done from several directions. Regardless of the reflection properties of the material, the sensor constantly provides reliable measurement values. The raw data is transferred directly to the customer software, assembled into a 3D model and finally used for the path planning of the laser welding head. The nozzle can then be placed at the correct distance from the surface and guided along the calculated path. The result is a new, even, and full surface.

Different sensors can be used depending on the intended use, such as repair, 3D printing, joining, or coating and component size. The scanControl 3050-50/BL is ideally suited. This sensor offers a measuring range of 50 mm, with 2,048 measurement points per profile and a measuring rate of up to 10,000 profiles per second. The blue laser line enables precise measurements on metallic surfaces.

Advantages of the Laser Scanner over a Camera Solution

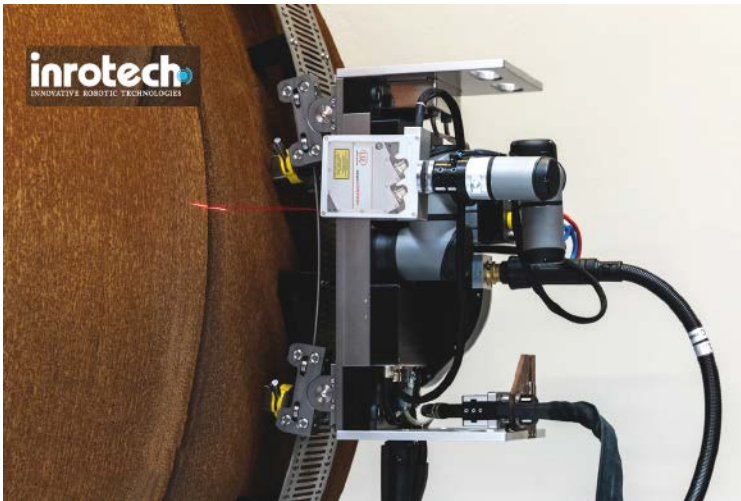
In contrast to a camera solution, laser profile scanners enable the creation of a 3D model and are also surface-independent in terms of contrast. The higher precision, as well as the various integration and processing possibilities of the acquired measurement data, also offer significant advantages in this application.

Compared to tactile measurements, the required cycle time is considerably shorter thanks to non-contact measurements.

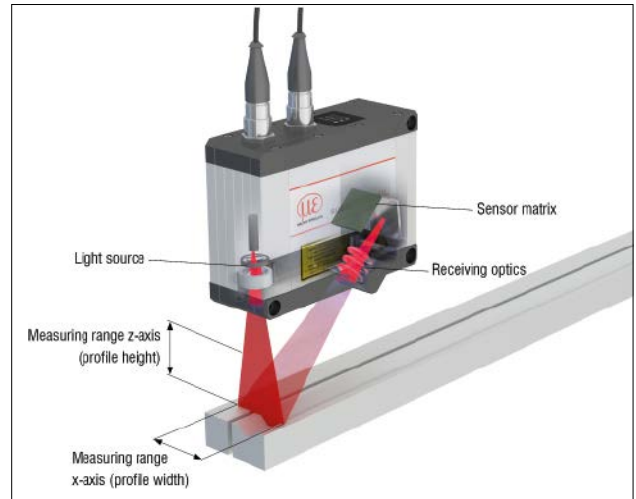
3D Measurement of Components Prior to Plasma Cutting

The Slovak company MicroStep, spol. is one of the world's largest producers in the field of automated plasma cutting systems. The company relies on precision sensor technology from Micro-Epsilon in a specially developed machine for processing vessel and boiler covers, the so-called domes, as well as profiled materials. The system can handle domes with diameters up to 7 m and a height of up to 1.2 m. In these domes, openings for pipe and valve connections are normally cut.

