

CONTROL CABINET MANUFACTURING 4.0: SEIZE THE DIGITAL POLE POSITION!

WAGO: From the First Design to the Finished Control Cabinet

08

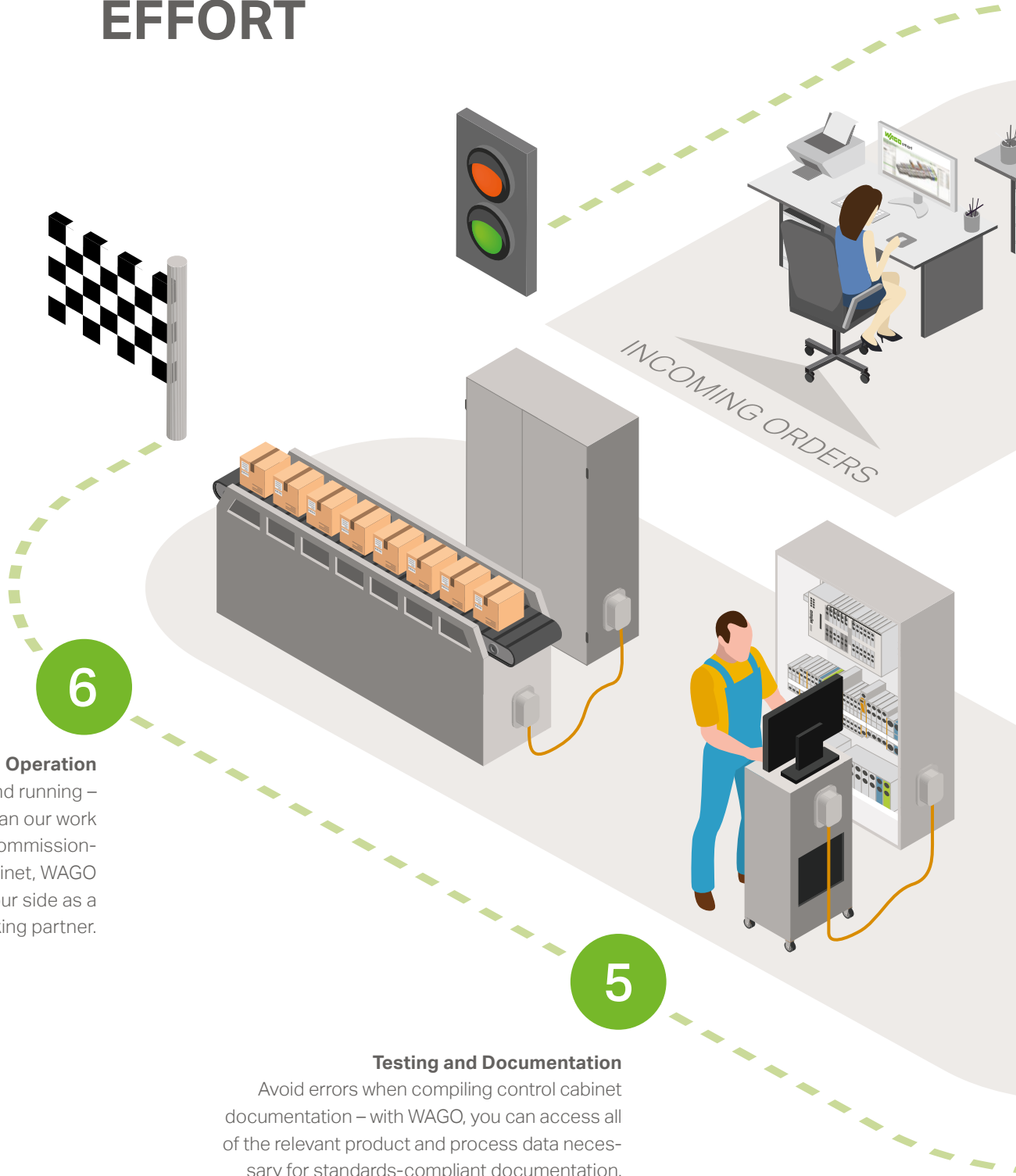
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REDUCE COSTS, SAVE TIME, MINIMIZE EFFORT



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Operation

Your system is up and running – but that doesn't mean our work is done! Even after commissioning your control cabinet, WAGO stays right by your side as a forward-looking partner.

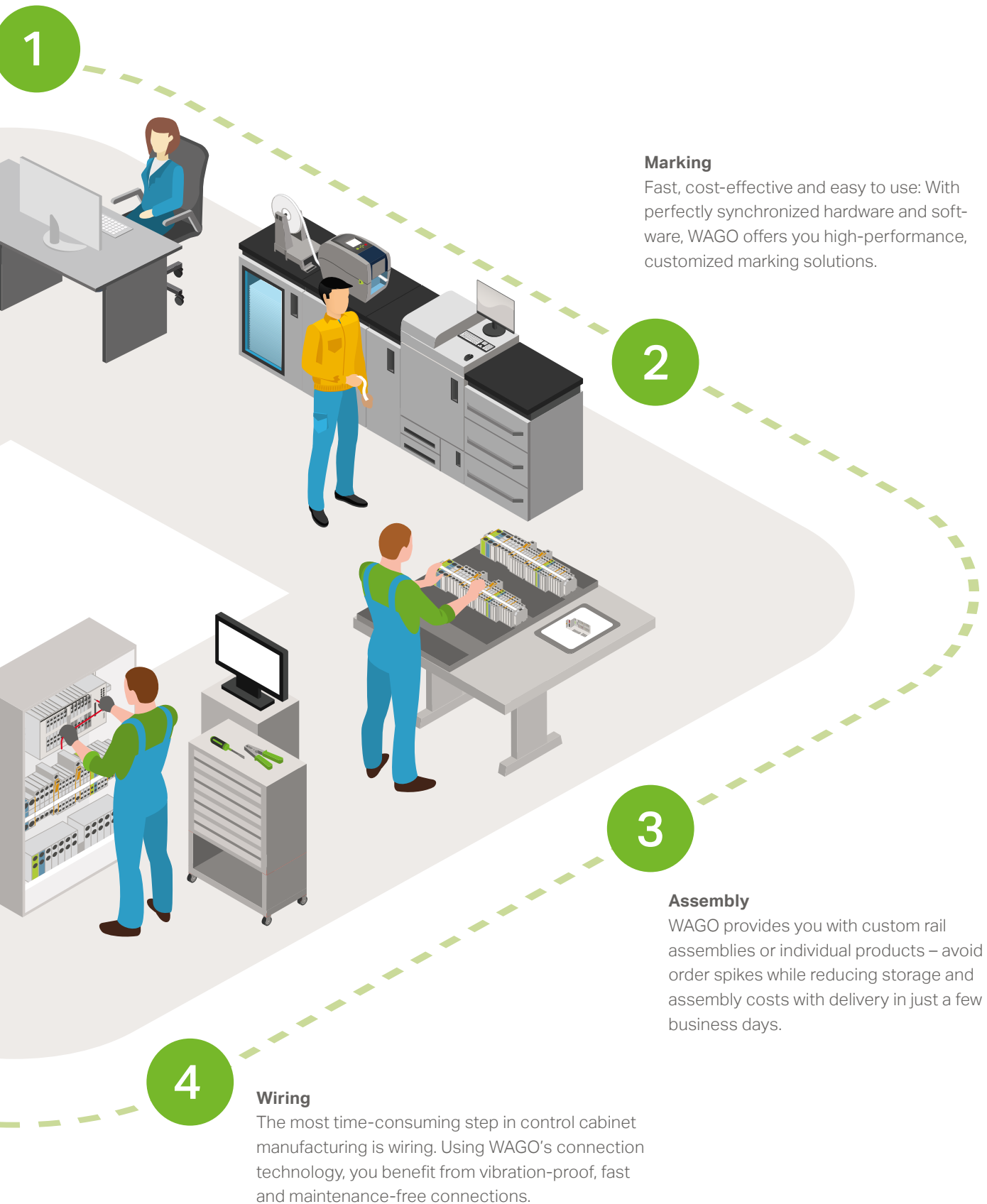
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Testing and Documentation

Avoid errors when compiling control cabinet documentation – with WAGO, you can access all of the relevant product and process data necessary for standards-compliant documentation.

Planning and Project Design

Save time and money: To make your planning as smooth as possible from start to finish, WAGO offers you complete data, software tools (WAGO Configuration Software Smart Designer and WAGO Marking Software Smart Script) and interfaces.



Marking

Fast, cost-effective and easy to use: With perfectly synchronized hardware and software, WAGO offers you high-performance, customized marking solutions.

Assembly

WAGO provides you with custom rail assemblies or individual products – avoid order spikes while reducing storage and assembly costs with delivery in just a few business days.

Wiring

The most time-consuming step in control cabinet manufacturing is wiring. Using WAGO's connection technology, you benefit from vibration-proof, fast and maintenance-free connections.



WAGO GETS YOU
TO YOUR GOAL FASTER:

WAGO offers control cabinet manufacturers comprehensive solutions that support them every step of the way – from planning and development, through engineering design, all the way to testing and commissioning.

EXPLOIT DIGITAL OPPORTUNITIES,
EXPAND YOUR DIGITAL EDGE

EDITORIAL

*EASIER.
FASTER.
MORE EFFICIENT.*

*Seize the Pole Position –
Control Cabinet
Manufacturing with Us!*

Get in gear by
getting to know
our solutions:
[www.wago.com/
control-cabinet](http://www.wago.com/control-cabinet)

Dear readers,

It may sound years away, but it's actually here now: Digitization is changing numerous processes in industry. Growing networks and the integration of systems both increase the necessity of digital positioning. And the optimization of structures and work processes is a challenge for control cabinet manufacturers as well. Both the complexity of the products and associated cost pressures are increasing. Skill shortages and customer expectations of shorter and shorter delivery times are making general operations all the more difficult. But why does the industry struggle so much to take advantage of the digital opportunities and put them to use – even though the tools necessary for an integrated planning, development and design process are mostly already available? And how much digitization does control cabinet manufacturing need in order to meet the challenges of the future?

