the power to control

bachmann.

Engineering Software

A single suite for the complete engineering process.

energy.industry.maritime.

Future Automation

Breaking limits, meeting challenges

More functions, multiple variants. Longer operating time, greater productivity. Shorter lead times, lower costs. The growing list of demands in the investment goods market could hardly be any longer and sometimes hardly any more contradictory.

How is it possible to solve this apparently insolvable dilemma? Experts are agreed: The key to this is in the engineering processes. Whoever is successful here and maintains consistency and efficiency has a major advantage – as well as the critical edge over the competition.

Engineering with Bachmann

For plants that are faster on the market and longer in operation

The Bachmann SolutionCenter gives the engineering of automation solutions a new dimension. It provides a new level of efficiency – in development and design, commissioning, operation and maintenance. In short: over the entire life cycle of a plant.

WIND, MARITIME, RENEWABLE ENERGY AND INDUSTRY:

- *Complete engineering support from Bachmann for all automation sectors.*

The SolutionCenter becomes the central engineering hub: open-loop control, closedloop control, drive engineering, visualization and safety technology are all provided under one roof. Developers, plant builders, installers, operators and service technicians – they can all concentrate on the functional added value of their work and not get lost in the complexity and functional density largely required today in mechanical engineering.

The result: A noticeably reduced time-tomarket and at the same time a plant that guarantees productivity, functionality and performance even in the future.

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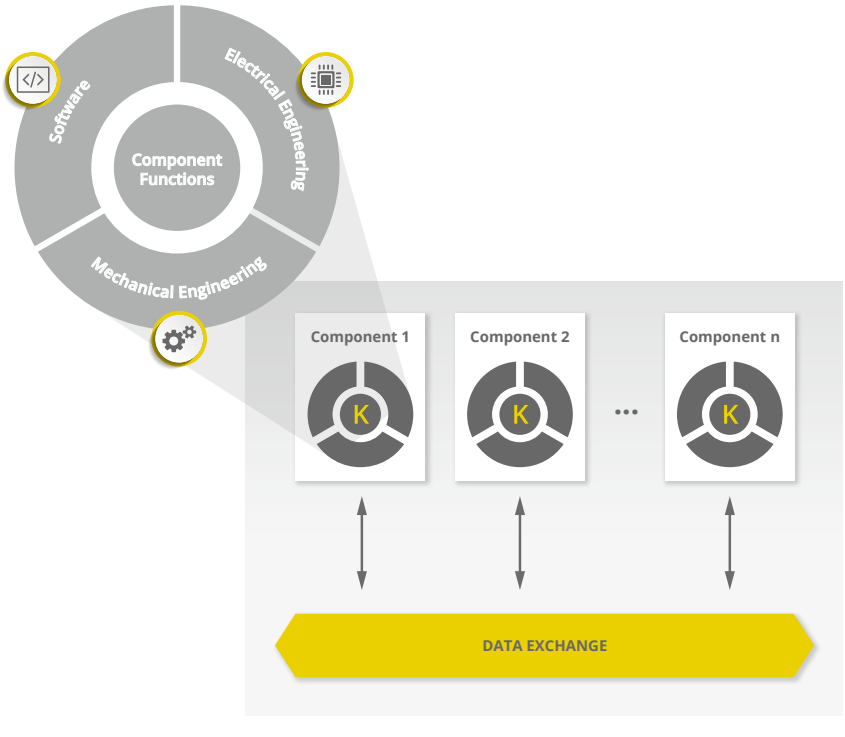
Well Thought-out Components

Rapid and bespoke development also in the future

More than ever, modern plants consist of complex mechatronic systems which can only be implemented through close collaboration between those responsible for mechanical engineering, electrical engineering and software creation. This complexity can be considerably reduced by breaking down the plant into logical function units or components.

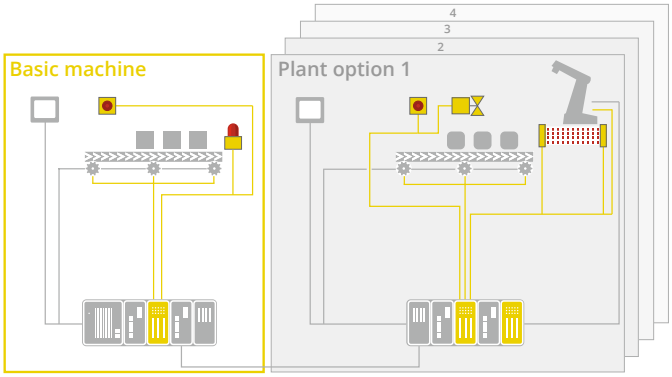


Application

Basis for efficiency and quality in engineering: A component represents an independent logical unit that is self-contained and compiled independently. The internal structure is abstracted and defined entirely by its interfaces such as signal exchange or configuration.

Modern software development

Component based software creation considerably shortens the development process since the development of mechanical engineering, electrical engineering and software can take place at the same time. The process description takes center stage instead of any cryptic program codes. In this way, applications can be developed without the need for any extensive knowledge of programming. Once components have been created, they can be reused simply and quickly for future projects, either unchanged or with different parameters. The interfaces here ensure high quality in development: They enable the targeted testing of individual components with the “Component Manager” software.



Easy adaption: Installing and commissioning system extensions later with little effort.

Secure investment

Bachmann uses the eclipse open source programming tool as the SolutionCenter platform. A large number of third-party plug-ins, which can be incorporated easily into the applications, are available for use from an online market place. This market place is growing continuously, thus also securing the possibility of straightforward software expansions and updates in the future. The SolutionCenter also enables users to create their own plug-ins, which they either generate themselves or are programmed by external partners. In this way, applications can be adapted optimally to the user's particular needs.

Reliable applications

The defined interfaces of the components not only enable the targeted testing of components. The entire application can also be tested thoroughly. The process data of the components can also be viewed at any time. This simplifies diagnostics and further increases reliability.

Greater protection

The reuse of components that have already been developed – and tested – not only reduces the time required, but also the risk of errors occurring in applications. Any corporate know-how that has been implemented in the development of components is always protected since only the function description and the interface of the components can be accessed by the customer – but not the detailed program code.

Simple variant management

The use of components enables cost-efficient series machine building. Customized functions can be added and product variants produced without changing the existing software. All program parts and the extensions are supplied with the basic machine and activated as required. This is also the case with safety systems. Any renewed testing of the entire system when modifications are made is therefore no longer necessary, and any versioning problems with hardware and software are avoided.

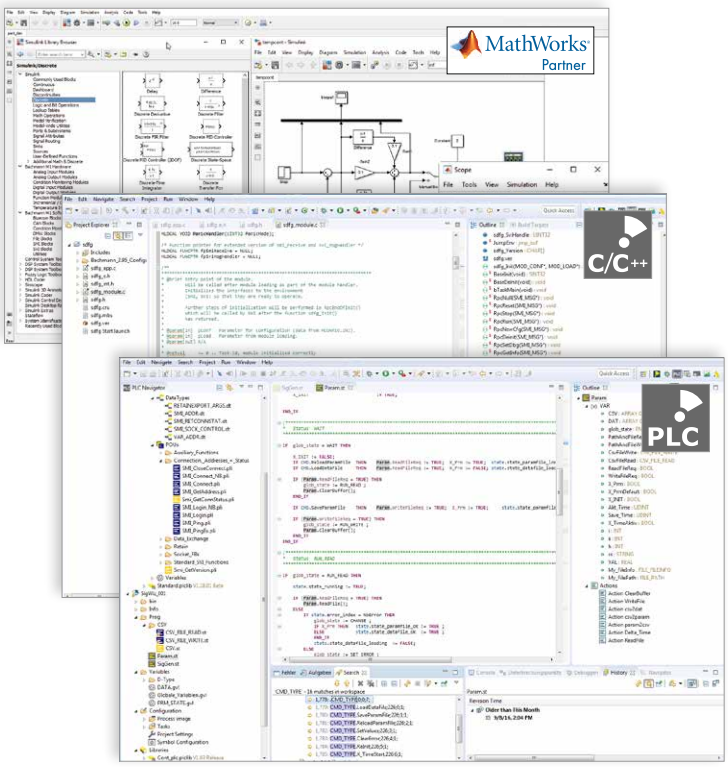
THE BACHMANN SOLUTION: COMPONENT MANAGER

- *Efficient engineering through a component-based approach*
- *Cost-efficient and uncomplicated development of series machines and variants*
- *Minimized risk thanks to reusability and extensive software testing*
- *Protection of intellectual property*
- *Tailored expansion of functions by means of thirdparty plug-ins*

Development in all Languages

Creating applications and components ergonomically

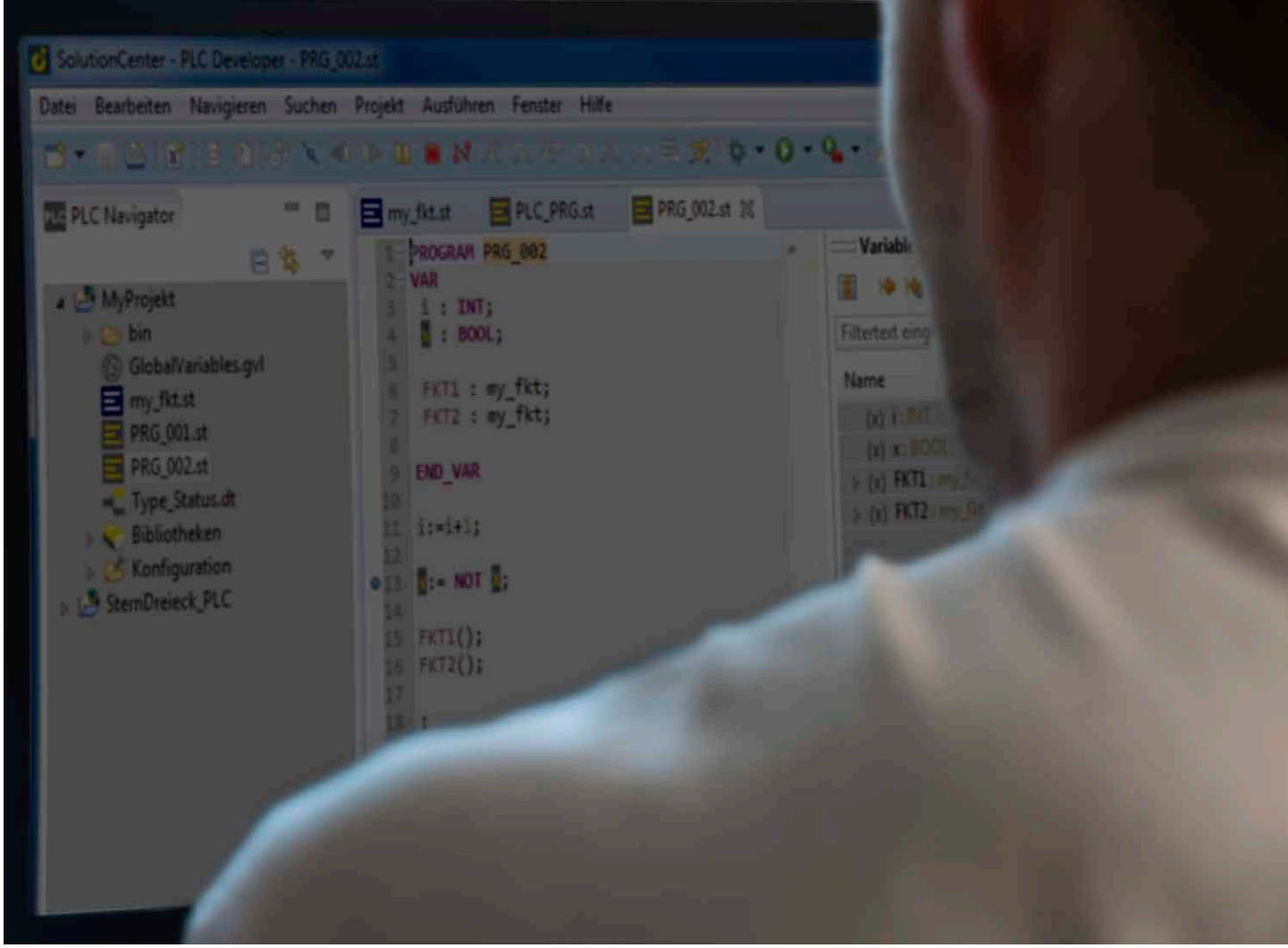
Programming is an essential part of the engineering process. Any possibilities to save time in this development step in particular are therefore sought after. The combination of optimum technology for the particular task and helpful functions increases efficiency and improves code quality. Model-based development with graphical simulation and programming environments are becoming increasingly established tools for complex tasks. These reduce complexity and ensure that the focus is on what is essential: optimum task implementation.