In order to process these huge domes quickly, fully automatically and at extreme precision, it is necessary to determine their shape and exact position within the production line. As the pure CAD data of the dome often differs by several centimeters from the actual dimensions, the 3D profile of the covers is measured before processing using scanControl 2900 laser scanners. The exact dimensions are then determined from the 2D data generated by the scanner which is connected to a 6D scanner position system. The scanning process is performed at high speeds up to 60 m/min. Therefore, a reliable hardware trigger is required to obtain the real shape of the target. The precise measurement values are then transferred via an SDK connection as a



Inrotech in Denmark relies on sensors from Micro-Epsilon to achieve optimal quality of weld seams in a fully automatic process.



Laser scanners use the triangulation principle for two-dimensional profile acquisition.

point cloud to the customer's evaluation software mScan, which calculates the optimum tool path from them. For fully automatic processing of the measured values, synchronizing the scanner data with the data of the processing space is necessary. MicroStep uses a patented auto-calibration (ACTG) system for this purpose.

Advantages of the Laser Scanner

Its compact design with integrated electronics and speed makes the Micro-Epsilon laser scanner suitable for inline integration. In addition, high performance scanners achieve a high repeatability of 50 $\mu\text{m}/\text{m}$ even with different reflective properties of the metallic test objects. High repeatability ensures that the process is always carried out at consistently high quality. Furthermore, the measured data can be used to check the quality of the dome. The laser scanner provides a point density of 80 μm over a measuring range of 100 mm.

Optimizing Weld Seams with Profile Measurements

Inrotech in Denmark relies on sensors from Micro-Epsilon to achieve optimal quality of weld seams in a fully automatic process. The company has developed the so-called Inrotech-Crawler which calculates welding processes in advance before carrying them out. Therefore, the robot uses the precise measurement values provided by Micro-Epsilon's laser profile scanners.

A scanControl scanner is fixed on the Inrotech-Crawler and detects the geometry of the seam to be welded before the actual welding process starts. These high precision profile measurements enable the process to be automated. Based on the optimal exposure time regulation and high resolution, the sensor reliably measures almost any measurement object. Due to its compact, lightweight design with integrated controller, the laser profile scanner is ideally suited to this measurement

task. Various connection possibilities offered by the Software Development Kit enable the customer to directly transmit the profile data calibrated to their own software via scanControl DLL. The Weldlogic technology from Inrotech then calculates, among other things, the number of welding processes, the position of the weld seams, the weld speed, and the oscillation width. Directly after the calculation, the Crawler automatically performs the welding process.

Completely Automatic 3D Repair Welding

The laser scanners are also used when welding robots carry out automated repair work. The company Mabotic has developed a method for RWE to automate this repair process. The welding robot enables the scanning of weld geometries such as plates or curves with various surface characteristics. The robot is mobile and is ideal for different environments, e.g., for welding tasks in the oil & gas industry, offshore, shipbuilding, wind turbines and building construction.

For example, it is used for repairs on chain links of lignite excavators. Here it is much more economical to repair the worn parts than to replace the old components with new ones. After around four years of harsh, continuous operation, these steel parts are worn so much that several centimeters of steel are missing in the affected areas. To repair these areas, the missing material would be welded on again by hand over several hours in the conventional way. The welder would have to manually weld on several parallel webs to restore the original shape of the chain link. With the automated process, this procedure takes just minutes.

A resistant sensor is the base requirement in this and many other environments. The laser profile scanner from Micro-Epsilon is ideally suited to these requirements. In the first step, the surface of the defective area is scanned by a laser scanner, which is guided

over the surface by a robot. In conjunction with the position data of the robot, the 3D data of the wear point is determined exactly. Thanks to the surface independence of the sensor, pre-treatment of the surface is not necessary. In a second step, the 64,000 measuring points per second are inserted into the CAD target model of the chain link. Therefore, the difference in volume between the high resolution measured values and the target contour is obtained. In the next stage, the optimum welding lines for welding the eroded material in this differential volume are calculated. This entire process is completed in less than three minutes. Finally, the calculated welding lines are transmitted to the robot controller and the automated welding process begins.