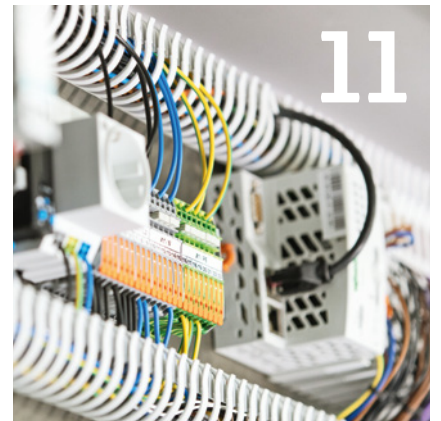
These are central questions of this special edition of WAGOdirect. Technical expertise and efficient manufacturing processes determine how competitive a control cabinet manufacturer is. WAGO offers innovative solutions – from advanced power supplies to the mainstay of all cabinets – the rail-mount terminal block. Advancements in service abound too, including an online project design tool and project support. All products and systems are perfectly synchronized and aligned to a consistent value creation process, generating real added value and supporting users from planning and configuration through production to testing and commissioning. This allows control cabinet manufacturers to consistently operate at their full potential while saving time and eliminating errors in the implementation of processes.

In this edition, you will learn more about the latest developments and industry trends in control cabinet manufacturing – and even if your orders are full right now, you won't miss out on the digital future. Switch to a digital mindset, and get an early start on making your company more efficient. With WAGO, you have a reliable partner at your side.



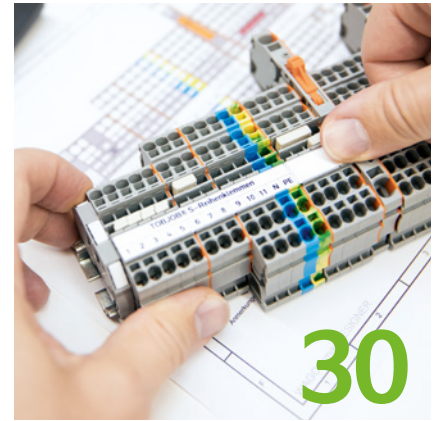
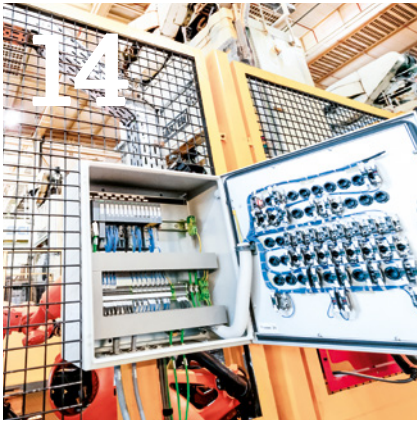
Nicole Kreie
Director of International
Project Service at WAGO

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Control Cabinet 4.0: Seize the Pole Position!

This is where the heart of a machine beats, and where electricity and data flow safely into the channels provided: The control cabinet is the electronic interface between devices, machines and equipment. And although communication can't function perfectly without analog wiring and installed pluggable connectors, control cabinet manufacturers that don't want to miss out must start the digitization of their development, design and production processes now. But how? WAGO has taken stock of the opportunities and risks.



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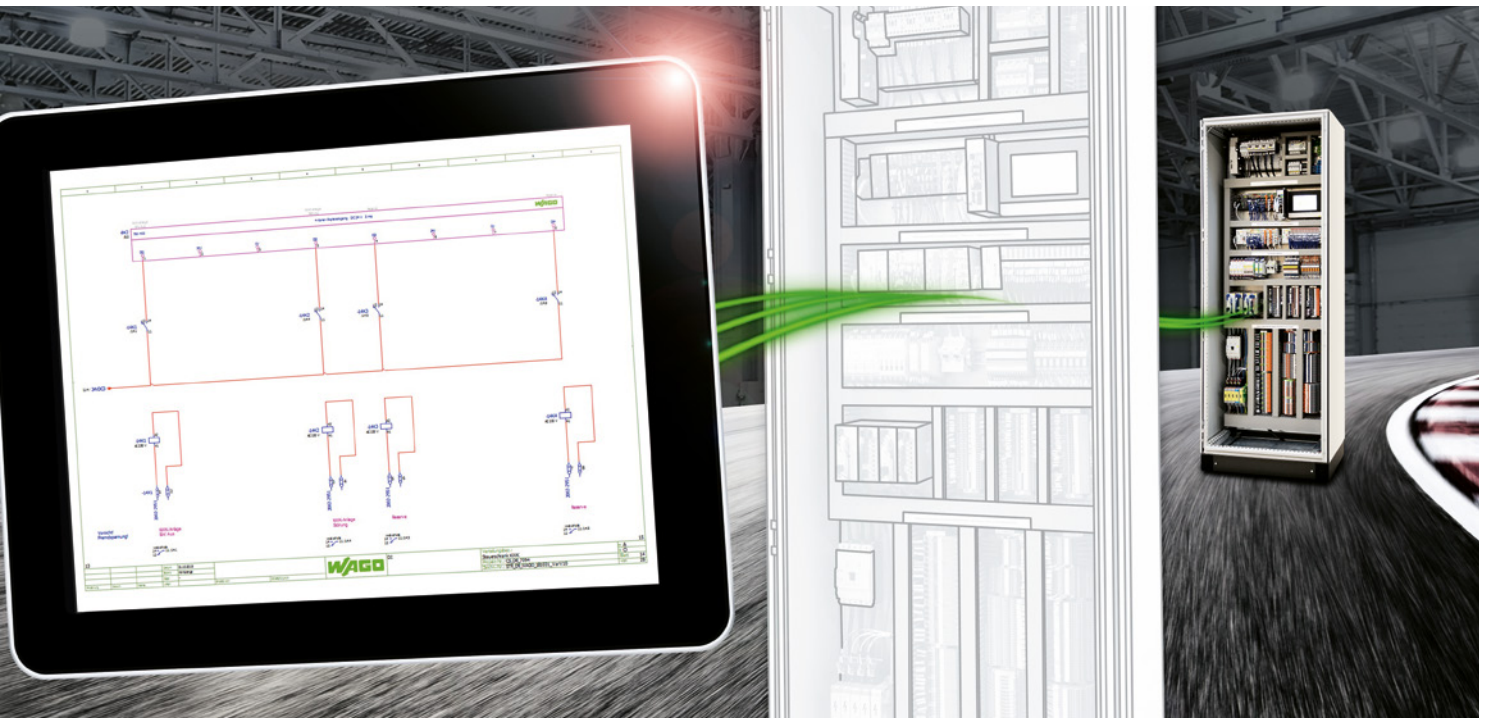
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FROM THE FIRST DESIGN TO THE **FINISHED** CONTROL CABINET

Ordering and production processes will be increasingly digitized and automated in the industries of the future. The goal: Consistency and data transparency along the entire value added chain in order to reduce costs and save time while preventing unnecessary added expense. To support this horizontal integration, WAGO offers engineering service solutions that support users from the planning and design stage, to production, all the way to testing and commissioning.

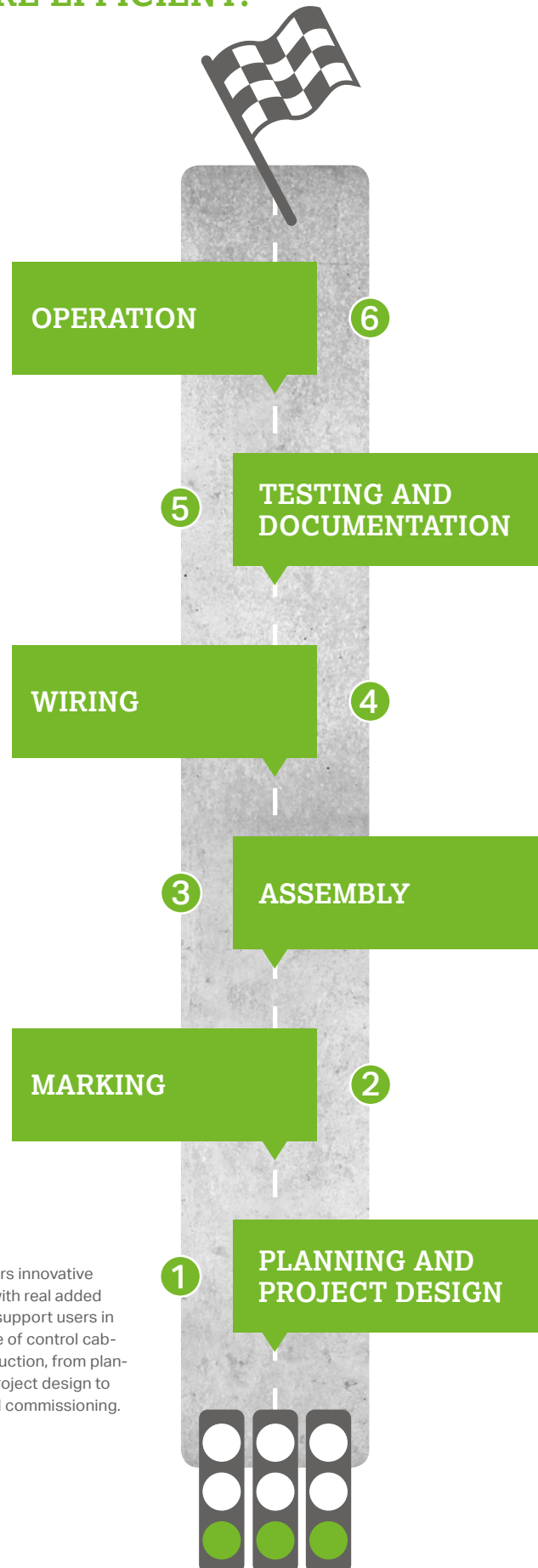
EASIER. FASTER. MORE EFFICIENT.

In the age of Industry 4.0, product complexity and customization, along with the need for specialists are increasing alongside cost pressures – so control cabinet manufacturers find that quality and price are priorities in conflict. Besides the expertise of its employees and the features of its products or services, a company's ability to compete ultimately is determined by the effectiveness and efficiency of its production processes. To support its customers on the path to greater efficiency, WAGO offers a multitude of data and services focused on custom products and solutions. This enables consistent data storage and prevents failures in different systems, which could lead to multiple iterations and significant added expense.