Equipped for the future

The SolutionCenter and controller from Bachmann support a wide range of programming languages: C/C++, all IEC 61131-3 languages and also MATLAB®/Simulink®. Programmers thus have the possibility to create applications in their familiar environment and language. Existing and established software code can also be reused without any problem. Libraries for PLCs can be created in all languages. The supported languages can also be combined as required.

Supports all important languages: Combine and reuse modules with the SolutionCenter at any time irrespective of the programming language.



Convenient programming with quality

Convenient input tools simplify programming both with the C/C++ Developer and also with the PLC Developer. Troubleshooting is supported here with powerful debugging functions. Programmed modules can then be thoroughly tested with the Component Manager.

Solving every challenge

Challenging automation and closed-loop control tasks can be solved easily with the extensive range of toolboxes available. Ready-made applications can be implemented in a very short time. This considerably reduces the programming and commissioning effort required.

Faster to market – with model based design

M-Target for Simulink® enables automation solutions to be simulated in no time at all and transferred to the controller. Predefined openloop and closed-loop control modules ensure maximum productivity. Flexible display features reduce complexity at the same time and provide a greater overview.

Realistic simulation and optimization online

M-Target for Simulink® depicts the modules and their time sequence. This makes it possible to create a very realistic simulation of the operation beforehand. After simulation, the software automatically generates the code and transfers it to the controller. M-Target for Simulink® supports hardware-in-the-loop systems (HIL). The Scope3 software oscilloscope enables the implementation to be modified directly online and operation to be optimized.

THE BACHMANN SOLUTION: PROGRAMMING LANGUAGES

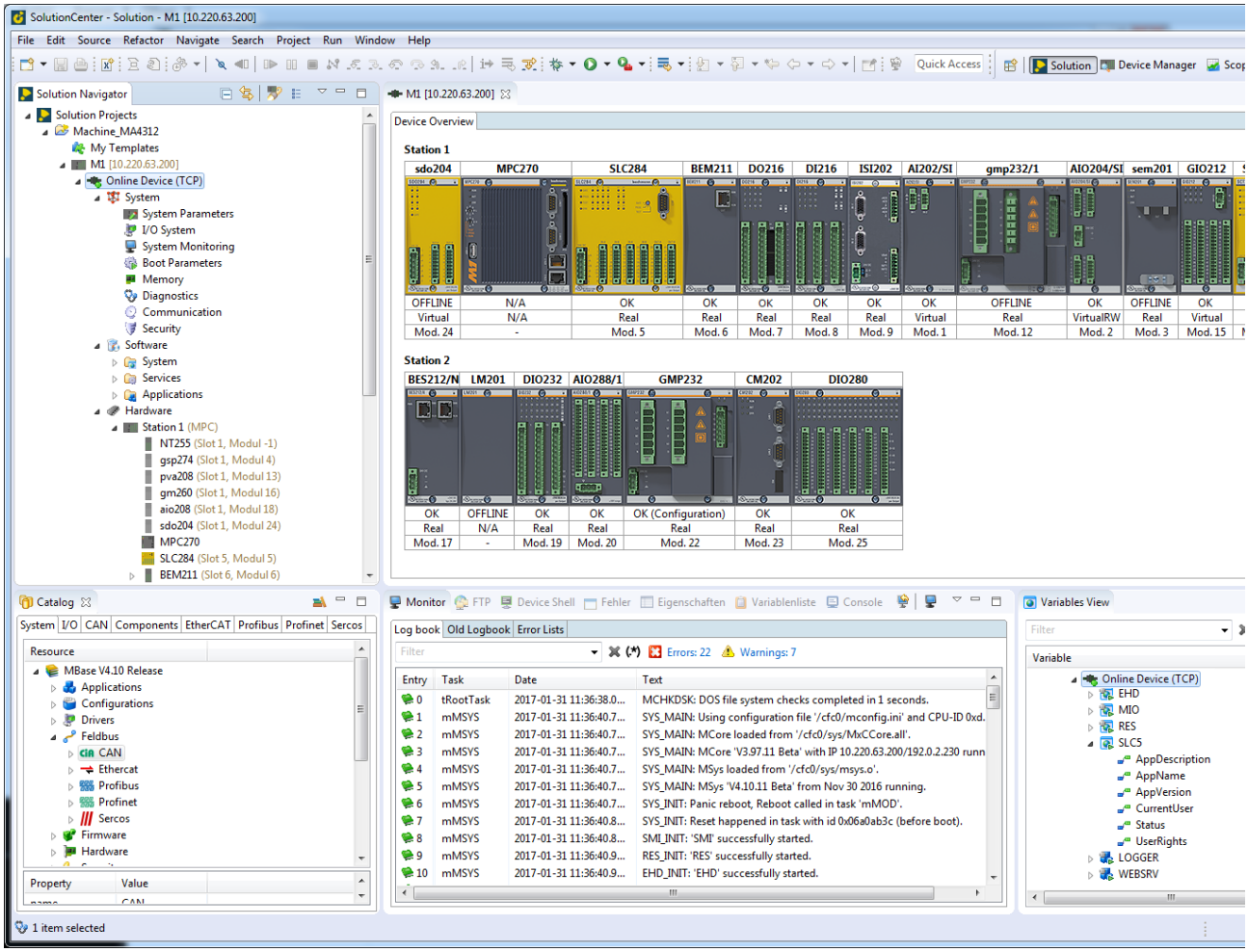
- *Any combination of languages C/C++, IEC 61131-3 and MATLAB®/Simulink®*
- *Minimize time-to-market with state-of-the-art development based on eclipse*
- *Rapid development of advanced solutions with useful toolboxes*
- *Precise simulation by making allowance for the time sequences of system components*
- *Automatic code generation and online control of the implementation*

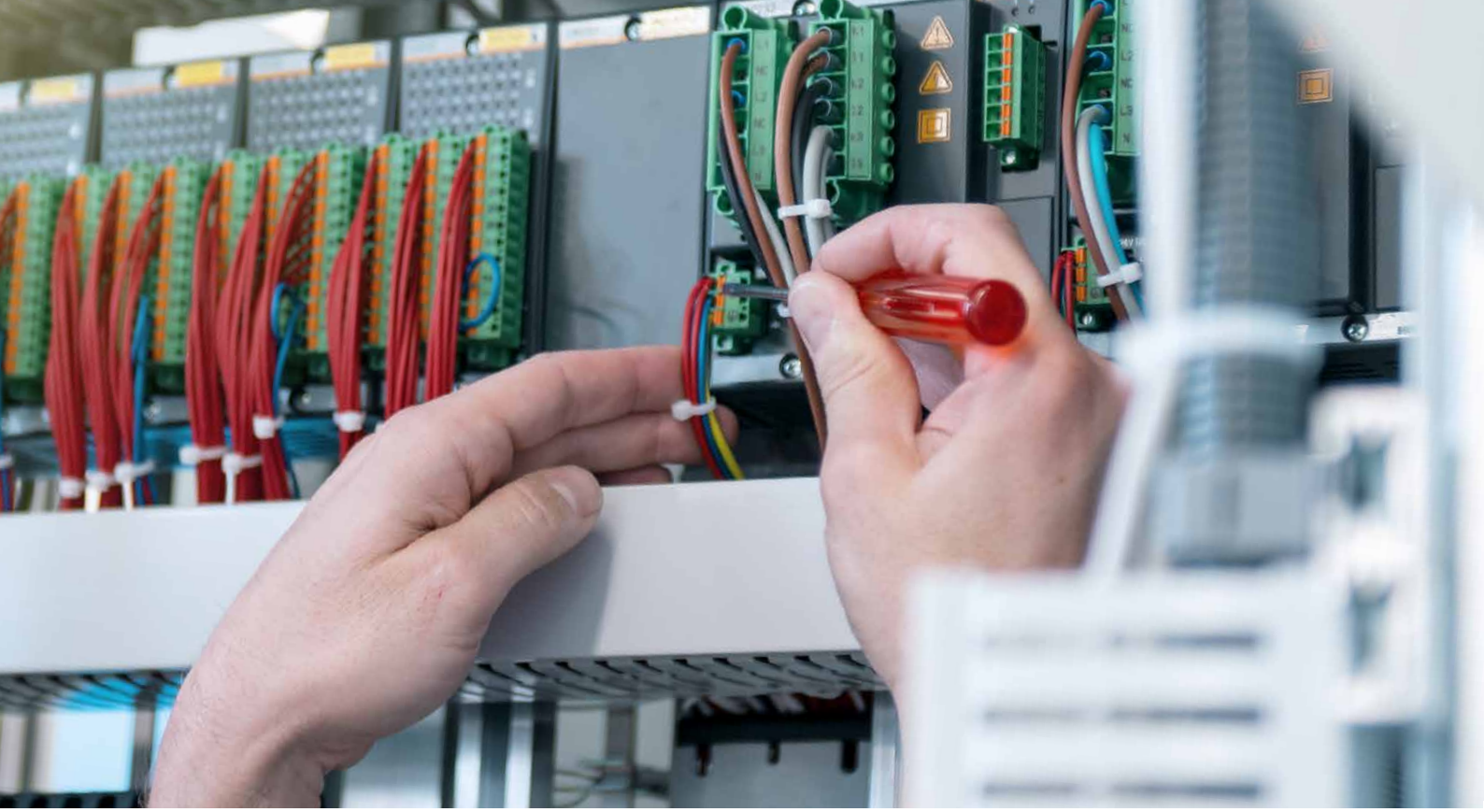
Intuitive Operating Concept

Configuring hardware and software in an instant

The configuration of the subcomponents of the automation solution plays a central role during the development process. Components, such as hardware, software modules and fieldbuses have to be adapted and managed according to the particular application. A central solution handles all these tasks: the Device Manager.

Intuitive configuration: The Device Manager can handle all configuration tasks in an instant – from planning the topology up to archiving software module versions.





One for all

The Device Manager provides support in all steps of the configuration: the planning of the controller topology, the configuration of the fieldbuses, as well as the installation of all software modules required for the application. The Device Manager also provides wiring test functions for the electrical installation.

Hardware and software modules can be managed easily. Components are organized in catalogs, which can be easily archived and forwarded.

The configuration parameters of all modules can be accessed in dialogs, and all supported fieldbuses can be fully configured and transferred to the controller directly and without the use of additional software.