Blue Laser Technology

In addition to the red standard laser, Blue Laser Technology is available for measurements on demanding surfaces. Micro-Epsilon holds a patent for measurements with blue lasers on red-hot glowing objects exceeding 700 $^{\circ}\text{C}$ and (semi-)transparent objects. Transparent objects include plastics, glass, adhesives, silicones, paints, coatings, perspex, and seals. For many measurement objects, Blue Laser scanners offer crucial advantages compared to sensors with a red laser diode. On organic, glowing materials or semi-transparent objects, the blue laser line is sharply imaged which enables stable and precise results.

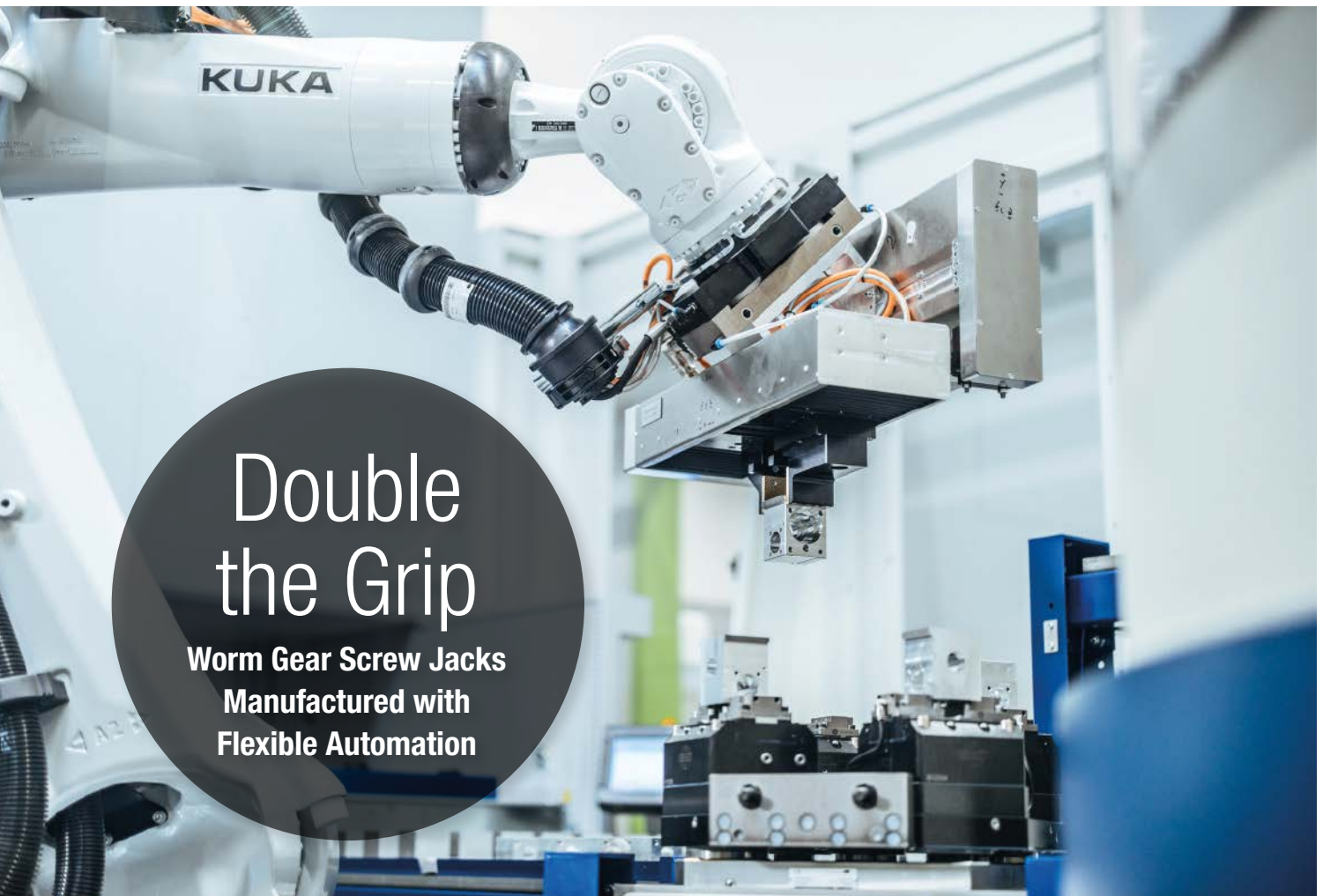
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Double the Grip

Worm Gear Screw Jacks
Manufactured with
Flexible Automation

A new manufacturing cell that includes milling, loading, and unloading, plus clamping technology and sensors for improved reliability facilitates the production of worm gear screw jacks considerably.