A Seamless Solution

It's important to start with this approach right from the electrical engineering planning and design stage: If the electrical designer needs to import data using different design tools in order to incorporate customer project data, such as circuit diagrams or component lists, WAGO can support this with the WAGO Engineering Software Smart Designer too. Smart Designer makes it easy to correctly structure rail-mount terminal blocks and all other electronic components. The online tool has interfaces to various CAE tools such as EPLAN and WSCAD, allowing easy incorporation of existing electrical engineering design statuses. Furthermore, as a Web application, the software can be accessed conveniently via Internet without integration into the company's own IT system. This approach saves both time and money and is especially advantageous when IT is outsourced to an external service provider that charges for new installations or software updates; any version control problems also disappear. Design statuses can be administered or reused by setting up an independent account. If electromechanical components or automation systems from WAGO are used, Smart Designer supports project designers by providing a direct link to WAGO's online catalog. Up-to-date product information is always available in the form of data sheets, product pictures and downloads of CAE and CAD data. Once the rail assembly has been configured, Smart Designer automatically checks it for errors. For instance, the software might indicate that an end and intermediate plate must be placed to prevent contact between live parts when rail-

WAGO offers innovative solutions with real added value that support users in each phase of control cabinet construction, from planning and project design to testing and commissioning.



mount terminal blocks are used. If controllers are planned, the start-up current is calculated, among other things, in order to determine a need-based power supply. Once the design is completed, both the desired products and the rail assembly can be ordered via the online shop. They are custom-manufactured for the client and shipped. After a logic check in Smart Designer, the data, once compiled, can be displayed completely in 3D and documented for further use or additional review. Parts lists, product pictures or marking data for components that will be incorporated into the control cabinet later can be generated and printed – for example, for the rail-mount terminal blocks.

Horizontal Integration

If intelligent components are planned for the DIN-rail, it is possible to easily transfer data from Smart Designer to the **e!COCKPIT** Engineering Software. For programming complete components, WAGO offers **e!COCKPIT**, an engineering tool that was developed to provide user-friendly and intuitive op-

Smart Designer makes it possible to read external data, configure terminal strips online, and automatically check, document and mark them.

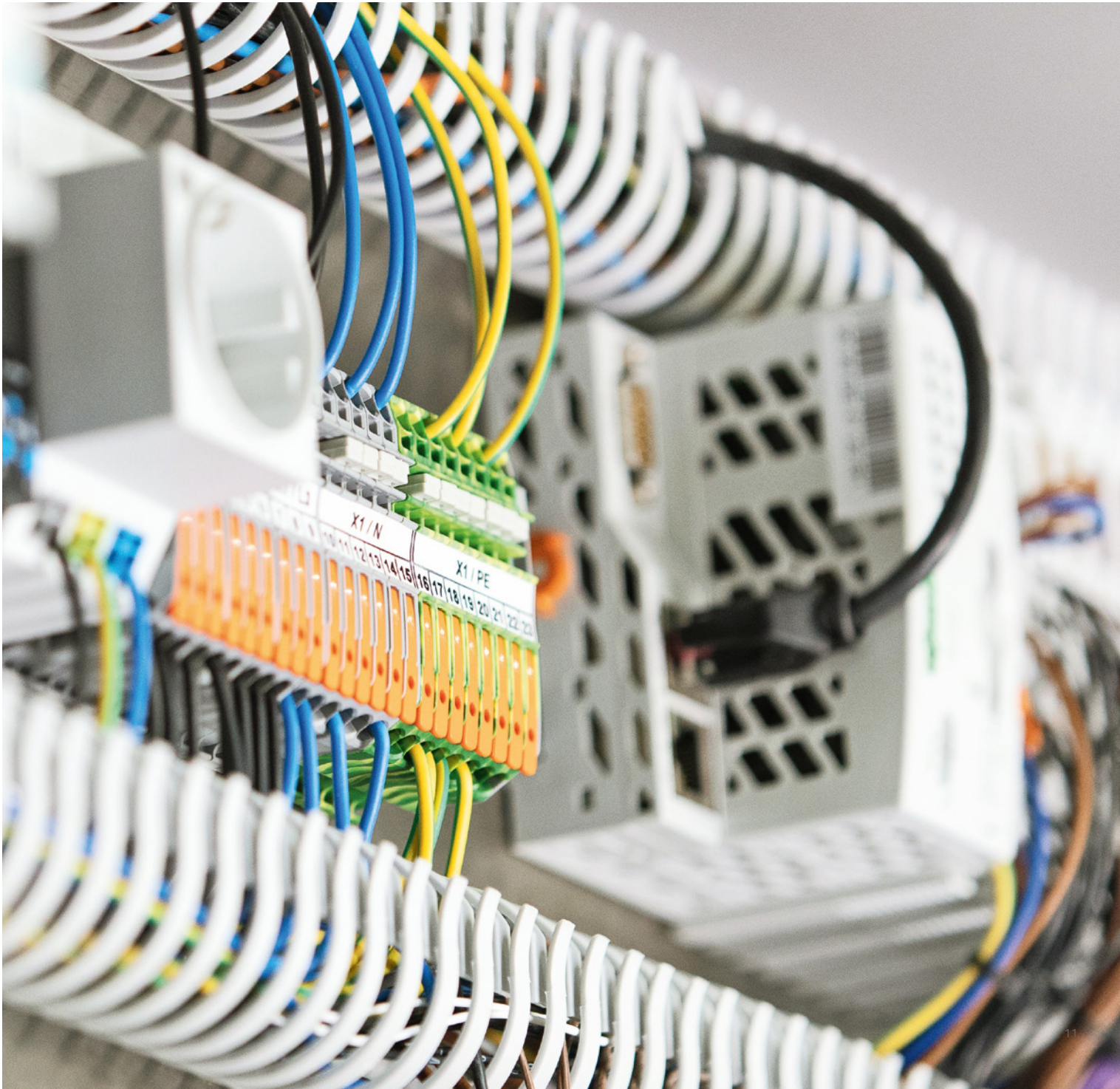
With Smart Data, WAGO Offers a Seamless Solution

eration. The tool supports all manufacturing steps, from hardware configuration and programming, to simulation and visualization, to commissioning of the control cabinet. In order to reduce **e!COCKPIT**'s learning curve, the user interface looks and feels like standard Office programs. To give users an overview of their projects as complexity increases, the user interface prominently features context-sensitive menus. This means that the only menu items and functions that appear are those that can be used in the current design or operation stage. Components can be placed in the main area of the user interface and connected to each other virtually using drag-and-drop. Because this preempts connection errors from the outset, it also prevents costly troubleshooting after installation. Since several controllers can be configured and programmed in **e!COCKPIT** simultaneously, it is also possible to simulate and run through different test scenarios for the planned system. As a powerful online design tool, Smart Designer provides the interface to electrical design, accelerates the entire design and ordering processes and additionally offers many ways to simplify documentation. The interface to the **e!COCKPIT** Engineering Tool guarantees consistent transmission of design data for further configuration and programming of the automation components.



COMBINING FARMING WITH **CUTTING-EDGE** RESEARCH

What does a bundle of asparagus have in common with a pineapple? At first glance: nothing. But HEPRO®, which develops peeling machines for long vegetables and fruits, sees the commonality.



Strawberries, asparagus, potatoes – there’s plenty of those in the rural town of Verlar near Salzkotten. But the little town has much more to offer than what you’d expect at first glance. SIPRO supplies intelligent controllers from Verlar for HEPRO® – equipped with intelligent WAGO automation technology and WAGO’s new TOPJOB® S Rail-Mount Terminal Blocks with levers.

Rural Character, Global Success: Jens Frommann (left) and Franz Mielemeier combine agriculture and cutting edge research with innovative peeling machines and intelligent control technology.



Intelligent Controllers for Asparagus Peeling Machines

Greenery as far as the eye can see – not much really happens in Verlar, a small town near Salzkotten in North Rhine-Westphalia.

But at SIPRO, big things are afoot. Here Franz Mielemeier, managing director of SIPRO, and his employees produce controllers for mechanical engineers. One of their customers is HEPRO®, a produce peeling technology specialist. “At SIPRO, we combine farming and cutting-edge research. We supply our asparagus controller all around the world: from Europe, to Peru, to China,” beams Mielemeier. The company also maintains good relationships with renowned research institutions to help optimize control systems. WAGO supplies the control technology. “As engineers, we obviously considered cobbling a controller together ourselves. But that costs time and money. WAGO makes our work easier,” says Mielemeier. But how exactly?

Lift the Lever, Insert the Supply Line

“I went into engineering, not telecommunications, so that I could use my hands and eyes instead of just sitting in front of a computer,” says Mielemeier about his career choice. In practice, two key concepts matter to SIPRO: simplicity and speed. That also applies to SIPRO service engineers, especially during system commissioning and maintenance. Björn Kexel, an e-workshop employee at SIPRO, has recently been using the new WAGO Rail-Mount Terminal Blocks TOPJOB® S with levers:

“Our service engineers can work significantly more quickly: Lift the lever, remove the supply line, and the electronics can be dismantled in a short time. In the end, what matters is customer satisfaction,” says Kexel in summary.

During asparagus season, every minute matters for peeling machines. The machines must be able to withstand continuous operation. In the event of a breakdown, WAGO’s new TOPJOB® S Rail-Mount Terminal Blocks with levers allow components to be replaced quickly – without any tools. This helps service technicians prevent more serious machine failures quickly and easily. And questions about where the screwdriver goes don’t even come up.

Mechanical Engineering Meets Fresh Vegetables

The history of HEPRO®, the peeling technology specialist from Rheda-Wiedenbrück in North Rhine-Westphalia, Germany, started with a unique question: "Why aren't there any asparagus peeling machines?"

"Our service engineers can work significantly more quickly: Lift the lever, remove the supply line, and the electronics can be dismantled in a short time. At the end, what matters is customer satisfaction."