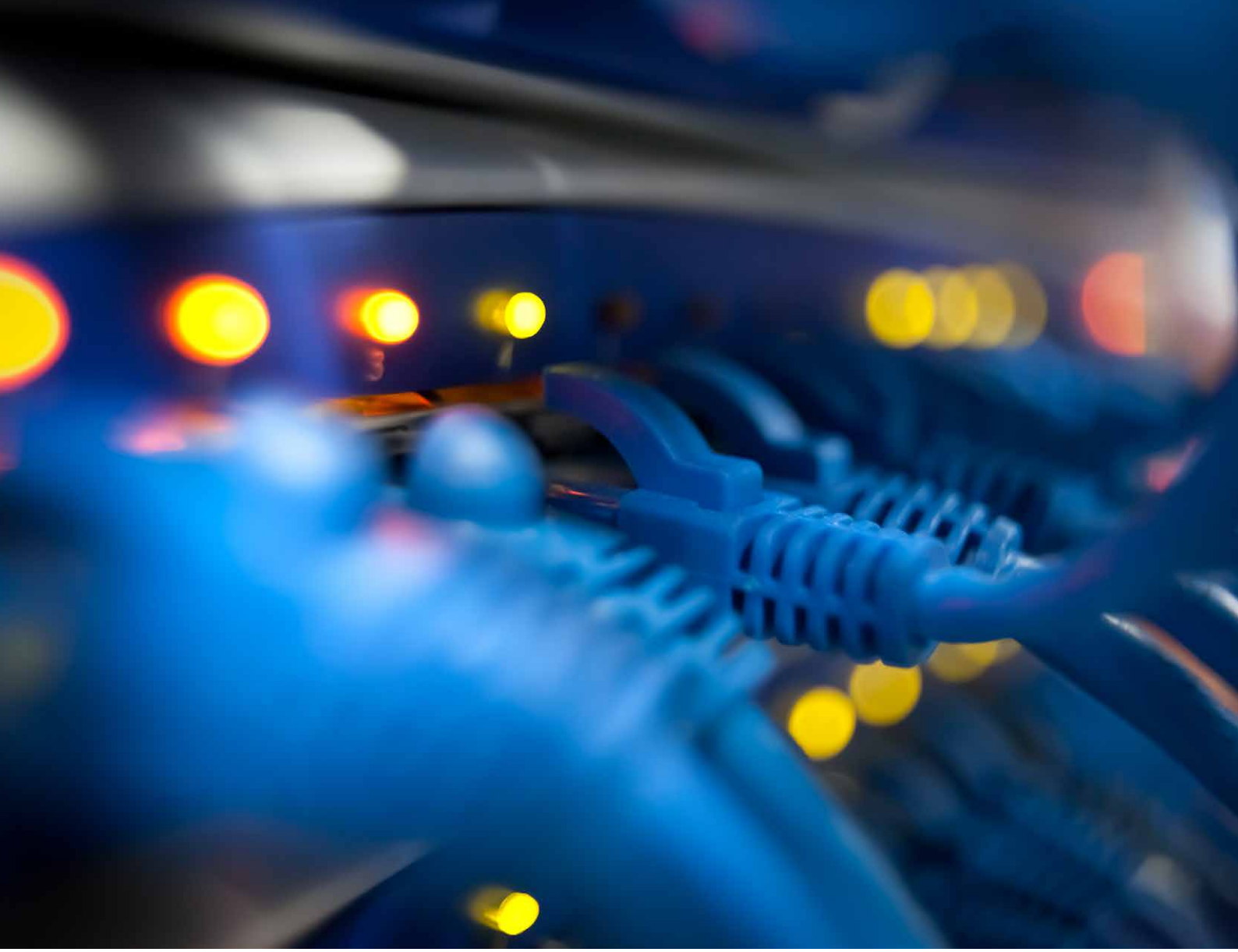
Maintaining an overview

The Device Manager is based on a seamless operating concept to ensure an optimum workflow. Together with the detailed user rights management system, the ability to arrange windows as required enables each user group to create the optimum view for their particular tasks.

All I/O signals can be given a meaningful name on the controller, irrespective of the type of fieldbus or module. These names not only simplify identification during diagnostics. They can also be used in the software for addressing or access directly as variables. The signal names can also be taken directly from the electrical diagrams for the control cabinet. Conversely, all hardware modules of the control system are available as certified libraries for EPLAN users.

THE BACHMANN SOLUTION: DEVICE MANAGER

- *Use of the same software environment for all configuration tasks*
- *Minimization of training required thanks to intuitive operation*
- *Customized adaption of the view according to individual requirements*
- *Maximum overview for programming and diagnostics thanks to the clear signal designations*



Fieldbuses and Protocols

Integrating third-party systems and components simply

Networking and data exchange in real-time are gaining increasingly more importance in the factory of future. An open, standardized and seamless platform provides the basis for efficient communication and automation. Particularly when the devices and systems of different vendors have to be integrated into an effective overall concept, or when operators put additional plant sections into operation over the course of time, seamless communication must be ensured. Actual data also has to be made transparent at any time in order to respond quickly in the event of a malfunction.

Simple integration and linking

The open software interfaces and the use of eclipse as the development base enable any additional functions required to be added as necessary (more on this on page 30).

The drives of any manufacturers can be connected easily via an intelligent software middleware and put quickly into operation via the comprehensive drive library. Process data is configured automatically, initial values entered and a generic interface generated for the application. In this way, drives can be operated without having to take the special features of the particular drive profile into account.

Open and stable control

The VxWorks real-time operating system offers outstanding features thanks to its stability and openness for special requirements. The possibility to use functions on the operating system level ensures that existing VxWorks functions can be used as well as providing maximum flexibility.

Real-time capability and high availability

Bachmann places importance on vendor independent fieldbuses and communication protocols. Real-time capable buses provide the basis for seamless communication and plantwide transparent access to all important information. Standard protocols such as OPC UA enable the efficient and open exchange of online data between production data acquisition, control system and visualization.

atvise® connect is an OPC UA-capable multiprotocol server that expands the communication interfaces of atvise® hmi and atvise® scada. By connecting with a wide range of industrial controllers and communication protocols, the solution ensures first-class performance in data acquisition and seamless integration into the visualization – for a consistent, transparent display of all relevant plant data.

The OPC-UA server running directly on the controller enables immediate and reliable data acquisition, even without an additional Windows PC.

For applications without high real-time requirements, Bachmann has developed the real-time capable and streamlined bluecom protocol.

THE BACHMANN SOLUTION: OPEN INTERFACES

- *Problem-free integration of third-party systems and components*
- *Simple expansion of functions through the eclipse market place*
- *Reusability of existing functions through open operating system*
- *Free choice of protocol without changing the automation*
- *Plantwide data transparency in real time*

PROFIBUS® PROFINET® EtherCAT® CANopen

DeviceNet™ Modbus sercos the automation bus M-Bus

OPC FOUNDATION OPC UA bluecom DNP 3

IEC 61850 IEC 61400-25 IEC 60870-5-101, -103, -104

Highly compatible: The SolutionCenter supports all important fieldbuses and communication protocols.

State-of-the-art Web Standards

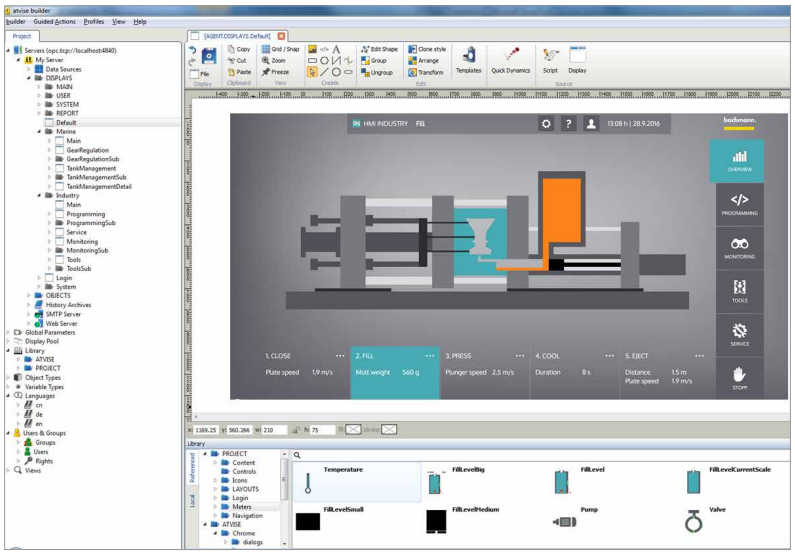
Operating real-time interfaces intuitively from anywhere

Visualizations have to be able to be adapted quickly and effectively to the requirements of the application and integrated into existing systems. It must also be possible to operate the automation solution from anywhere, without jeopardizing security. The requirements placed on the user interface here are varied: It must be modern, intuitive and user-friendly, and must also represent the mostly unseen technology, quality and reliability.

Creating bespoke and efficient visualizations

The atvise® builder makes it possible to create bespoke visualization solutions without any programming knowledge. Process images can be drawn simply, and animations and events can be configured. The flexible reuse of visualization pages and a large number of ready-to-use graphic objects and layouts ensure maximum efficiency.

Special requirements can be programmed additionally at any time with JavaScript on the client.



Bespoke visualization: Configuring graphical operator interfaces efficiently and without any programming knowledge – with atvise® builder.

Visualization from anywhere and with any device

M1 webMI pro is used for visualizations in smaller projects and atvise® scada for more extensive visualization tasks in complex plants. With the help of a comprehensive portfolio based on one scalable solution, a wide range of use cases is offered – from HMI to cloud-based SCADA.

Both solutions visualize plant status in real-time and allow plant operation from any place, with any device, and with any standard web browser, thanks to modern web technology. Dedicated HMI devices with separate software thus become a thing of the past.

Intuitive and clear operation

Like the standard features on cell phones or tablet computers, operation on M1 webMI pro and atvise® scada is highly intuitive with multi-touch gestures. Vector graphics and HTML5 technologies guarantee the loss-free display of data even in large scales. Trend displays can also be used to support data interpretation.

Greater efficiency, even with large projects

The seamless "OPC Unified Architecture (UA)"-compliant SCADA solution allows efficient, object-oriented engineering and the simple connection of visualizations to the system.

Process connection, extensive historization and high-level alarm management can be run in highly efficient server structures. The 64-bit support further increases system efficiency and enables the implementation of large-scale projects with several 100,000 process variables. The solution can be integrated everywhere, runs on Windows and Linux, and offers maximum flexibility thanks to support for containers and ARM architectures.

Secure at any time

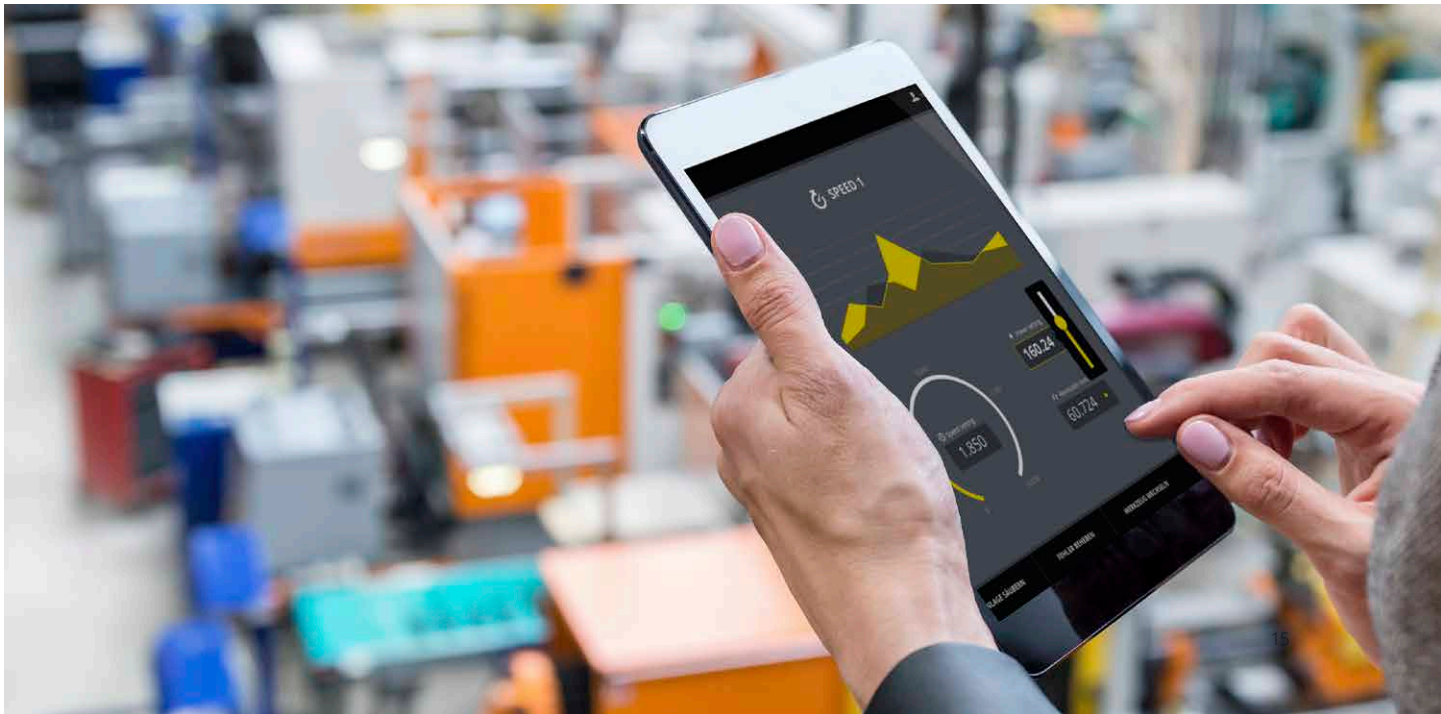
The M1 webMI pro visualization solution is directly integrated on the PLC with a secure web server. Plants can thus be operated securely and remotely via an HTTPS connection. Security is further increased through the detailed assignment of rights by group for operators, service technicians, process engineers and other operators.