In the past, the production of worm gear screw jacks – electromechanical actuators that convert a rotary motion into a linear motion – was a laborious process for the Austrian manufacturer Zimm. For example, the individual components used to be clamped manually onto pallets. This procedure was both time-consuming and had high production costs. A project by the Lindau-based automation specialist Vischer & Bolli Automation and its cooperation partner proves that it can also be simplified. Together they developed a flexible manufacturing cell for about 30 different types of screw jacks. In addition to a five-axis milling machine from Grob, which ensures that high-precision components are created from the raw material, two Kuka robots are used here, which take over the loading and unloading of the fixtures and workpieces with their subsequent finishing in a fully automated manner in a modular production cell. The specially adapted clamping technology and sensors from Vischer & Bolli Automation guarantee reliable processing in the cell and machine.

Bespoke Gripper Solution for the Robots

For the special gripping tasks in the robot cell, the responsible person at Vischer & Bolli Automation, Marcel Haltiner, fell back on a long-standing partner: the system technology department of the gripper specialist Zimmer Group from Rheinau, Germany. It is one of the world's leading specialists when it comes to customized solutions. With its system solutions, the company's system technology department can, among other things, optimally equip any robot make – including Kuka robots, of course - and significantly increase their functionality and efficiency. For the production plant at Zimm the department developed a special version of a double gripper with servo technology. This can grip components of all types and different geometries. It has a stroke of 150 mm and a holding force of 5000 Nm or 3000 Nm with a secured hold via a trapezoidal threaded spindle in the event of an unforeseen power failure. In addition, the clamping pressure on the gripper can be variably programmed for each workpiece.

Fully Automatic Operation

Almost all tasks that previously had to be carried out by hand at Zimm are now performed fully automatically by a KR Quantec and a KR Agilus from Kuka. The five-axis milling machine is supplied with raw material via a lift system. To do this, the employees load trays inside a huge lift system which projects four meters into the production hall. There is enough space to store raw material and finished parts here, also the clamping devices and, if necessary, tools are stored in this lift system. Afterwards, everything is automated. A special gripper, which is docked to the KR Quantec robot via the V&B zero-point clamping system, first removes the trays filled with raw parts (aluminum and cast cubes) in various sizes from the lift system in the robot cell and places them on an attachment table. Then the robot uses the Zimmer gripper to automatically position four raw parts in the Vischer & Bolli fixture and inserts them into the milling machine. „The machine can produce about 30 different components in batch sizes



A KR Quantec from Kuka takes over the loading and unloading of the components automatically with a gripper from the Zimmer Group.

between one and 200 from aluminum and cast iron," explains Marcel Haltiner and adds: „By loading the 4-fold fixture outside the machine, we avoid unnecessary downtimes with a table machine.“

Tolerance Deviations Are Transmitted and Automatically Corrected

While the milling machine is machining the four workpieces, the gripper on the KR Quantec loads another fixture in parallel. Once the components have been finished from both sides – the turning process is also automated – the gripper places them on the workstation for finishing. There, a KR Agilus of the KR 10 R900-2 type deburrs and cleans the aluminum and cast-iron parts. Meanwhile, the Procam master computer of the modular robotic cell takes over the entire logistics. „The next step in automation is to check all the measurement parameters in a further process step. Tolerance deviations can then be transmitted and automatically corrected via a feedback loop to the milling machine,“ explains Haltiner.