BJÖRN KEXEL

SIPRO

Two farmers posed this very question to HEPRO®'s founders Siegfried Hennemeier and Christoph Protte. The two mechanical engineers immediately recognized an opportunity to apply their inventive talent. They now run a company with about 50 employees that confronts the daily challenge of supplying farmers with peeling machines for asparagus and other long vegetables. "We develop, manufacture and sell professional asparagus and vegetable peeling machines that meet the most demanding requirements," says Jens Frommann, managing director of HEPRO®. This development has made the company a global leader in the area of blade peeling technology for long vegetables. The WAGO controller has been used for over 10 years.

Pineapples Ready to Go in 25 Seconds

"We want to make the operator's job as easy as possible. The innovative WAGO controller helps us do that," says Frommann. The latest innovation is a pineapple peeling machine that includes WAGO components. The ability to innovate is important to HEPRO®:

"We have great in-house developers who help our products get even better," adds Frommann. For the pineapple peeling machine, convenience was the key issue, because people's time is increasingly more limited, and they want things to be as easy as possible – even at dinnertime. "Consumers no longer want to peel things. Now, within 25 seconds, the pineapple is ready to eat," says Frommann, speaking from experience.

As a "hidden champion," HEPRO® has the goal of continuous further development. "Even after vacation, people are excited to come back to work here," says Frommann. And what's next after pineapples? Frommann definitely already has an answer to this question – we're excited to see what the next development from Rheda-Wiedenbrück will be.

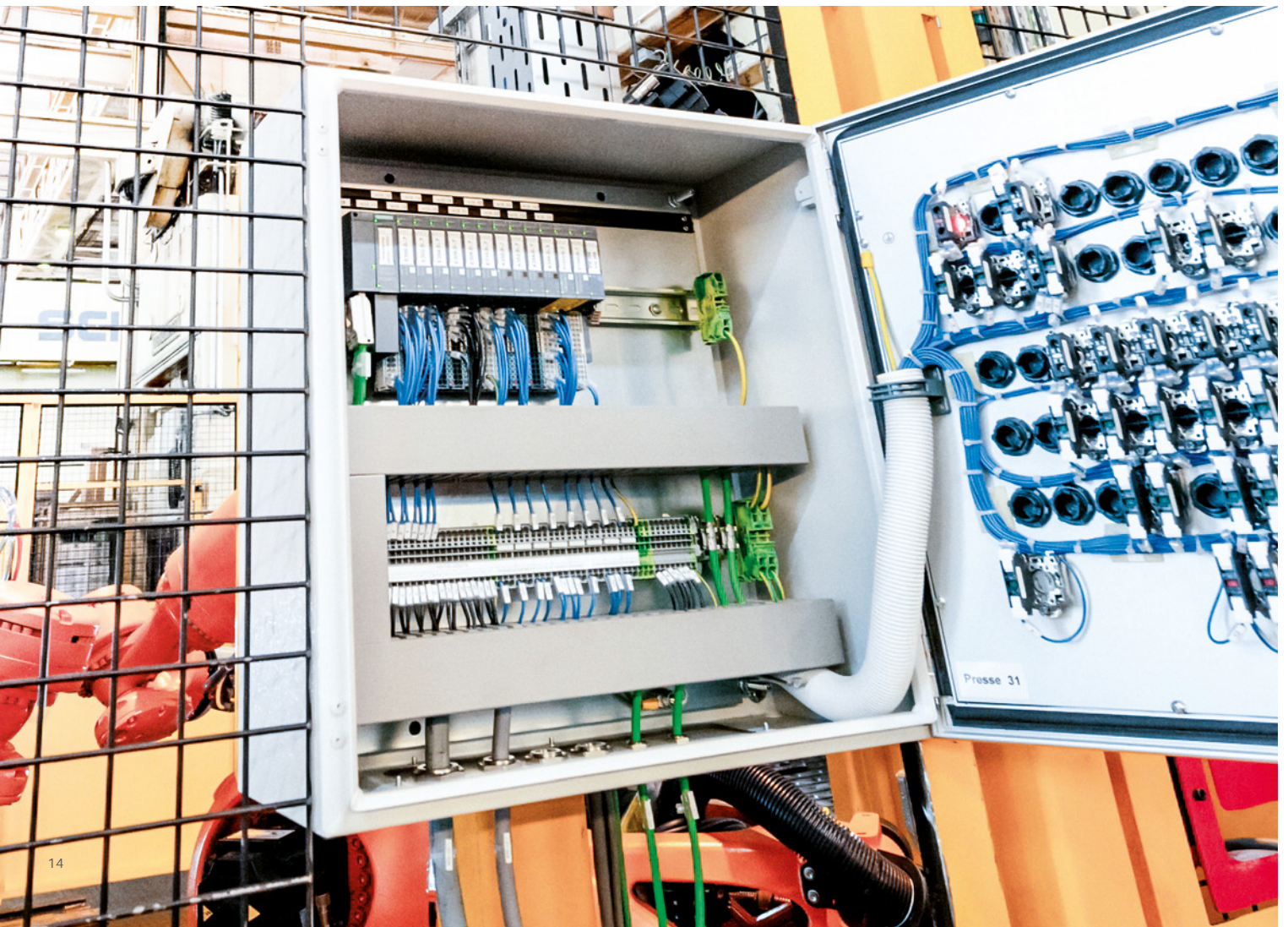


**PEELED IN SECONDS –
THANKS TO AUTOMATED
PEELING TECHNOLOGY**



Control Cabinet
Manufacturing
at Ford Using
WAGO Terminal
Blocks

IT'S ALL IN THE DETAIL





The Ford plant in Cologne has lots of big equipment, but sometimes it's the little details that matter. Around 18,600 employees work for Ford in Cologne, where they produce one of their most successful compact car models: Up to 1,400 Ford Fiestas roll off the assembly line daily – and have since 1976! The large punching machines and presses used to produce the chassis components have a lifespan of several decades. However, many of the components and systems involved in the press line don't last anywhere near that long. For example, during conversion and retrofitting – typically performed during factory-wide vacations – new assemblies are installed, the safety technology is expanded and the electronics are updated. During the process, the control cabinets (including the control and automation technology), as well as the energy distribution, are updated and further optimized.

Henry Ford was, without a doubt, one of the most important pioneers in automobile production and left his mark on the industry like no one else, through the introduction of assembly line production. The aspiration to always improve processes remains in the company's DNA up to this day. During a recent factory-wide vacation, the press line at the production facility in Cologne, where chassis parts for the Ford Fiesta are fabricated, was rebuilt and optimized. And a seemingly small element played a major role in this process: a rail-mount terminal block from WAGO.

A Service Provider within the Company

Equipment is also produced internally on the premises of the Ford plant. In this department, about 180 employees perform conversion and retrofitting projects for various equipment in the production plant. The main focus is on control cabinet manufacturing. This department normally covers the entire spectrum: from electrical planning and design, to the mechanical structure and wiring, to programming and commissioning.

The orders for in-house equipment production come primarily from the two German Ford plants in Cologne and Saarlouis. But the other European plants have also already implemented projects stand up to external competition.

The press lines in the Ford plant are being brought up to the state of the article with reworked electronics.

Project-Related Conversion to Standardized Terminal Block Technology

The various internal customers within the Ford Group sometimes set very different requirements for their projects. This also applies to components for use in control cabinets, for example. As a result, in the past, different terminal blocks from different suppliers were often used in the control cabinets. Two years ago, during the conversion of a press line in the Cologne plant, the idea arose for the first time to standardize terminal blocks by switching to WAGO Rail-Mount Terminal Blocks exclusively for the conversion of the press line. Agreeing on a uniform project-related system leads to enormous advantages for logistics, purchasing and spare parts procurement.

For the people involved at Ford, the choice for WAGO's rail-mount terminal blocks was based on financial and – above all – technical considerations. The project-specific concentration on one terminal block system reduces warehouse volumes and provides predictability for all employees involved in the planning and production process. WAGO's innovative push-in CAGE CLAMP® Connection Technology offers the end customers superior contact quality, even – and especially – under extreme conditions. One of the greatest technical advantages of WAGO's rail-mount terminal blocks is the push-in connection technology. Not only do they make the wiring quicker than the old terminal blocks using screw technology – the fact that the terminal blocks are maintenance-free is also a great advantage: Screw connections need to be retightened at regular intervals. With WAGO Terminal Blocks, this work is unnecessary. And its absence saves significant time for maintenance. Furthermore, faults occur less often. The large presses experience very significant vibrations.



Support plays a big role – Daniel Kocks, Automotive Key Account Manager at WAGO, Patrick Kaiser, Engineer Construction Services and Christos Abatzis, electrical foreman at the Ford equipment building plant (from left to right).

The Right Terminal Block for Every Application

The control cabinets built by the in-house equipment production department mostly use TOPJOB® S Rail-Mount Terminal Blocks. They are used to connect a wide variety of signals from sensors and actuators. Ford limits itself to three or four series of rail-mount terminals blocks. That works very well, especially since the terminal blocks accommodate a very wide range of possible conductor sizes. The power distribution with large conductor sizes is connected via WAGO's high-current rail-mount terminal blocks equipped with POWER CAGE CLAMP. The experts at Ford use WAGO's terminal blocks for other requirements as well. Recording power consumption has become an important part of many projects. For this purpose, Ford uses current converters and WAGO 3-Phase Power Measurement Modules, as well as function modules from WAGO's 750 Series automation portfolio.

During the recent factory-wide vacation, another press line was also converted – based on past success, the control cabinet was again equipped with WAGO Rail-Mount Terminal Blocks. Using the standardized rail-mount terminals blocks for press line conversion projects has since become routine. However, during conversion, it was important for the in-house equipment production unit that WAGO support was always reachable to help guide Ford's team through a broad product portfolio. The tight integration between the Ford Key Account at WAGO, WAGO's local sales and industrial system advisors enabled short response times.



This creates a risk of screw connections coming loose. Therefore, two years ago the maintenance department also advocated for switching over to WAGO Rail-Mount Terminal Blocks, which at that time were already listed as the plant standard, in the conversion of the press line.