A simple and transparent license model offers maximum freedom, and by using the atvise® license server, software licenses can be provided dynamically – even during redundant operation.

THE BACHMANN SOLUTION: HMI/SCADA BASED ON PURE WEB TECHNOLOGY

- *Efficient and bespoke configuration*
- *Real-time display at any place and on any device*
- *Intuitive operation with multi-touch gestures*
- *Increased security through detailed assignment of rights*
- *Interoperability through OPC UA in the core*

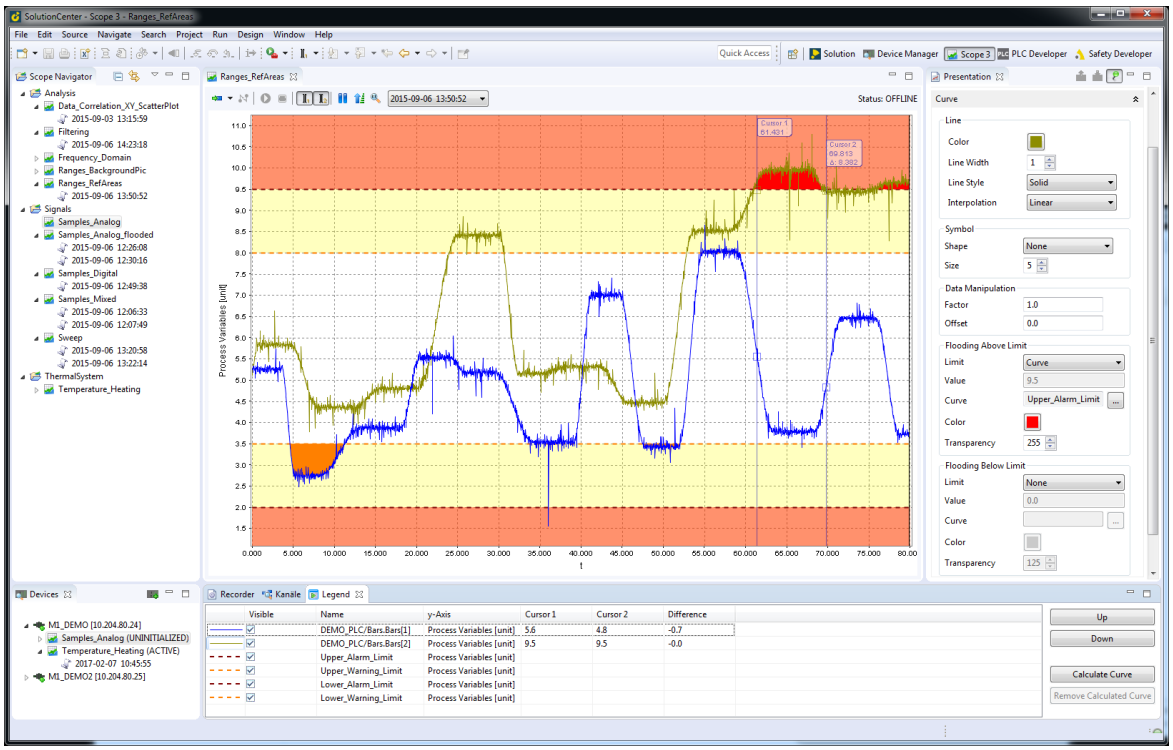
Intuitive and secure: Real-time operation and monitoring – on any device with a web browser and at any place



Full Transparency

Precise plant maintenance

The more modern and complex the automated system, the more important transparent information on process states and sequences in the overall system becomes. Only in this way can availability be maximized. At the same time, the increasing time pressure in development makes it increasingly more important to reduce the time required for commissioning and maintenance to a minimum. A comprehensive oscilloscope function provides support for these challenges.



Fast commissioning, lower service cost: Using Scope3 to make the plant transparent quickly and down to the microsecond range.

Acquisition directly on the controller

The Scope3 software oscilloscope is a universal tool and is used for the real-time diagnostics of automation solutions. It combines signal acquisition and archiving in a single tool. Its intelligent functions shorten the time required for commissioning and maintenance and thus increase plant availability. The oscilloscope is integrated directly on the controller and seamlessly in the webMI pro visualization.

Efficient commissioning

The acquired data can be displayed flexibly. Thanks to the high resolution, highly dynamic processes can be traced with a high level of transparency – the integrated data logger records data in real-time with scan rates of up to 100 microseconds. Mathematics functions expedite troubleshooting and ensure rapid implementation phases. The component-oriented approach also simplifies diagnostics.

Simple analysis and maintenance

In the event of a fault, the relevant data is logged automatically. After the recording is completed, the controller sends all details of the event to a service technician by email as required. Digital and analog values are recorded in a comprehensive database. Scope3 thus enables the comparison of live and archive curve characteristics and thus a detailed long-term observation of the plant. This then allows sound maintenance decisions to be made based on this information.

Recorded data can also be recalculated with standard or user-defined algorithms at a later time. Individually adaptable variable lists with setpoint assignment as well as filter and sorting functions additionally increase efficiency.

THE BACHMANN SOLUTION: SOFTWARE OSCILLOSCOPE

- *Shortening commissioning times*
- *Maximizing plant availability*
- *Long-term monitoring thanks to automatic event logging and comparison functions*
- *Rapid fault localization u sing mathematics functions and high resolution*
- *Efficient collaboration thanks to easy data exchange between experts*

Precise Monitoring

Detecting problems early

Condition monitoring enables condition oriented maintenance. This provides a clear economic advantage compared to preventative maintenance, which can only replace components within fixed time intervals based on empirical values. Besides the condition-based replacement of components, a targeted plant control system reduces mechanical stresses according to the data collected by the condition monitoring system (CMS) and thus increases lifespan even further.

Early detection of impending damage from anywhere

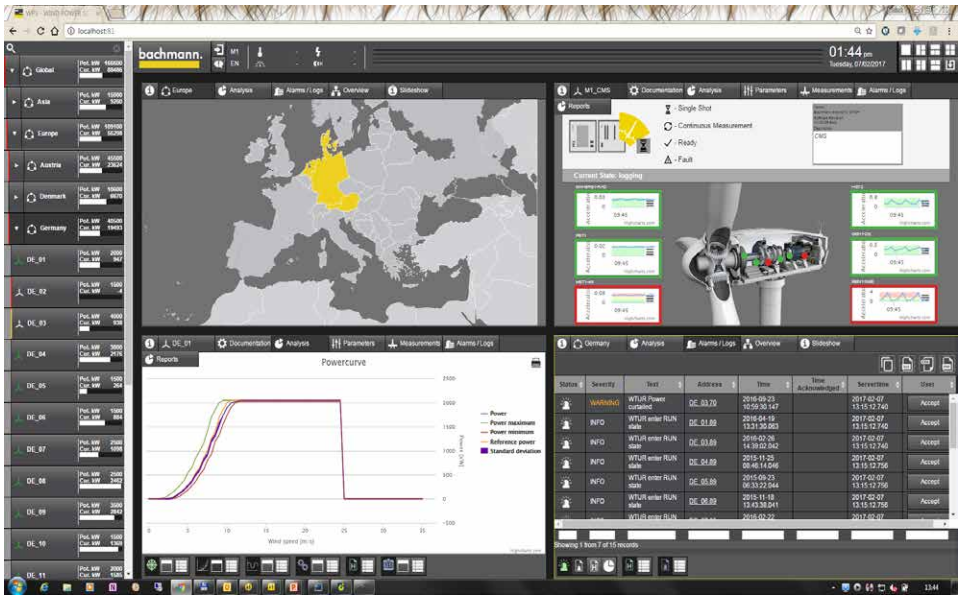
The web-based WebLog Expert® analysis software allows access to the condition data and process variables of the monitored plant from any online workstation in the world – providing the appropriate rights are available. In this way, wear damage can be detected at an early stage – regardless of whether it is a machine, a ship or a wind turbine.

Convenient analysis

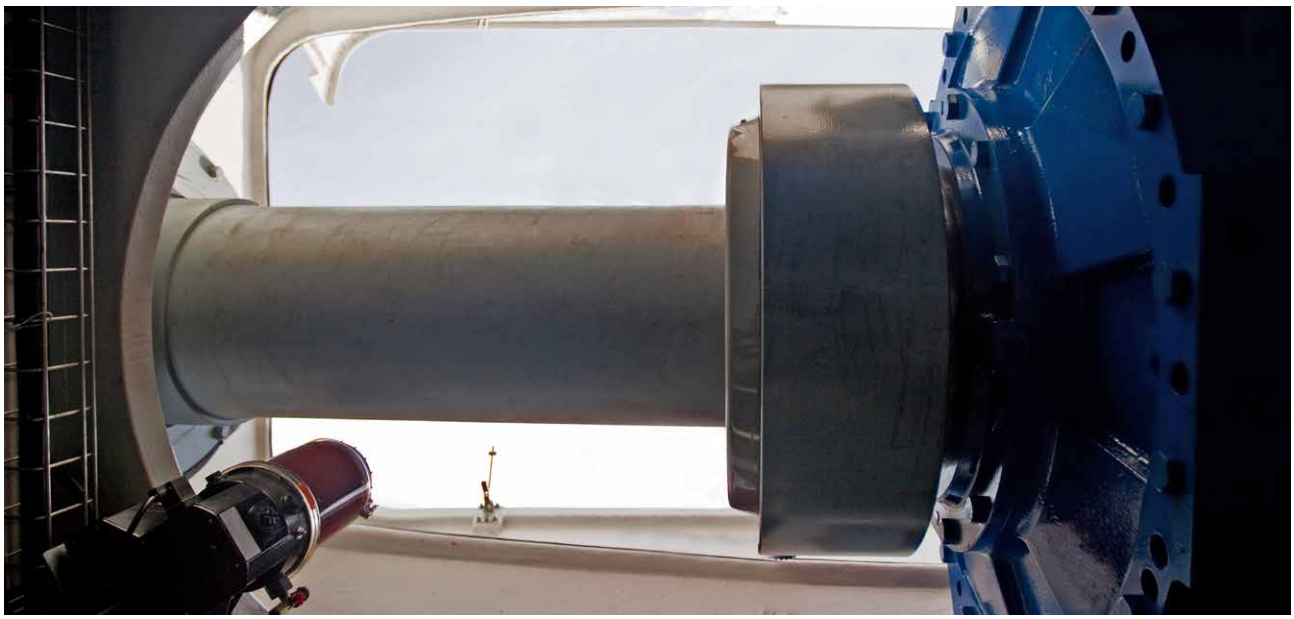
Helpful tools for extensive signal analysis, such as the trend analysis, support the evaluation process. Acoustic analysis is also possible: Sensor signals are made audible in order to make an acoustic assessment of any abnormalities in the measured range. This can eliminate the need for a service call-out on site. A reliable alarm signal is output if a defined limit value is exceeded – if required by email.

The right solution for any application

The general conditions for using a CMS vary according to the application. With four product variants, Bachmann can supply the optimum solution for any situation – both for systems that are planned from scratch, as well as for existing plants, to which a CMS is to be integrated later.



Transparent state: Keeping the precise plant condition in view from anywhere in the world with the Bachmann CMS.