24/7 Production Possible

When all production steps for the workpiece have been completed, the gripper places it back on the tray for parking in the lift system. The last step is now carried out manually again, with the employees simply removing the finished products from the tray and passing them on for assembly. „Among other things, automation allows us to produce in

unmanned shifts at night and on weekends, which increases our productivity and competitiveness,“ Hardy Ponudic, production manager at Zimm, explains the advantages of the robotic cell. For example, all the work that until recently had to be done manually with a great deal of manpower and time is now carried out by the two Kuka robots in the cell. „This upgrades our workplaces because employees are now being trained to become robot operators,“ Ponudic says. According to some studies, the Corona crisis has already worsened the highly noticeable shortage of skilled workers, and so it is also becoming increasingly difficult for Zimm to recruit. Thanks to automation, employees who previously took care of monotonous tasks at the milling machine can now be deployed in other areas where they can concentrate on value-added activities. „Our solution runs largely without further intervention and relieves employees primarily of less demanding tasks such as clamping and unclamping workpieces,“ affirms Haltiner. In addition, the solution is smart because, for example, alerts can be sent to a smartphone via a mobile interface. The alarmed colleague can then decide with complete flexibility whether intervention is necessary or not.

Almost Unlimited Possibilities Thanks to the Modular Design of the Cells

Due to the modular design of the robot cell, Haltiner sees almost unlimited application possibilities: „Machine and mould construction,

medical technology, the automotive sector – in principle, we offer the possibility for entry into automation for all machining companies.“ Because Marcel Haltiner is convinced that the future of machine tool building is automated. Especially when it comes to parts handling, he sees hardly any other option in the future in terms of economic efficiency and feasibility. The Zimmer Group, as a pronounced handling specialist, also benefits from this. Haltiner also expressly emphasizes that today it is important for customers to have only one contact partner for such automation projects, for clamping technology, robot cell and software.

A new project is already underway with the gripper manufacturer and Vischer & Bolli Automation, involving an interlinked solution with eight machines in the hydraulics sector.

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All Tight

Modern Servo Amplifiers for Demanding Applications Enable Quick and Precise Screw Tightening Processes

In car body construction, advanced robot-aided screw tightening systems that rely on servo amplifiers are essential. A long-standing, fruitful cooperation between Weber and Sieb & Meyer has led to a wealth of benefits that improve production and open up new fields of application.

The German manufacturer Weber Group supplies robot-aided screw tightening systems around the globe. Its products support a great variety of motor types and comply with international standards and conventions. The servo amplifier SD2S by Sieb & Meyer meets these requirements, and more: it also features a small construction size and a high surge current capability. Switching to an SD2S model with integrated Ethercat slave fieldbus interface saved Weber costs while improving the performance.

An Established Partnership

For more than 25 years, Weber Group has been trusting in servo amplifiers by Sieb & Meyer from Lueneburg. „Our tightening systems have been equipped with various controller generations,“ agreed Christian Schönig, Head of Development at Weber. „At first with analog devices, later with digital models. Both sides have continuously developed the technology, which has always perfectly complemented one another.“ Weber develops, manufactures, and sells ‚technology that connects‘: The systems by the medium-sized family business take over tightening, connecting, feed-in

and control tasks – reliable and highly efficient. About 400 employees make sure that more than 1,000 machines and systems leave the production facilities each year – and from their headquarters in Wolfratshausen they supply globally. Since the forward-thinking technology is in global demand, the company keeps production facilities and sales offices in Germany, France, the USA, Italy, the Czech Republic, and China.

Screw Connections with High Tightening and Loosening Torques

The robot-aided Weber tightening system RSF is designed for flow drilling screw connections. This system is particularly popular in car body construction because composite construction and one-sided accessibility of joints make machining more difficult in this industry. The RSF technique ensures high-strength connections with one joining process. Screw connections can be made with or without pre-holes, which compensates for material variations and manufacturing tolerances. Another advantage: The connections are not permanent. For this purpose, a metric thread is formed directly into the items to be connected.

This makes disassembly possible at all times, which is particularly advantageous with regard to repair works or recycling of materials.