Easy Wiring and Clear Marking

Not only does the push-in connection technology of WAGO's TOPJOB® S Rail-Mount Terminal Blocks make them maintenance-free and user-friendly, the electrical department staff was also able to trim wiring time by nearly 25%. Conductors with crimped ferrules are easy to insert – that makes wiring very quick and easy compared to screw-type terminal blocks. The marking method also saves time: Standardized marking strips exist for all terminal block sizes, which the Ford employees can print quickly and easily with one of the two printers that were purchased for this purpose. WAGO's thermal transfer Smart Printers are controlled online, allowing created markings to be stored and reused in later projects. The marking strips offer plenty of space for clear labeling of connection points. This too saves wiring time, since employees can find the right connection point more quickly. And the clear marking makes maintenance much easier too whenever faults need to be eliminated. Besides the rail-mount terminal blocks, the Smart Printer can also be used to mark conductors with marking sleeves or thread-on wire markers, making it an incredibly versatile solution.



Straight to the Cloud? Absolutely!

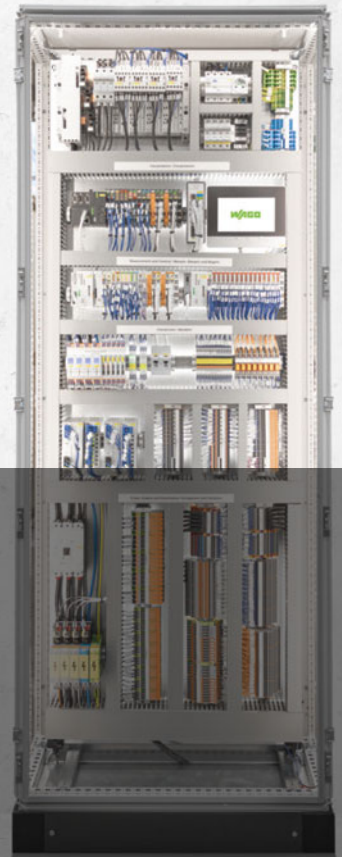
Do you want to use your machines, systems and building data for monitoring and analysis in the cloud? Take advantage of WAGO's powerful Touch Control Panels for an easy and secure connection. With flexible programming in IEC 61131 or directly on the Linux® open source operating system, you're perfectly equipped for your digital future.

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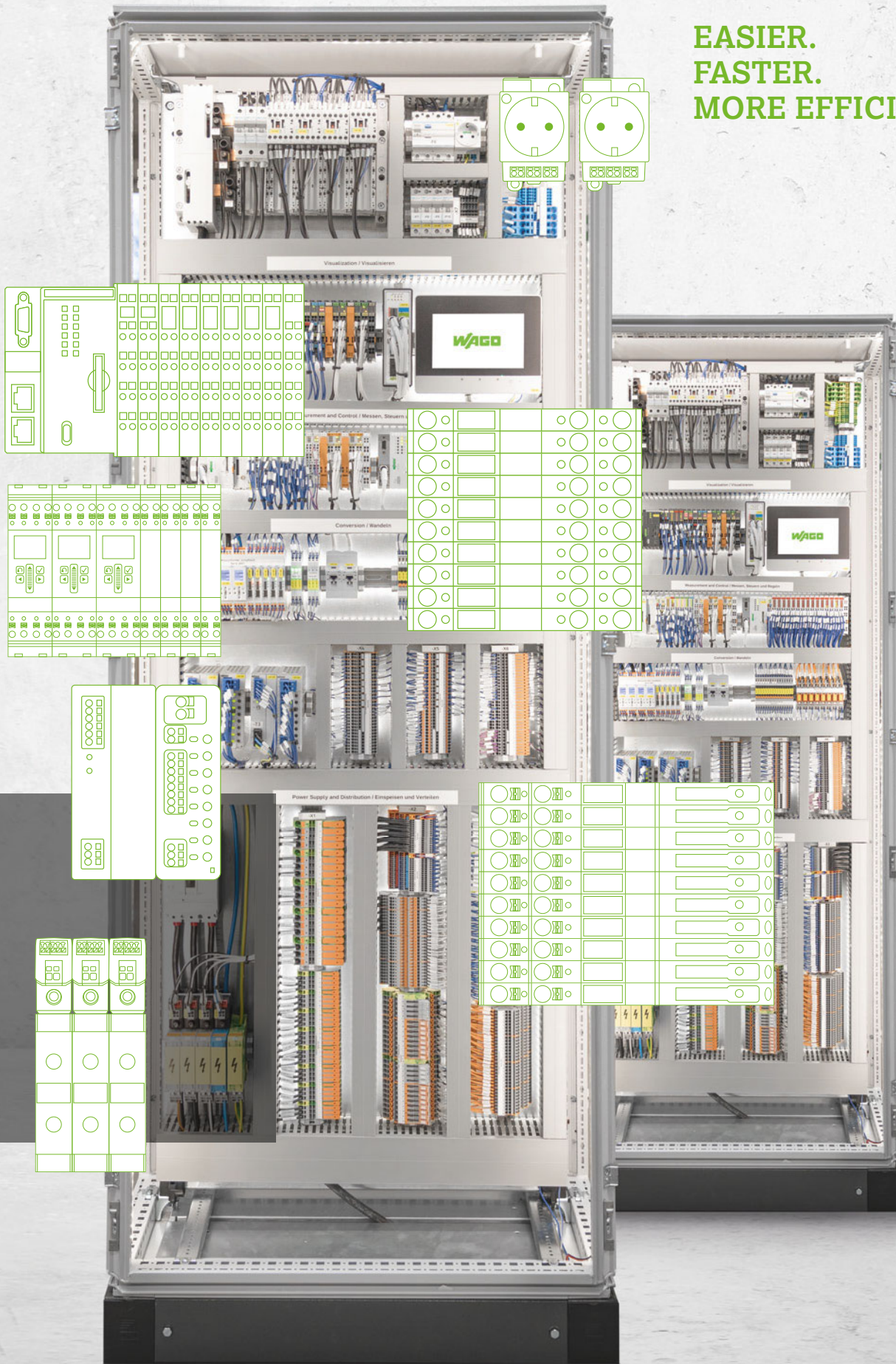
CONTROL CABINET MANUFACTURING 4.0



Seize the Digital Pole Position!

The heart of a machine, from which power and data flow securely into the channels provided for them: The control cabinet contains the electronic interface between different devices, machines and entire systems. Kilometers of cabling and countless installed pluggable connections ensure smooth communication – in traditional analog fashion. However, development, design and production of control cabinets are facing a digital future – making it necessary to take stock of opportunities and risks.

**EASIER.
FASTER.
MORE EFFICIENT.**

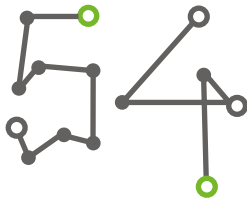




The Reality: Still Analog

The requirements of control cabinet manufacturing change in the course of digitization: Complex installation cycles must be simplified and time investments reduced. That guarantees competitiveness in a hotly contested global market. The central concept of Industry 4.0 promises transformation-capable value creation systems that economize the production of customized products, even for lot size one.

However, the reality in German companies is still largely analog. Even today, essential work steps are performed, not automatically, but by hand – paper reigns supreme in the planning and production of control cabinets.



hours: the *average wiring time* with a procedure based on circuit diagrams – 49% of the total production time.

A study by the Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW) at the University of Stuttgart examined the control cabinet manufacturing of the future. Some 92% of the study participants admitted to relying on 2D engineering. The study is from 2017.

Are Germany's control cabinet manufacturers missing out on the digital transformation – a transformation in which continuous information chains and intelligent, autonomous machines are already offering many options for making processes more efficient and economical?

With 500 wires per control cabinet on average, more than **16 hours** are spent just on **reading the documents**.



320

– the number of **pages** in the average **circuit diagram**

54%

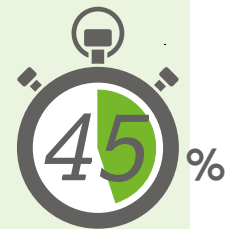
less time required

for electrical PCB assembly if digital control cabinet models are used for the pre-assembly of the terminals blocks.

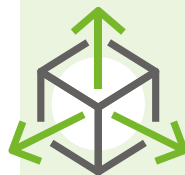
HOT SPOTS

Control Cabinet Manufacturing in Figures

Source: 2017 study "Schaltschrankbau 4.0" (Control Cabinet Manufacturing 4.0) Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW), University of Stuttgart

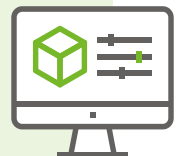


of the time is saved by companies who are *switching to function-oriented, modular circuit diagrams* in their engineering process.



35%

Up to **35%** of the **engineering time** and up to **22%** of the **production time** can be saved if three-dimensional design plans are generated in the engineering phase.



55%

of the production time can be saved in mechanical processing **when digital design drawings are used**, for example, for processing the mounting plate and the cabinet walls of the control cabinet.

THE DIGITAL TRANSFORMATION NEEDS A STRATEGY

What are the first steps that need to be taken in this direction? Where does the potential for optimization lie? What do the corporate processes look like at the moment? We discussed the opportunities and risks, challenges and visions for the future with Dr. Arno Kühn, director of the Product and Production Management department at the Fraunhofer Institute for Mechatronic Systems Design IEM in Paderborn, Germany.

Legacy processes and structures, demographic changes and the digital transformation are challenges related to Industry 4.0. In particular, what are the future challenges facing medium-sized control cabinet manufacturers?

» The challenges are multi-layered. A crucial one is customer-specific production – the key concept is “lot size one.” Customers want their control cabinet produced as quickly as possible. For the production department, that requires a high degree of flexibility in the face of ever-shortening throughput times. And more intense foreign competition, in Eastern Europe for example, isn’t making things any easier. Many companies are becoming more and more tempted by the notion of shifting larger portions of their control cabinet production there. Last but not least, the growing skills shortage is a challenge: Keeping pace with large companies and hiring competent people is even harder for small and medium-sized control cabinet manufacturers.

But it doesn’t sound like these challenges have just appeared out of nowhere ...