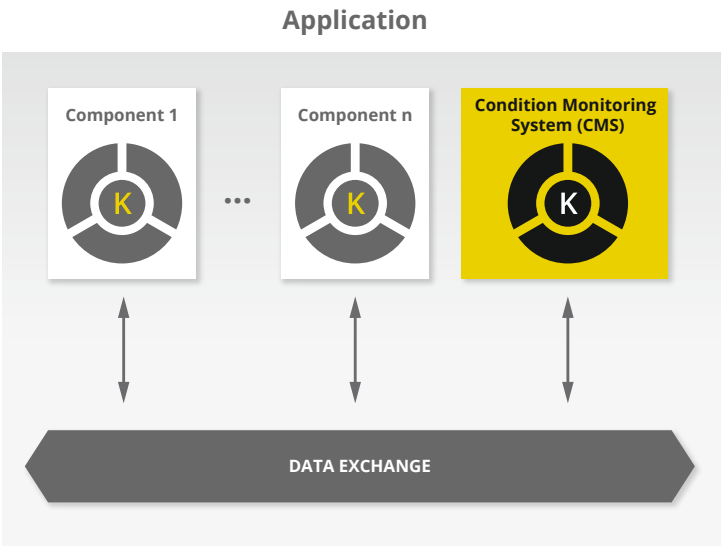


By combining vibration measurement with atvise®, the scalable condition monitoring toolkit offers everything from local monitoring of individual devices to fleet management. This cloud-ready system collects vibration data and expands the possibilities of condition monitoring with the goal of smart maintenance.

The stand-alone solution combines all the required components in a compact and autonomous control cabinet. It is ideal for the straightforward retrofitting of a CMS. The Top-Box solution is integrated in an existing control cabinet.

This enables existing power supply and communication components to be used as well. The fully integrated solution is completely installed in an existing Bachmann controller environment.

Greater diagnostic reliability is ensured by linking the measured variables with other operating parameters. The mobile solution enables timelimited examinations to be carried out, e.g. routinely at the end of the warranty period of a plant. The measured data can be compared easily with other online CMS data and controlled remotely.



Simple integration: Retrofitting condition monitoring simply and without software modifications.

THE BACHMANN SOLUTION: CONDITION MONITORING

- *Maximum yield thanks to coordinated maintenance planning*
- *Securing production through on-time spares procurement*
- *Better utilization of the lifespan of machine elements thanks to accurate condition information*
- *Realistic risk assessment in relation to the failure of important plant components*

Integrated Safety Modules

Comprehensive personnel and machine protection

The use of automation solutions requires the comprehensive protection of persons and machinery. The current safety regulations place demanding requirements on the implementation of safety solutions. A programmable safety controller provides the basis for meeting these requirements. The complete integration of safety technology in the controller and development environment reduces the effort required at the same time at different locations and increases the range of diagnostic options.

Complete integration

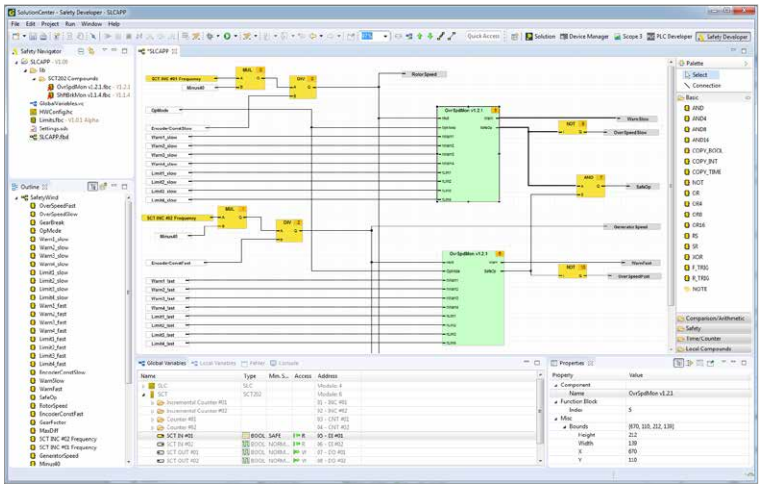
The configuration and programming of the safety functions are integrated in the SolutionCenter and thus enable standard PLC tasks to be linked seamlessly with the requirements of functional safety.

As with standard components, the integration allows online and offline configuration as well as extensive online monitoring. Interrelationships are thus clearly identified, remote diagnostics and onsite troubleshooting are simplified and downtimes reduced.

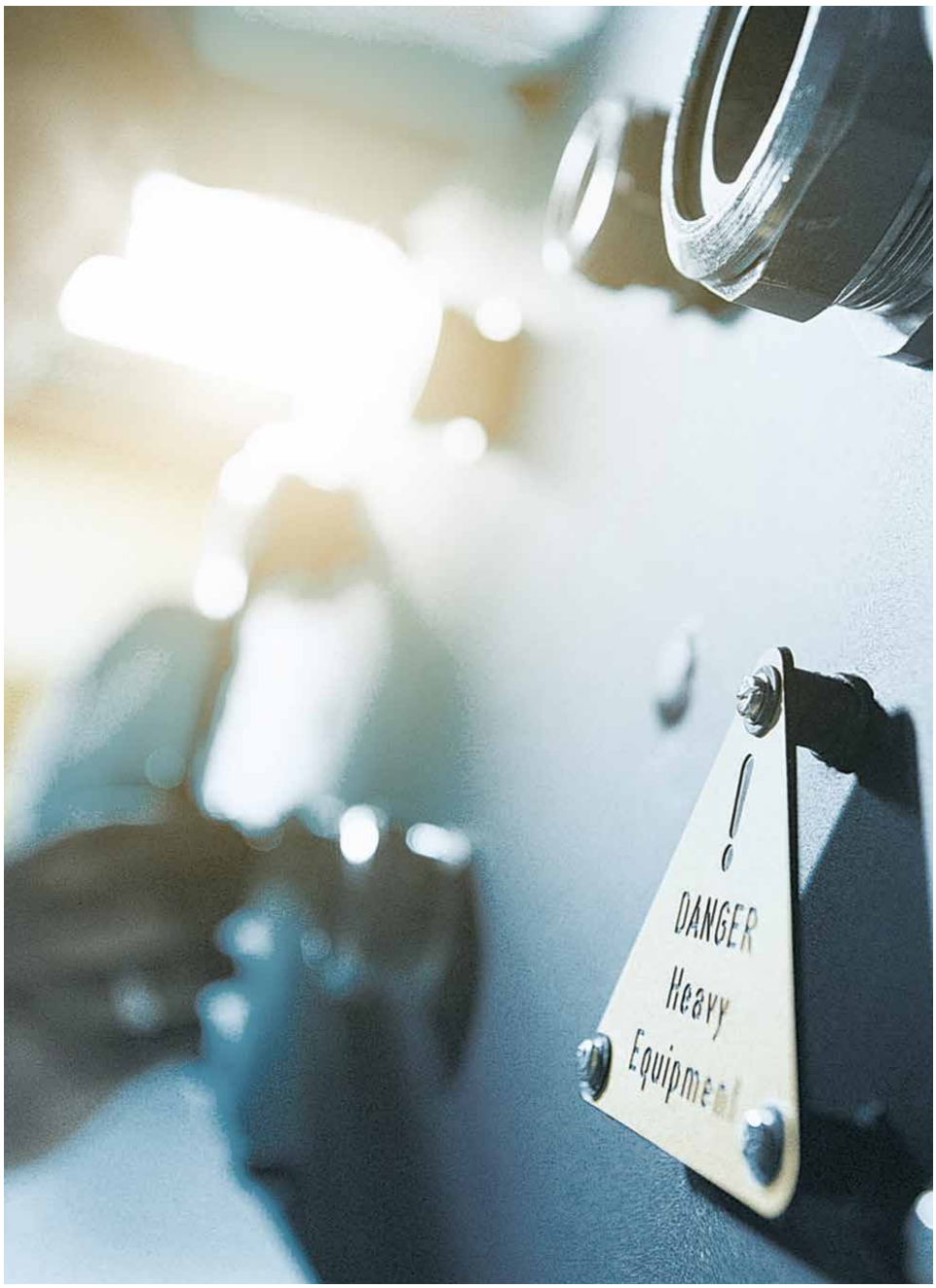
Maximum flexibility

Safety modules can be arranged remotely within the plant control system as required. This enables the implementation of flexible and individually tailored solutions.

The safety modules are directly integrated in the Bachmann controller. The later implementation of additional safety functions does not therefore involve any unnecessary interruptions – the software can simply be changed online. This also applies to modular machine concepts in series machine building.



Seamless integration: The complete integration in the SolutionCenter reduces the time required for the configuration and reduces downtimes, thanks to the simple remote diagnostics and onsite troubleshooting.



THE BACHMANN SOLUTION: SAFETY SOLUTIONS

- *Seamless linking of safety and standard modules*
- *Online monitoring of the safety application*
- *Shortening of downtimes*
- *Implementation of machine options and expansions without reprogramming*
- *Automatic documentation of safety-related accesses*

Maximum safety

The Bachmann safety modules and the SolutionCenter support all commonly used safety standards: ISO 13849, IEC 62061, EN 61511 and IEC 61508. All modules are also implemented according to the PLCopen safety and IEC 61131 standards and are certified according to PLe as well as SIL2 or SIL3. This therefore meets the normative requirements for the transparent development of safetyrelated applications.

Safe operation: The SLC284 – one of the many Bachmann safety modules that can withstand even the toughest environmental conditions.

Multi-level IT Security Concept

Knowing that plants and data are secure

Modern business models for plant manufacturers require access to controller networks and control consoles via Intranet and via the Internet. Without the use of suitable mechanisms, the expanding network increases the possibility of plants being accessed without authorization. The unauthorized manipulation of processes here can result in serious damage. Furthermore, the complete logging of interventions is now even a statutory requirement in some sectors. Protection from unauthorized access and the targeted assignment of rights are therefore a top priority when networking plants.

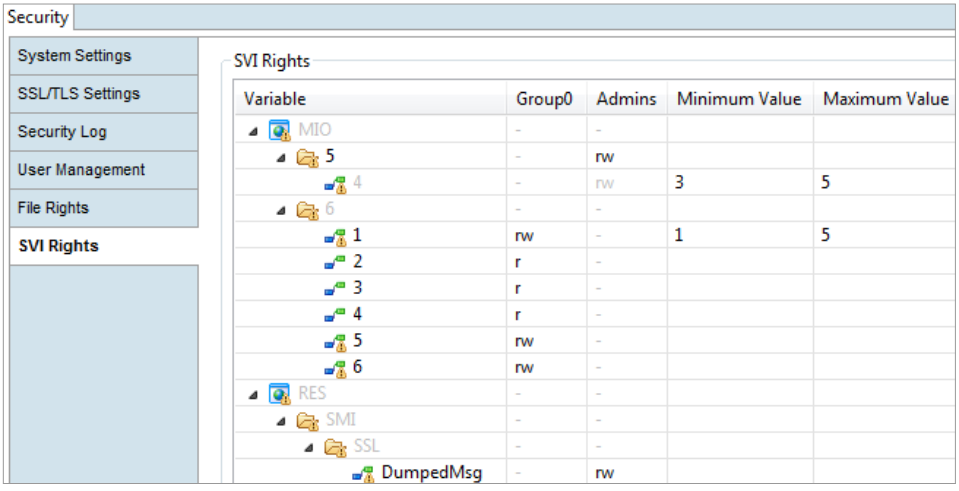
Security as standard

A selective security management not only helps with unwanted and potentially destructive hacker attacks. Particularly in the protected environment of production plants, any accidental modification of machine parameters or configuration errors in the machine network are difficult to fully exclude. The effect of these, however, is often as serious as outside threats.