Screw Tightening with High Speeds – but Still Gently

The models RSF25, RSF30 and RSF21 use the servo amplifier SD2S to drive the motor of the screw tightening spindle. During this process the screw must be tightened with much ‚feeling‘ to ensure exactly the tightening torque necessary for the respective screw connection. In addition, high speeds are important for the quick tightening of the screws. „For flow drilling screw connections, high speed is actually a requirement,“ explained Christian Schönig. „High speed generates heat at the screw-in point so that the screw can penetrate the sheet metal in the first place.“ SD2S easily provides the required speeds of more than 20,000 rpm – as well as all other requirements: The servo amplifier provides a power supply of 3 x 400 V to 3 x 480 V especially for international applications and comes with NRTL certificate (C/US certificate for US and Canadian market). In spite of the high surge current capability, SD2S is a very compact device.



At present, Sieb & Meyer is working on a device series based on the new development platform SD4x that is future-proof in every way – Weber can envision switching to these devices.



SD2S by Sieb & Meyer easily provides the required speeds of more than 20,000 rpm – as well as all other requirements by Weber.

Sieb & Meyer made a few customized adaptations for Weber, though: SD2S allows docking and undocking the tightening tool from the robot hand, for example. „This means the motor can be disconnected from the controller,” said Christian Schönig. „After docking, the system is ready for operation within few seconds.” In addition, control of the digital inputs and outputs of SD2S via Ethercat was implemented. For this purpose, the standard interfaces provided by SD2S could be used. Additional output hardware was not necessary.

Real-time Control with Ethercat

Weber has been using the SD2S with integrated Ethercat slave fieldbus interface for several years. This model was launched in 2015 – and with good reason: „Ethercat is characterized by an outstanding performance enabling new control concepts that are technically not feasible with classic fieldbus systems or analog +/-10 V interfaces, which are still widely used,” explained Ralph Sawallisch, Key Account Manager Drive Electronics at Sieb &

Meyer. „Among the Ethernet based real-time fieldbus systems, the Ethercat protocol has rightly become a fixture in the field of automation engineering.” In order to enable easy implementation based on established communication and device profiles the CANopen profile CiA 402 was implemented. For the manufacturer, using the new model resulted in financial benefits. „On account of the Ethercat connection our wiring costs per tightening system are reduced by about 100 Euro,” said Christian Schönig.

„In addition, the signal transmission is interference-free without offset and noise.” Furthermore, Weber can transmit additional status values now and the depth of diagnostics in case of a drive problem is much improved.

A Cooperation at Eye Level

The continuous technical development runs like a thread through the cooperation of the two partners. At present, Sieb & Meyer is working on a device series based on the new development platform SD4x that is future-proof in

every way. The devices support new interfaces and offer a number of additional functions. Users benefit from optimized performance, higher speeds as well as lower motor heating without sine-wave filters. „The enhancements allow improving the production quality for existing applications and, beyond that, exploring completely new fields of application,” Ralph Sawallisch pointed out.

Christian Schönig can definitely envision switching to a device of the SD4x series in the future. „Our partner is again developing a solution that is technically superior to competitors. One interesting aspect for us is the fact that these devices will support additional bus control methods.” The head of development is not afraid of any ‚teething troubles‘ of the new servo amplifiers: „The Sieb & Meyer support has always been excellent, technical requests are answered within no time. The contact persons know our area of application well and we can communicate openly and at eye level. Since the product price is also right, Weber will continue to trust in the expertise of Sieb & Meyer– it’s going to be interesting, how many more development steps the long-time partners will go together.”

Author

Torsten Blankenburg, CTO

Servo Amplifier SD2S by Sieb & Meyer

The servo amplifiers of the series SD2S come with a flexible software that supports the operation of high-dynamic servo motors and high-speed motors with asynchronous and synchronous technology. Depending on the application, SD2S can operate without a sensor, for example, in case of spindles in machine tools. Naturally, SD2S can also operate with sensors, for example, in highly dynamic tightening spindles in the automotive industry. The efficient software package drivemaster2 supports the user during the application-specific parameter setting and initial operation.

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