» No, in the control cabinet manufacturing industry – as in many other industrial sectors – none of this is new. However, the necessity of significantly increased efficiency has become clear. Most companies have long maintained their competitiveness by improving their value creation processes. At this time, we still have a great deal of very competitive control cabinet manufacturers

in Germany. But that doesn’t mean that the industry can rest on its laurels. The digital transformation presents control cabinet manufacturers with many opportunities, but also many challenges. Addressing these is unavoidable.

One crucial competitive factor concerns digital engineering. Why do many control cabinet manufacturers still rely on paper-based assembly plans when the control cabinet production process is digital anyway?

» Digitization offers enormous efficiency potential for the entire value creation process: I have access to digital information about the control cabinet that I can use to make downstream processes more efficient. When I consider the race to exploit potential efficiency, I see both digitization of the processes and its associated automation as a tremendous competitive edge. Therefore, investing in their own digitization potential is a fundamental next step for companies. Nonetheless, many companies hesitate and fall back on conventional tools. That often has to do with the fact that a typical control cabinet manufacturer is a medium-sized company, caught up in everyday concerns, which seldom leave much time for strategizing.

In your opinion, why is not enough emphasis placed on process work?

» It’s like any strategic question companies face: How much time should I invest for strategic considerations, which, yield no direct economic benefit after all? However, scrutinizing and optimizing my processes is essential in order to remain competitive in the future. The competition, which is more automated, cost-effective and powerful, is great. Another central element of digitization is the question of what I really want to digitize in order to make processes efficient and transparent. However, it’s also clear that employees often lack



Dr. Arno Kühn studied mechanical engineering with a focus on product development at the University of Paderborn. He now heads the Product and Production Management department at the Fraunhofer Institute for Mechatronic Systems Design IEM. In the "it's OWL" excellence cluster, he is responsible for strategy/R&D. Arno Kühn is also the director of "Digital in NRW – Kompetenz für den Mittelstand" ("Digital in North Rhine-Westphalia – Expertise for Medium-Sized Companies") for the Ostwestfalen-Lippe region.

the qualifications necessary to conceive and design leaner processes.

Who in a company do you see as the driver of a digital transformation?

- » It's crucial that the senior management are one hundred percent committed to the issue. The path to digitization is not free. It's an investment in the future, which involves more than just buying a tool or machine. It's an investment in staffing and in cooperation with third parties. However, I also think that everyone in the control cabinet manufacturing ecosystem has an interest in making processes as efficient as possible. Control cabinet manufacturers can strengthen their role – from the machine and equipment manufacturer, to the component supplier, all the way to the engineer and tool supplier.

How can production be networked and the data that can be extracted from it be exploited in order to optimize, not just one production step, but an entire value creation chain?

- » If I want maximize the automation of production, I need to provide this information early on. I can do that by collecting all the data centrally in a digital model as early as possible so it can be used further in all downstream automated production processes. That's what we mean when we speak of a three-dimensional layout. The information I produce consistently at this point is the key to the digital factory. Ultimately, this is nothing other than the creation of a digital twin of the control cabinet that can be used later for the entire production process, and also for further operation.

Design and production are two different segments of the value creation chain – but the end goal is the same. How can the two "languages" be better linked to each other?

- » In this connection, I like to mention the concept of "production-oriented design": Subsequent production should already be considered during the control cabinet construction design. That only works if skilled people from

production can route their knowledge and experience back to the design phase. Production workers are often very experienced and have spent years reading circuit diagrams and optimizing the control cabinets as well. This feedback must flow back to the project design phase efficiently. That's one way experienced workers could be involved directly in the design phase.

This type of interdisciplinary cooperation sounds very efficient in theory. What does the reality look like?

- » It has been the case in the past, and remains so today, that the design data are partially provided by the customer, reworked a little around the edges and then passed to production. Where automation and efficiency of production need to be increased, the control cabinet plan must be thought through in detail. Continuous coordination between the different departments is essential for this. Sooner or later, much more than the actual production know-how will be built up and entrenched in the design phase. In contrast, production will focus more and more on the handling of machines and production systems.

How long will the transformation process take? Where are we at now?

- » We speak of a digital transformation process, and most companies are taking their first steps in this right now. However, many control cabinet manufacturers are already experienced with similar transformation processes, such as introducing cable assemblers or drilling machines, which many control cabinet manufacturers did over 10 years ago. The process that took place there is not different from what now needs to be gradually built up in other areas. Today there are already companies exploiting their digital potential to a

great degree, but there are also those that still handle production as they did 15 years ago – transforming will be difficult for the latter.

To what degree could the digital transformation influence production methods also – the key concepts being “continuous production versus batch production” and “modular control cabinets with a project- or task-oriented structure versus a function-oriented structure?”

» The main question here is, “What kind of control cabinet manufacturer we’re talking about?” What is its order situation? Does it produce in small quantities or large series? How can component suppliers adapt? Due to the higher degree of automation, the tendency here is towards continuous production. The function-oriented modular construction of control cabinets contains enormous potential for efficiency. Large quantities of pre-assembled modules can be installed and produced accordingly. The central challenge here again is that pre-assembled, modular construction has to start in the early design phase. Since modularization can also impact the design, it should be performed in close coordination between mechanical/systems engineering and control cabinet construction.

What does this development mean for the current skills shortage?

» It shifts the need for expertise to the upstream processes. The demands of project planning and design are increasing, since a significant portion of the tasks must be handled there. Much more forethought and planning are necessary for projects than before – so more jobs will be created in these areas. The employees in these areas are highly qualified and not so easy to recruit. On the other hand, unskilled production employees can be supported with digital assistant systems so that they can be deployed more flexibly.

Is the level of training in Germany sufficient for the digital transformation?

» We have enough training institutions in any case – there’s no shortage of options in Germany. The question is just whether the qualification process is headed in the right direction. Educational institutions must also ask themselves what effects digitization will have on the content of their curricula and what qualifications employees will

need in the future. Interdisciplinary cooperation between various areas is essential for in training and qualifying skilled employees. Furthermore, a “lifelong learning” approach is gaining enormous significance, so employees can keep learning while on the job.

And finally, a question that focuses more on the practical than the theoretical: What’s your opinion of the variety of engineering tools available on the market?

» I consider the myriad of tools a good thing for the moment, especially since it’s definitely not as large as in other domains. The nice thing about the industry is that there’s no single solution that is the sole focus, such as Google is for search engines. Variety is an extremely important factor and value. Competition among tool vendors leads to continuously improving tools. Many things we speak of now in control cabinet manufacturing would never even have been possible without this variety. ■





KEYED INTO THE FUTURE

At Betron, All Departments Are Confronting the Digital Future Together

Machines and systems today must continuously increase productivity and efficiency, and the requirements and demands are increasing – a development that's being accelerated further in many industrial and commercial sectors by digitization. Betron Control Systems, an expert in “mobile and stationary automation” technology and OEM production for over 30 years, is facing the challenges of the future – and blazing new trails together with WAGO.

“We are service providers and bring innovation to the customer. Our aspiration is to always stay one step ahead of the competition – so we digitizing our processes more and more, which fits with our corporate philosophy,” explains Betron managing director Heinz-Hermann Welscher. For many years, this medium-sized company from Enger in North Rhine-Westphalia has stood out as a test bed for WAGO by always being willing to be the first to try out new products. For instance, in 2013 Betron was an early adopter of WAGO's Smart Designer configuration software, which is used designing the terminal strips for its system controllers and preparing production documents. Back then, only a local version of the tool was available, and files could only be exchanged in XML format. “Since 2015, we've used the online version, logging onto the WAGO network and using it to draw and request the terminal strips,” explains Betron designer Andrej Robert.

Save Time, Work More Efficiently

As part of blanket orders in many projects, the processes begin with the clients; the planned circuit diagram is then provided to Betron. “We review the data, process it and ‘refine’ it so it can be processed further and passed on to partner,” says Robert. From the user's point of view, it's very convenient to generate terminal strips online via Smart Designer, be able to access the database at any time and forward the request to WAGO directly from the tool. “We eliminate the intermediate stage through Purchasing and save at least one step in the process – without having to put anything together. That makes it possible to request multiple variants quickly without having to think through all the details beforehand,” explains director Welscher. This undoubtedly requires extra effort from WAGO as the recipient, since so many requests come in blind. From a costs perspective, it is an advantage for Betron that configured terminal strips can be ordered without needing to house stock in their own warehouse and configure them individually. Another pragmatic way that Smart Designer makes the process easier: Betron doesn't need its own CAD tool for developing terminal strips. Designer Robert also

considers WAGO's thermal transfer Smart Printer practical and quick for marking the terminal strips, which the printer imports precisely from the design plan data: “One positive side effect is that there's an interface between the marking system and the



Smart Designer.” The capacity of the three WAGO printers in Production is currently being exploited well – especially since they can also be used as the interface for other CAE programs.

Left: Digital workplaces are being set up piece by piece in Betron's production.

Top: The interface between WAGO's printers and Smart Designer simplifies the marking of terminal strips.

Different Requirements, New Work Environments

The use of a digital design tool like Smart Designer changes the workplace for the workers too, says Betron Supply Chain Manager Jörg Hennig: "We've set up a 'model station' in Production, where paper is hardly used anymore, and production documents can be opened on the monitor instead." This station allows employees to react to changes significantly more quickly. "We store data here to countercheck the status of the design or uncover sources of error, for example," continues Hennig. Demolishing structures, creating new ones and bringing all the employees along – this is the only way to accomplish a successful digital transformation. This is made easier by the fact that the employees are open to the transformation process – "The production department is actually calling for a digital workplace," emphasizes Hennig. They see the ability to read design drawings off the monitor as a great advantage: "Based on the order number, Production has data clearly associated with orders that can be linked to the corresponding production documents and workstations."