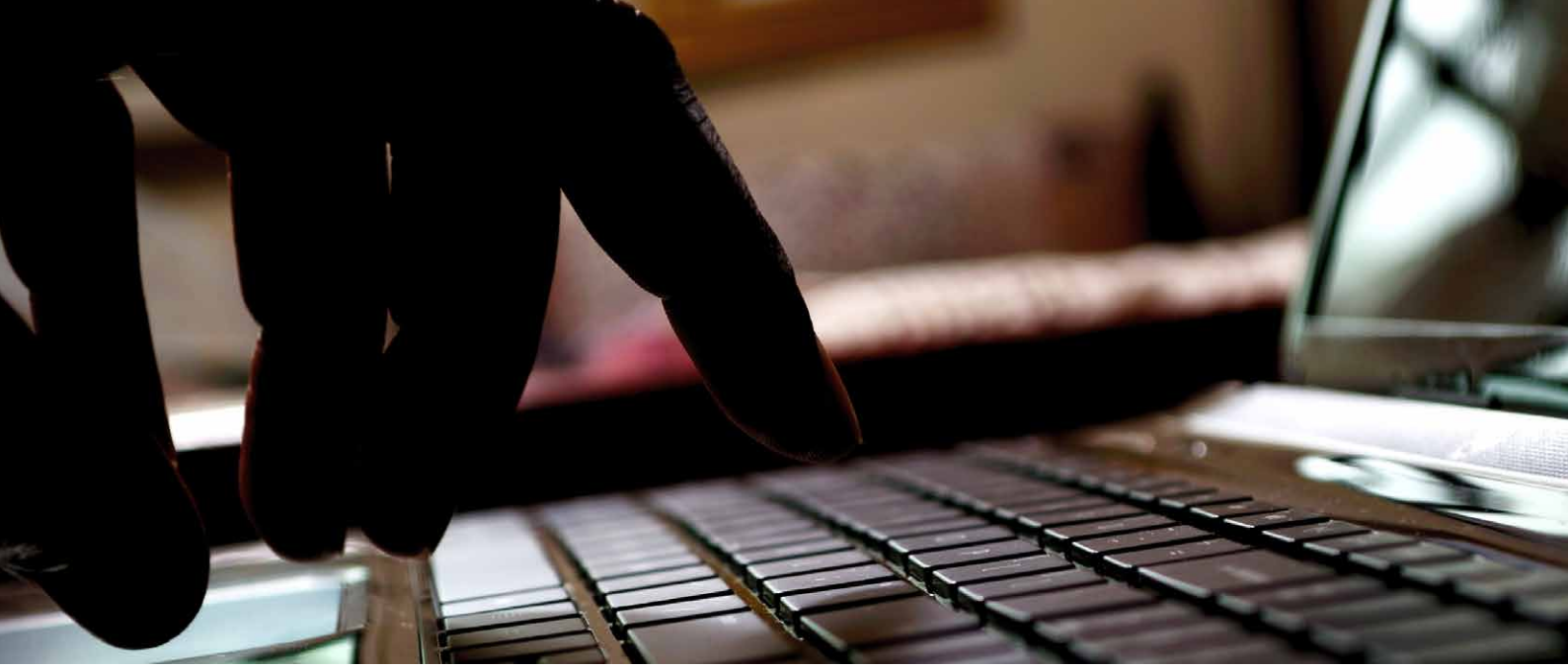
Bachmann protects plants from production failure caused by unauthorized manipulation with a 5-level security concept. The entire Bachmann CPU product range comes with all security functions as standard. This therefore provides the user with an optimized ready-touse security package.

THE BACHMANN SOLUTION: MANIPULATION PROTECTION

- *Integration of security functions in the basic functions*
- *Protection from unauthorized manipulation with a 5-level concept*
- *Simple configuration and adaption*
- *Convenient user and password management*
- *Precise logging of access*



Targeted assignment of rights: Assigning group-based access rights with the SolutionCenter.



Level 1: Protected network

- Tap-proof data transmission through encrypted network connections
- Band width limitation to defend against overload attacks and for protection from faults in the network periphery

Level 2: Tap-proof communication

- Access control based on integrated user and password management
- Server and client authentication for the protection of automated teleservice accesses
- Secure end-to-end encryption to the latest state of the art (TLS 1.2)
- Securing data sources by using certificates

Level 3: Authorized access control

- Rights are examined irrespective of the access path to the controller (visualization, SolutionCenter or with OPC UA)
- Restriction of system and execution rights for every user
- Role-based access control with groups (users inherit group rights)
- Configuration of access protection and visibility of files and process variables

Level 4: Hardened operating system

- The saving and running of additional applications can be prohibited
- Memory protection measures so that third-party processes cannot access the memory of the application
- Detailed logging of all user accesses with all user data and partition encryption

Level 5: Secure user applications

- Open interfaces to adapt and enhance all access control functions and for the use of cryptographic functions in applications
- Backup and recovery mechanisms
- Predefined security levels as templates for simple configuration

Bespoke Redundancy

Staying productive at any time

Malfunctions and failures in important operating components reduce the uptimes of plants. In addition to this, they often lead to consequential damage and lengthy repairs. A production failure also involves considerable costs and thus also financial loss. Redundancy systems therefore increase the capabilities of automation systems through the feature of single fault tolerance. This ensures largely fault-free productivity.

THE BACHMANN SOLUTION: NETWORK, SCADA AND CPU REDUNDANCY

- *Continuous productivity in the event of a fault, during maintenance or adaption*
- *Safe operation of mission critical systems through bumpless switching*
- *Free choice of network topology*
- *Automatic fault detection thanks to integrated self-monitoring*
- *Simple programming, configuration and diagnostics*
- *atvise® hot standby redundancy for high availability of SCADA systems*

Scalable and cost efficient

The Bachmann system enables redundancy solutions to be made to measure: from simple network redundancy to protection from communication failures, high availability of SCADA visualizations, right through to the virtually fully available system.

The seamless embedding in the existing hardware, engineering and programming concept, together with the robustness of the Bachmann components, guarantee the highest level of operational reliability, thus maximizing yield. This not only guarantees single fault tolerance throughout but even multiple fault tolerance in many cases.

Fast and flexible

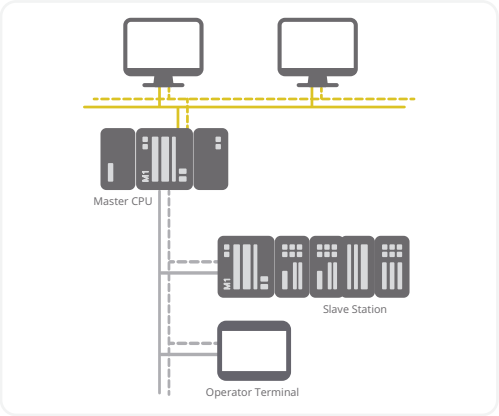
Compared to standard systems, which are often based on a ring topology, the Bachmann solution integrates the detection and switchover operation directly in the communication end points. This approach allows considerably faster switchover times.

The topology can be selected as required thanks to comprehensive Ethernet conformity. The redundancy solutions thus keep the plant productive continuously, not only during maintenance, but also when making adaptions to the software, e.g. due to function expansions.

Network redundancy

Network redundancy combines communication and media redundancy. Information is transferred multiple times in order to avoid individual faults in data packets. The physical transfer channel is also doubled. The risk of a total failure from a single event is thus virtually eliminated.

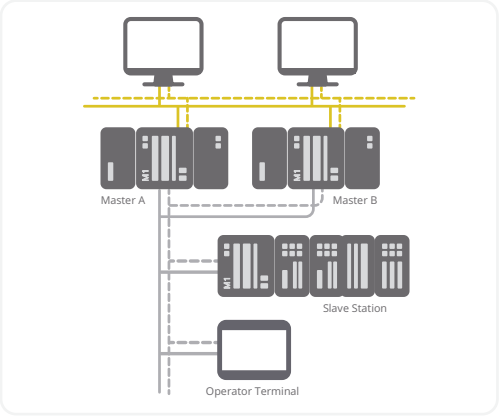
The network topology can be selected as required, and the switchover is executed in the same PLC cycle. Integrated diagnostic interfaces simplify fault localization.



Warm standby redundancy

This solution is one of two variants of CPU redundancy by which critical data can be reliably recorded. It combines network redundancy with two separate master CPUs, which, however, are not synchronized with each other.

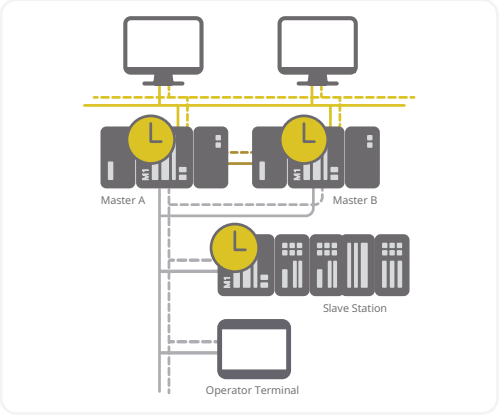
For applications which have exclusive read access to network components this variant is an inexpensive redundancy solution. Integrated self-monitoring mechanisms enable here automatic fault detection.



Hot standby redundancy

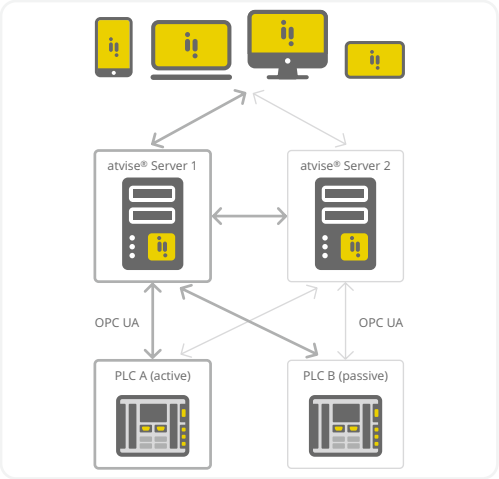
With this variant of CPU redundancy both masters run synchronously. Process variables and process states are synchronized cyclically. Integrated network redundancy is part of this solution.

Thanks to the bumpless switchover, this variant is particularly suitable for mission-critical monitoring, open-loop and closed-loop control tasks. The system and development environments support continuous operation during program adaptions, monitoring and online maintenance.



Redundancy in the visualization

atvise® hot standby redundancy ensures the high availability of SCADA systems through automatic synchronization and seamless switching between two servers – without data loss. Various switchover options, such as switchover and failover, ensure maximum operational reliability, while vital status tables monitor the status of the servers and networks. The visualization based on pure web technology enables a flexible system architecture, and integration with Bachmann engineering tools simplifies configuration and monitoring. This solution offers seamless integration for maximum system availability.



Robust and intelligent hardware

Tackling special challenges effortlessly

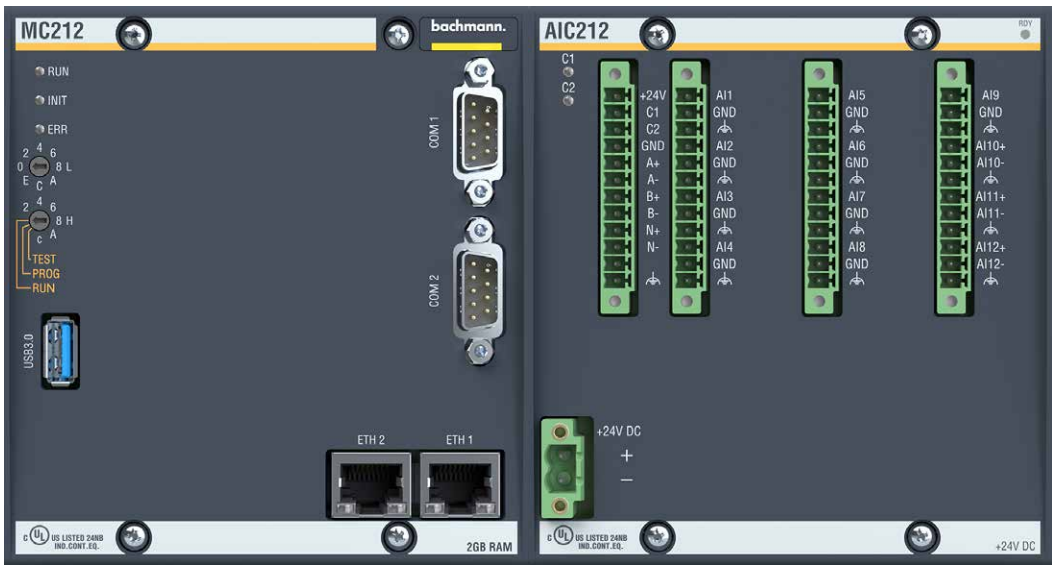
The Bachmann Controller System provides the ideal basis for any automation requirements. The intelligent hardware modules allow tailored solutions and ensure maximum efficiency in engineering. The large selection of modules also supplies precisely the right range of functions for particular requirements.

High precision analysis

The AIC212 module is part of the Ω-Guard® condition monitoring system (CMS), which has been tested and certified by Germanischer Lloyd (GL). The measuring inputs record vibrations at high resolution from up to nine different measuring points. For evaluations it includes any signals and variables from the entire control system.