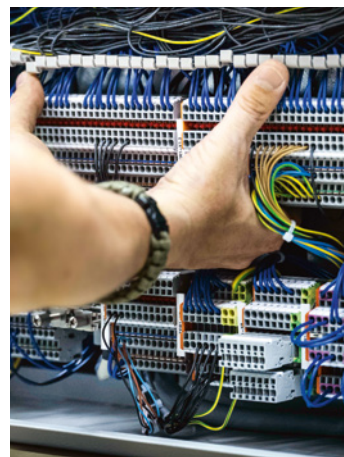
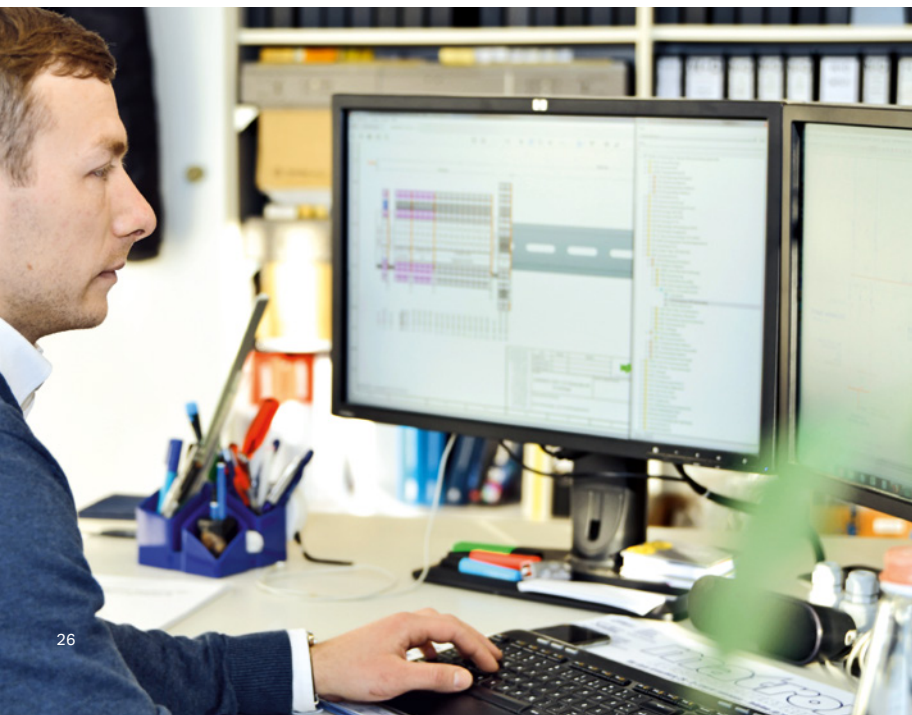
Furthermore, it's possible to track every switchover of an article promptly and transparently. The setup of three additional digital workstations is planned accordingly.

As far as operations allow, the company always attempts to extract benefit from digitization – so the plan is to digitize task management too with a tool

used specifically for this purpose. Production can then use this as an instrument to feed its requests for revisions back to the design phase. Furthermore, involving the workers is part of the procedure in any case, emphasizes managing director Welscher. "There are weekly project meetings where worker feedback is obtained – we take advantage of the value of experience when considering practicability, among other things."

Furthermore, the firm's in-house digital strategy influences the workers' job profiles. On a day-to-day basis, there's an increasing focus on being able to comprehend how production processes proceed, and less on how the product functions in detail says Welscher. "The emphasis is no longer on understanding entire circuit diagrams, but rather on understanding production documents." This allows production at Betron to rely on technically savvy recruits from different fields with an affinity for electronics, such as from the automotive industry or the trades. "We train new employees accordingly, allowing us to face the growing skills shortage."

With Smart Designer, designer Andrej Robert (left) prepares the circuit diagram data and passes it on to the production department for additional processing.





Andrej Robert, Heinz-Hermann Welscher and Jörg Henning (from left to right) are advancing the digitization of Betron Control Systems.

Collecting Data, Exploiting Opportunities

And what possibilities does collecting data offer for production and processes at Betron? “We’re more a series producer, so it makes sense in any case to collect as much data as possible in the early design stage. This yields an advantage in connection with traceability, for example: How have the terminal strips changed? What were we building two years ago?” emphasizes designer Robert. However, the demand for a digital twin for products is currently limited: Betron’s customer spectrum is broadly based, so the individual production processes also differ accordingly. The degree to which digitized processes are used is not only customer-specific, but also industry-specific. “For individual control cabinet components such as the terminal strip, we use 3D views. Otherwise we currently make less use of that in control cabinet manufacturing,” explains Robert. In contrast, 3D technology has already advanced further for electronic products such as control units for agricultural and construction machines, where it’s also in demand. “But it’s all a question of time,” says managing director Welscher

“The focus is no longer on understanding entire circuit diagrams, but rather on understanding production documents.”

with an eye to the future: “The control cabinet manufacturing industry is still more conservative. However, that too will change in the next two or three years – and we’re ready.” ■

THE MOST INTUITIVE WAY TO WIRE

Our customers show what WAGO's innovative and new rail-mount terminal blocks with levers can do.

For WAGO's TOPJOB® S Rail-Mount Terminal Blocks with levers, the clamping point can be opened and closed by hand via lever. The lever remains open, clearly marking the clamping point and freeing hands to connect difficult-to-bend conductors with large cross sections. The external connection is equipped with a lever, while a push-button or operating slot is available for internal wiring. Especially when making connections in the field, the user benefits from the ease of use offered by this intuitive design – no tools needed. Customers have already put TOPJOB® S Rail-Mount Terminal Blocks to the test – their experience? Thoroughly positive ...



EFFICIENT PEELING

“Operators and service technicians have an easier job: Lift the lever, remove the supply line and the electronics can be dismantled in a short time.”

Every minute counts for peeling machines. The mechanical engineering company HEPRO® must be sure that the machines can withstand continuous operation during the asparagus season. SIPRO, which manufactures the controller, installs the new WAGO Rail-Mount Terminal Blocks TOPJOB® S with levers. This allows defective components to be replaced quickly – no tools needed.



REIMAGINING COMPRESSED AIR

“Rail-mount terminals blocks with levers allow intuitive operation without tools. That makes it easy for our customers.”

AltAirtative relies on WAGO's new TOPJOB® S Rail-Mount Terminal Blocks with levers. They fit perfectly with the control cabinets of the compressed air cogeneration plants, since especially at the interface to the customer, the connection must be simple and self-explanatory.



SIMPLIFYING INNOVATIONS

“The intuitive operation of TOPJOB® S Rail-Mount Terminal Blocks with levers minimizes errors on the construction site.”

Speed is often essential at construction sites, especially as the volume of orders steadily increases. Above all, what impresses SPIE Buchman about the TOPJOB® S Rail-Mount Terminal Blocks with levers is the fact that correct conductor connection can be performed intuitively and requires no tools.



CLEVER SOLUTIONS

“Tool-free connection and re-connection is great. Technicians no longer need to apply force to tighten screws.”

Hörburger has been active in building and system automation from the very beginning. Whether planning, programming or commissioning – interfaces and standards are becoming more and more sophisticated. WAGO's TOPJOB® S Rail-Mount Terminal Blocks with levers help meet these tricky requirements.



MOVING FORWARD INSTEAD OF STANDING STILL

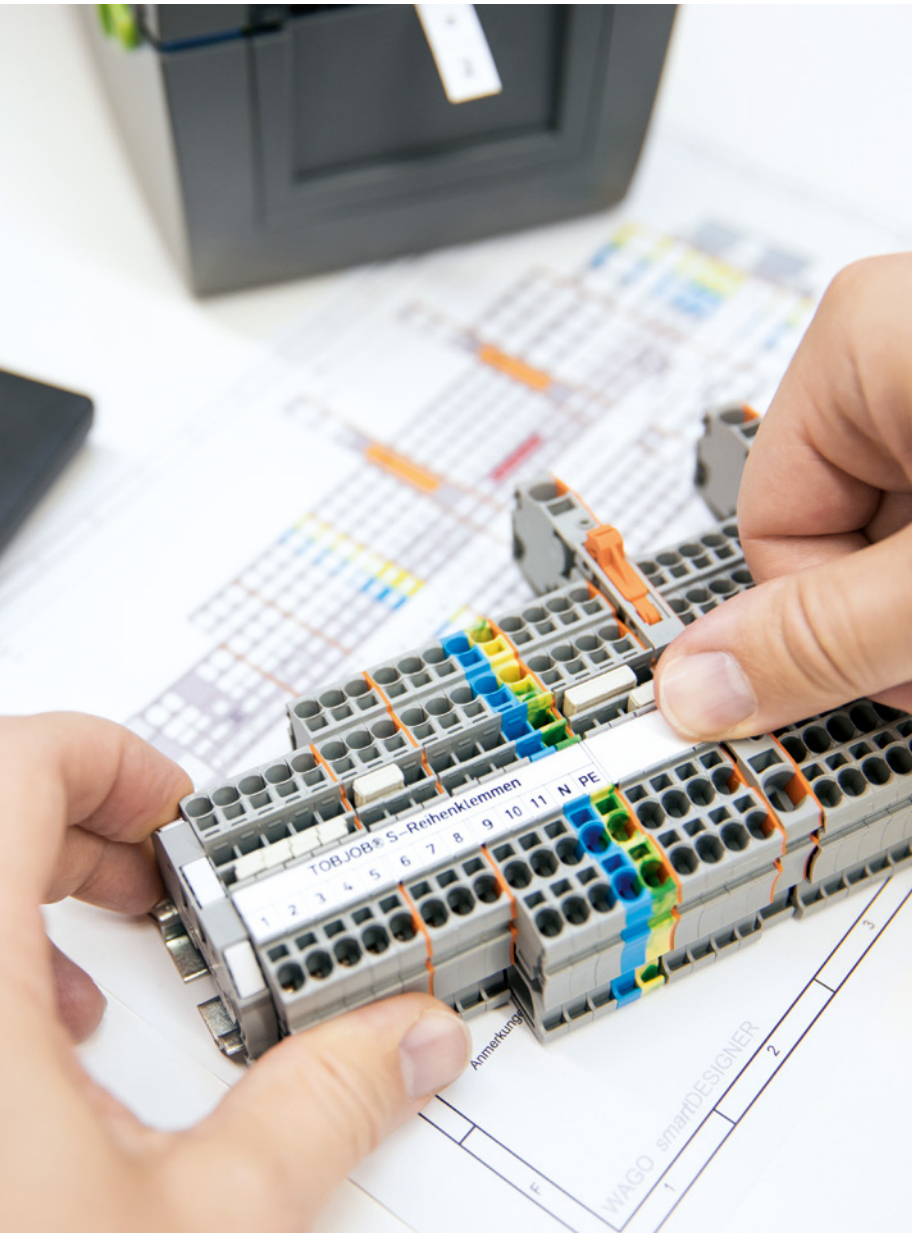
“Rail-mount terminals blocks with levers, offering tool-free operation, simplify our frequent connection changes at the technical center.”

“Conveying, emptying, filling, dosing – HECHT has been testing the behavior and properties of bulk goods in its technical center for years. This work is made much easier by the use of WAGO's new TOPJOB® S Rail-Mount Terminal Blocks with levers.



EFFICIENCY ALONG THE **ENTIRE** PROCESS CHAIN

Digital Engineering Offers Data Transfer, from Project Planning to Installation

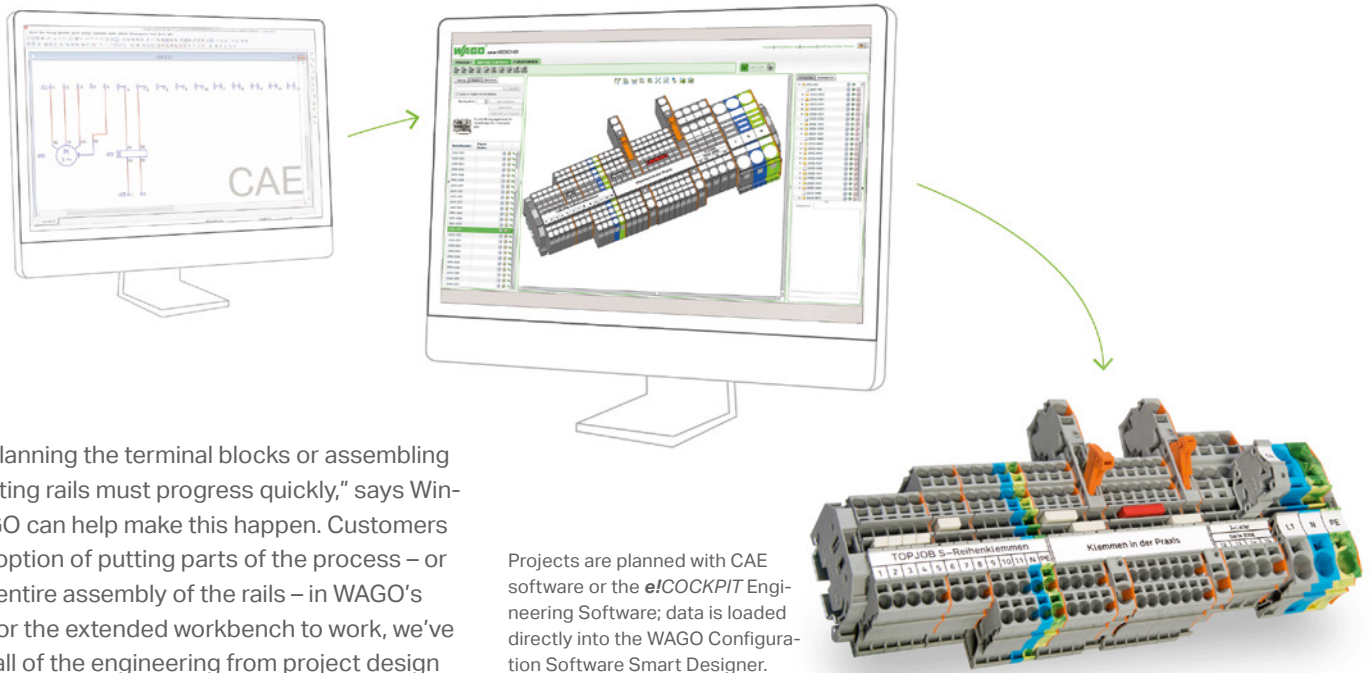


For equipment manufacturers to be able to handle their core business, an especially high degree of efficiency is required from all engineering processes. In the event of order peaks, outsourcing sub-processes can be a good option. Not only the high degree of technical expertise of the partner company, but above all a seamless transfer of all data is important for this. The WAGO solution offers exactly this data consistency along the value added chain.

A look at day-to-day operations in production quickly reveals the great challenges that control cabinet manufacturers must constantly meet. These include customer requirements, which can change from one day to the next, or order peaks, which are difficult to plan for. The ongoing skills shortage is another problem for these companies. "In such circumstances, good partners are incredibly important," says Steffen Winther from the Market Management Engineering Services department at WAGO.

Extended Workbench

"Especially with a heavy workload, our customers need every ounce of available capacity in order to handle their core business," says Winther with conviction. This increases the importance of engineering efficiency. The potential is huge. The Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW) at the University of Stuttgart recently found that when there are 500 wires per control cabinet, just reading the documents takes almost 17 hours. "To accomplish the task as efficiently as possible, individual parts of the process



Projects are planned with CAE software or the *e!COCKPIT* Engineering Software; data is loaded directly into the WAGO Configuration Software Smart Designer.

such as planning the terminal blocks or assembling the mounting rails must progress quickly," says Winther. WAGO can help make this happen. Customers have the option of putting parts of the process – or even the entire assembly of the rails – in WAGO's hands. "For the extended workbench to work, we've digitized all of the engineering from project design to installation," says Winther. That not only saves aggravation but also valuable time.

WAGO offers a comprehensive system consisting of products, software and services with straightforward interfaces that give customers both the ability to load data easily and directly access to WAGO products. For this transfer to function seamlessly, it must also be possible to process the data in the next step.

We Understand Each Other

Winther describes the situation as follows: "Every planning tool speaks its own language. If our customers use a CAE system for electronic planning – EPLAN or WSCAD for example – we have to go blind to try to understand this data and work with it." After all, interface problems or data discontinuity quickly make the extended workbench unprofitable for customers. With WAGO, customers can rely on high-quality CAE product data and CAE macros.

Easy Planning

And then what? The subsequent process is also digital. "Customers can start working on the mechanical structure directly via an interface to the CAD tool," explains Winther. "Or we handle that for them." It's important for the planning to function as simply as possible. WAGO's Smart Designer configuration software allows planned terminal strips to be constructed easily. Once assembly is complete, the data can be conveniently transferred to the WAGO Smart Printer thermal transfer printer. It works – no matter the data source. "In the WAGO

system, everything fits together," explains Winther. Customers can outsource process steps at any time, process the partial results further themselves or get involved in the process with their own data. "If necessary, the designer can request a completely assembled rail from WAGO directly from the Smart Designer after the planning stage by just following an HTML link," says Winther.

Data Standard for All Systems

For better data transfer, WAGO adheres to the "ecl@ss" and "ETIM" classification standards. In this way, the company ensures that technical and commercial product data is machine-readable and system-compatible throughout the EU. "The goal is for the various data systems to understand each other so well in the future that data can be transferred seamlessly to the other system," says Winther, explaining WAGO's commitment. This allows unnecessary expense and sources of error to be eliminated. "Data provision standardized in this way makes it possible to set up a particularly efficient value creation chain," says Winther in summary.



NEVER OUT OF PRINT

We take for granted that we have an unbeatably cost-effective printer. Also that the marking accessories are great. But what is much more important than the products themselves is that everything fits together – because economical marking in control cabinets only works if the marking data can be printed conveniently without errors. That's exactly what the WAGO marking system offers. And WAGO's new Smart Script marking software adds yet another element.

"Should a machine be at a standstill just because one connection is faulty? A solution for this problem is urgent," says Barbara Tiemann, Product Manager for *ELECTRICAL INTERCONNECTIONS* at WAGO. After all, the costs of failures can extend into the millions. "You want to open the cabinet, find your way around immediately and locate the faults quickly," says Tiemann. This increases the importance of marking the terminal blocks. This has long since been about more than just making markers as durable as possible.

When Everything Fits Together

"As part of Industry 4.0, machines and systems operate in a network," says Tiemann, describing the environments within industrial companies. "The controller in the cabinet must take that into account too." That's exactly where WAGO's focus lies. "We don't just want to provide a super printer or a perfect marking strip," says Tiemann. "It is much more important that our customers have a system at hand that allows their marking information to reach the terminals blocks quickly, cost-effectively and free of errors." How well such a system can be integrated into everyday business operations depends crucially on what the customer chooses. And this is precisely where WAGO scores points with its perfectly synchronized system consisting of free software, an unbeatable printer and optimized marking materials.

Design Template Included

"The individual elements can also be controlled by other system components," says Tiemann, explaining the compatibility of the WAGO system. For example, planning data in the CAE system can be transferred directly to the printer. No one needs to leave the data environment, since all the information reaches its destination via interfaces without any hiccups.

The highlight: The software adapts the size of the text entered to the available space, since the maximum number of characters, optimal size and font are stored. "That's how we ensure that every marker is clearly legible," explains Tiemann.



In the end, the marking not only needs to meet industry standards, but, above all, must be clear and unambiguous. "There's a good reason, as it represents the control cabinet manufacturer's business card," says Tiemann.

New Software: Intuitive Is More Fun

WAGO has improved its Smart Script Marking Software once again. Tiemann, who participated in the software improvement as a beta tester, is convinced that the modern, intuitive user interface makes it especially easy for users to operate the various functions. "Can't you make it a little bigger and clearer?" she asked. Everyone knows the phenomenon of

using new software: Users suddenly have to confront numerous unfamiliar elements. However, the symbols and features of Smart Script are intentionally designed and arranged to resemble common software products. Therefore, short tutorials are sufficient to get users on board. No printer driver needs to be installed, so users can start directly – without burdensome enabling processes. Furthermore, shortcuts make the software a joy to work with. Smart Script is a true jack-of-all-trades. "Not only can the control cabinet itself and the individual terminal blocks be marked, but it is also possible to mark conductors themselves to ensure a clear assignment." Various WAGO external products are no problem for the software either. ■

**WAGO Marking Software
Smart Script perfects the
WAGO Marking System.**



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