THE BACHMANN SOLUTION: CONTROLLER SYSTEM

- *Maximum flexibility through an extensive range of I/O modules*
- *Solving demanding tasks with a broad range of powerful CPUs*
- *Maximum compatibility thanks to the support of several real-time capable bus systems and protocols*
- *Use in the most severe environmental conditions thanks to non-condensing modules (ColdClimate)*



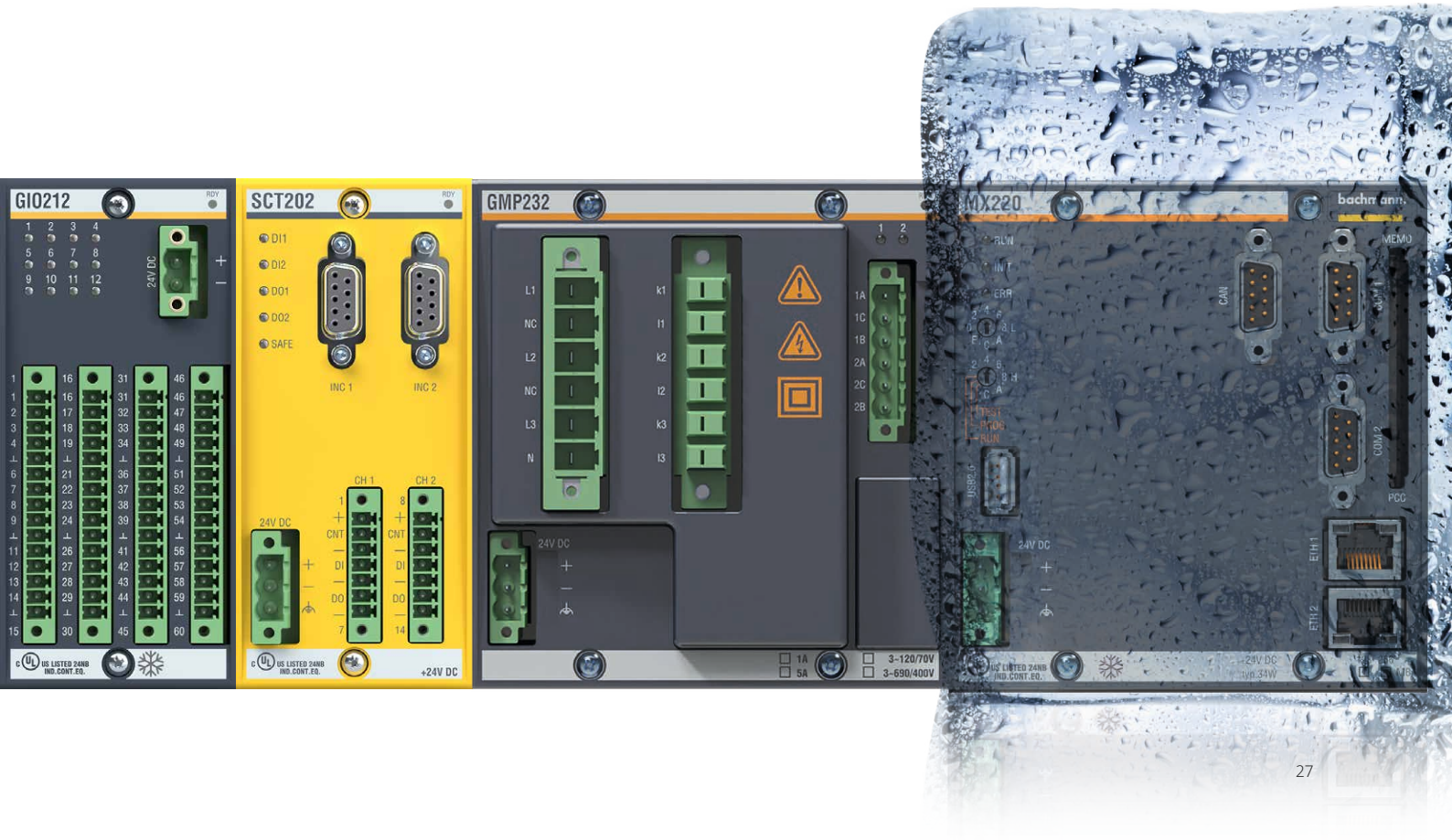
Full flexibility

The GIO212 universal I/O module ensures maximum flexibility. The channels can either be configured as analog or digital inputs or outputs, as counters or for temperature and resistance measurement. This reduces the stock-keeping, engineering and service costs for the module.

Network under control

The GMP232 module enables the safe, reliable and fast measuring of all relevant values for three-phase electrical networks. It makes the Bachmann real-time control system into a three-phase grid measuring system, a system for grid and system protection, power quality monitor and fault recorder.

Large temperature range:
Safe and fan-free automation at ambient temperatures from -40 °C to +70 °C thanks to ColdClimate.



Toolboxes and templates

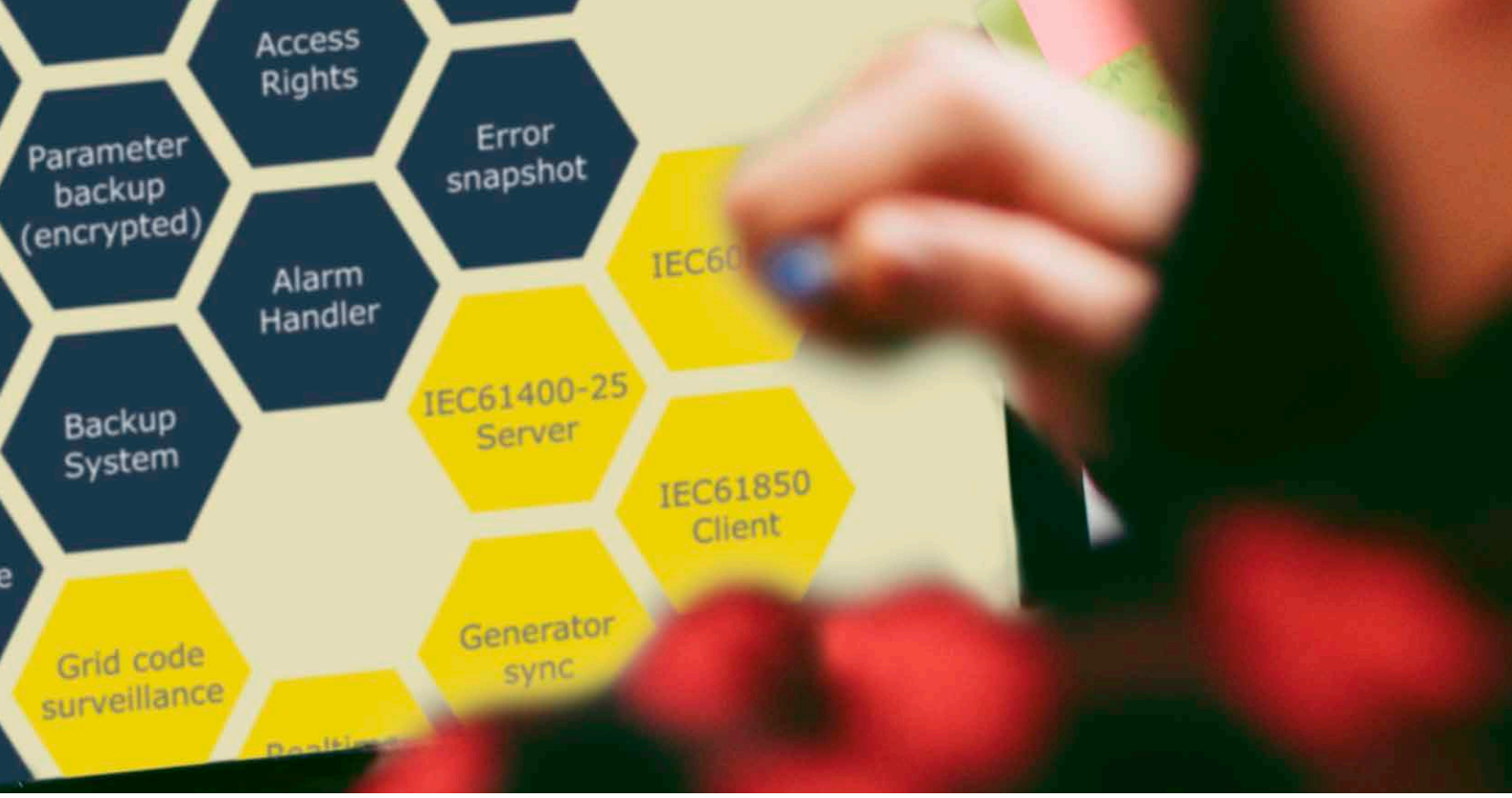
Reaching the target Faster with sector tools

Bachmann provides specific sector solutions for wind power, industry, the maritime sector and renewable energy. These help to even further reduce the time required for developing and commissioning the controller software and the visualization. The software packages bundle Bachmann‘s know-how and cover many standard tasks in the particular sector. Existing function can be adapted in all sector tools, and user-defined features can be added if required. The invested know-how of the plant manufacturer here is always protected.

Wind Turbine Template (WTT)

The WTT software environment contains the most important controller functions of a wind turbine as an editable template. Based on the IEC 61400-25 data area, the template provides all plant components. Helpful and user-friendly functions such as trending, wind rose, power curve and alarm handling are also integrated. WTT enables users to implement their own functions or change existing functions at any time.

Thanks to the modular structure, individual functions and libraries can be checked. This shortens the time required for the final testing of the plant software.



Wind Power SCADA (WPS)

WPS is based on atvise® scada and builds on the functions of the WTT. The SCADA system optimized for wind turbines incorporates the entire Bachmann know-how for the wind sector. The live process data of WPS can be viewed from anywhere and with any terminal device.

The SCADA system makes every small detail of the plants available. At the same time it provides a comprehensive overview of the entire wind farm. Farm overview maps enable plants to be easily compared with each other.

Turbine components are depicted via standard communication protocols according to IEC 61400-25. WPS thus provide a rapid overview of all important process variables. These can be analyzed graphically and in tabular form, compared with trend curves and stored in reports. A reliable alarm system is provided in the event of malfunctions or faults. Furthermore, the necessary level of security is ensured with the integrated user management.

atvise® object catalog

The atvise® object catalog offers a collection of advanced graphic objects for HMI/SCADA projects and enables efficient engineering. The objects include integrated alarm functions and maintenance planning and support optimized display and management of industrial processes. The industry-neutral catalog includes a wide range of segments for all industrial sectors and can be easily integrated into atvise® projects.

Industry Technology Modules (ITM)

The predefined software modules for industrial applications enable simple and precise control of complex machine control operations. The closed-loop control modules drastically reduce the effort required for PLC programming.

The ingenious closedloop control basic framework of the modules supports a wide range of operating modes, such as manual mode, surface change, or system identification. The data acquired by the controllers is converted by the PLC into precise movements at a constant pressure and force. This enables production at higher rates with minimum cycle times.

Maritime & Offshore Essentials (MOE)

The MOE supports users in programming – starting from the list of measuring points of the shipyard right through to the creation of the PLC program. The project manager generates PLC programs quickly and error-free. Even if special requirements are stipulated shortly before the deadline, these can be included very simply and more importantly, without any risk of programming errors.

Service technicians can easily set parameters to modify important functions. All settings are fully tested already in advance in order to avoid troubleshooting during commissioning on board ship.

Combined Heat and Power Template

The CHP Template contains ready-to-use solutions for the most frequently required tasks needed for operating a CHP unit. It also provides sufficient room for implementing manufacturer-specific extensions.

This template enables engineering cost savings of up to 80 percent. As well as the tasks needed for all aspects of grid connection, such as generator and grid monitoring, grid measurement and synchronization, the template is also suitable for typical close-loop control tasks. This includes, for example pre-programmed modules for speed, power, phase frequency and voltage regulation, as well as the regulation of the mixture or engine cooling circuit.

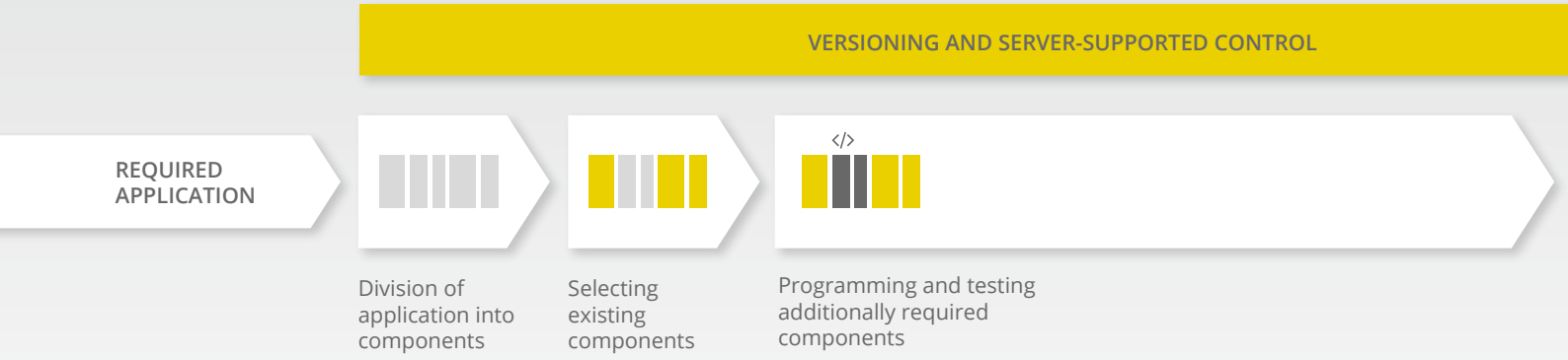
State-of-the-art development process

Clear project implementation

A modern development environment with seamless versioning provides the framework for modern research and development processes. The development process can be optimally adapted to the particular application – regardless of whether the programming is in C/C++, IEC 61631-3 or the Component Manager.

Fast and clear development: Make engineering projects more efficient by using known and reusable software components and always retain the overview with comprehensive versioning.

APPLICATION CREATION BASED ON ECLIPSE

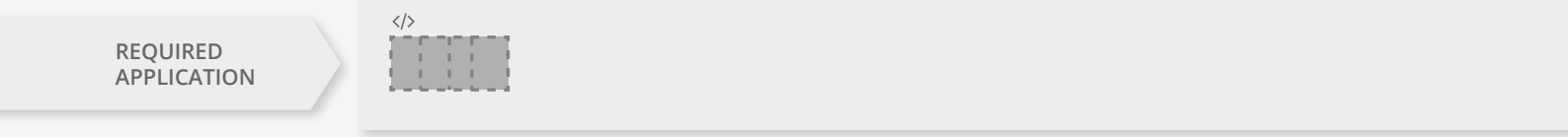


Division of application into components

Selecting existing components

Programming and testing additionally required components

CONVENTIONAL APPLICATION CREATION



Programming required program parts

Comprehensive versioning

Bachmann engineering solutions are based on the eclipse open development platform. This enables full project management with server-supported version control. All commonly available systems, such as git or Apache subversion (SVN), are supported here for central version management.

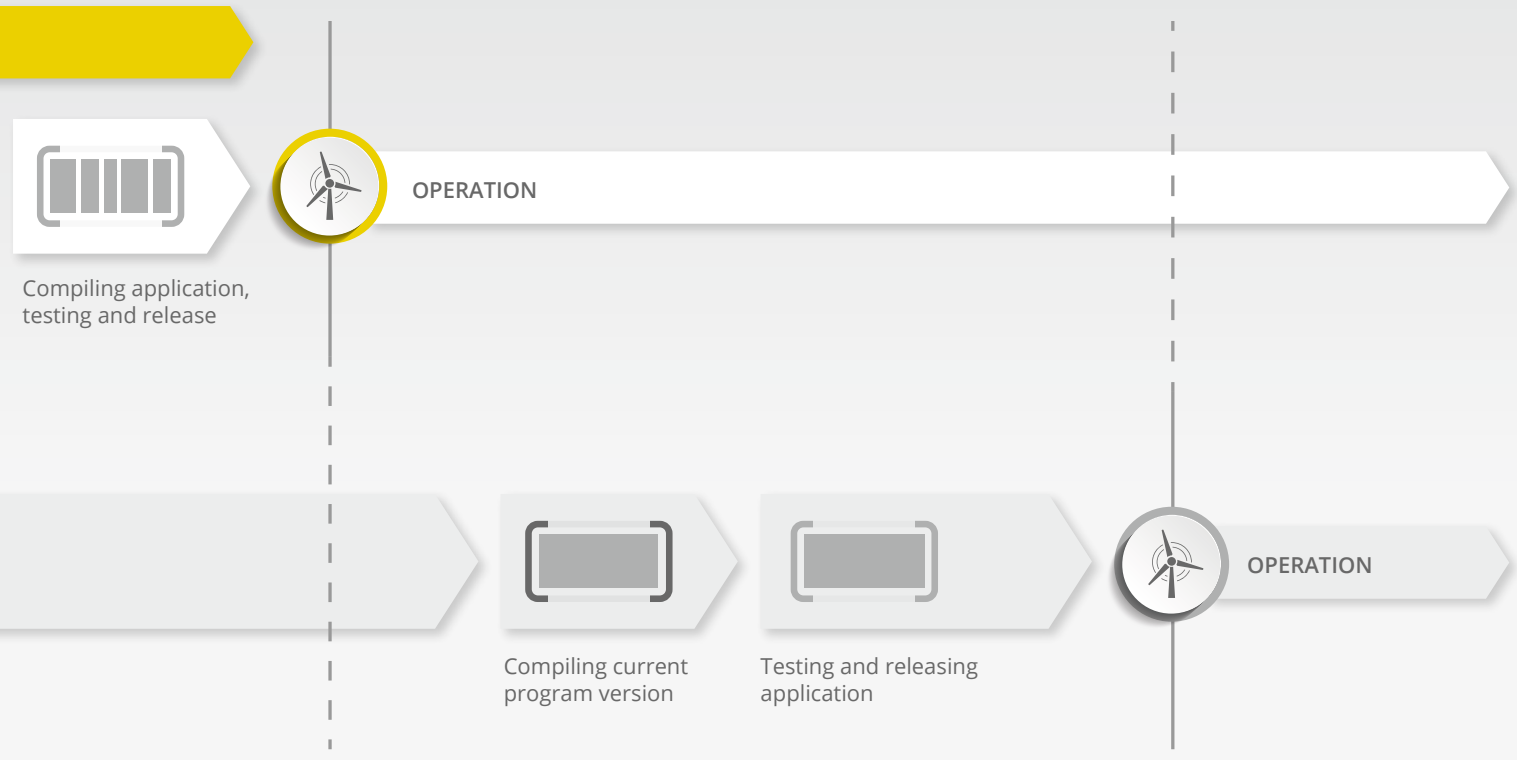
Helpful components

Projects are kept clear since many process functions already exist thanks to reusable functions. This shortens time to market at the same time. The final step of the development process – the test phases and release processes – are shortened through the component- based development. Custom plant adaptions can likewise be carried out simply and quickly.

eclipse git SUBVERSION

THE BACHMANN SOLUTION: VERSIONING

- *Correct software versioning and complete traceability of modifications thanks to versioning*
- *Ideal adaption of the development process to the particular application*
- *Shortening the time required for test phases and release processes*



Targeted support

Always staying up-todate

Even if the training needed for engineering is kept to a minimum thanks to the standard development environment: updating and deepening one's knowledge of individual engineering areas at regular intervals is worthwhile. The sound knowledge of personnel, combined with first-class products, is after all the key to perfect automation.

THE BACHMANN SOLUTION: ENGINEERING TRAINING

- *Perfect program adaption to individual requirements thanks to the modular concept*
- *Intensive knowledge transfer through hands-on training*
- *Training seminars held on site at Bachmann or as webinar*
- *Access to the in-depth knowledge of Bachmann application engineers*

Precisely tailored programs

Bachmann's training offering ranges from the proven standard training seminars right through to workshops tailored to your individual requirements. The modular training concept enables the creation of training programs tailored precisely to company requirements. The training is always centered around an intensive knowledge transfer and hands-on practice with special problem solving tasks.

Flexible knowledge transfer

The training sessions are held either in a Bachmann branch office or directly on site in the company. Individual modules can also be offered as webinars if required. Following each training course, the participants will receive a personalized certificate.

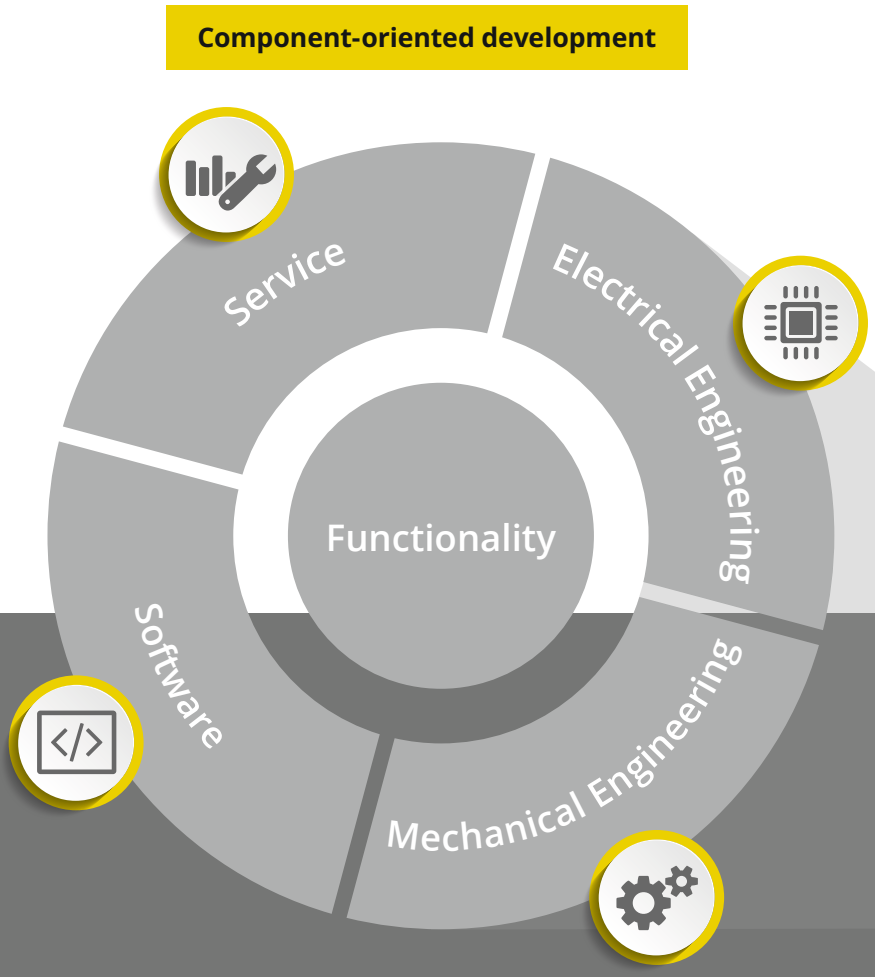
No questions unanswered

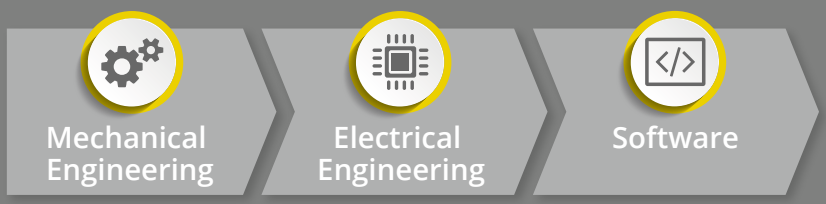
If a question remains unanswered despite the extensive training offer, Bachmann customers benefit from the know-how of several application engineers. These work in close proximity to the development team. They know every small detail of the Bachmann solutions and can therefore make use of all options available.

Basic Training	User Training	Advanced Training
Basic knowledge of automation required	Basic training and specific knowledge recommended	Basic training and specific knowledge of programming required
Bachmann automation	PLC programming	Wind Turbine Essentials
		Redundancy
		bluecom (Ethernet real-time protocol)
	Visualization M1 webMI pro	Visualization M1 webMI pro
	Motion Control	
	Condition Monitoring	
	Grid measurement and monitoring	
		Programming with C/C++ Developer
		Application development with M-Target for Simulink®
Safety technology	Safety technology (Safety Developer)	Model-based development with MATLAB®/Simulink®
	atvise® scada	
Service technician		Other customer-specific workshops

Thinking about engineering differently

Future automation

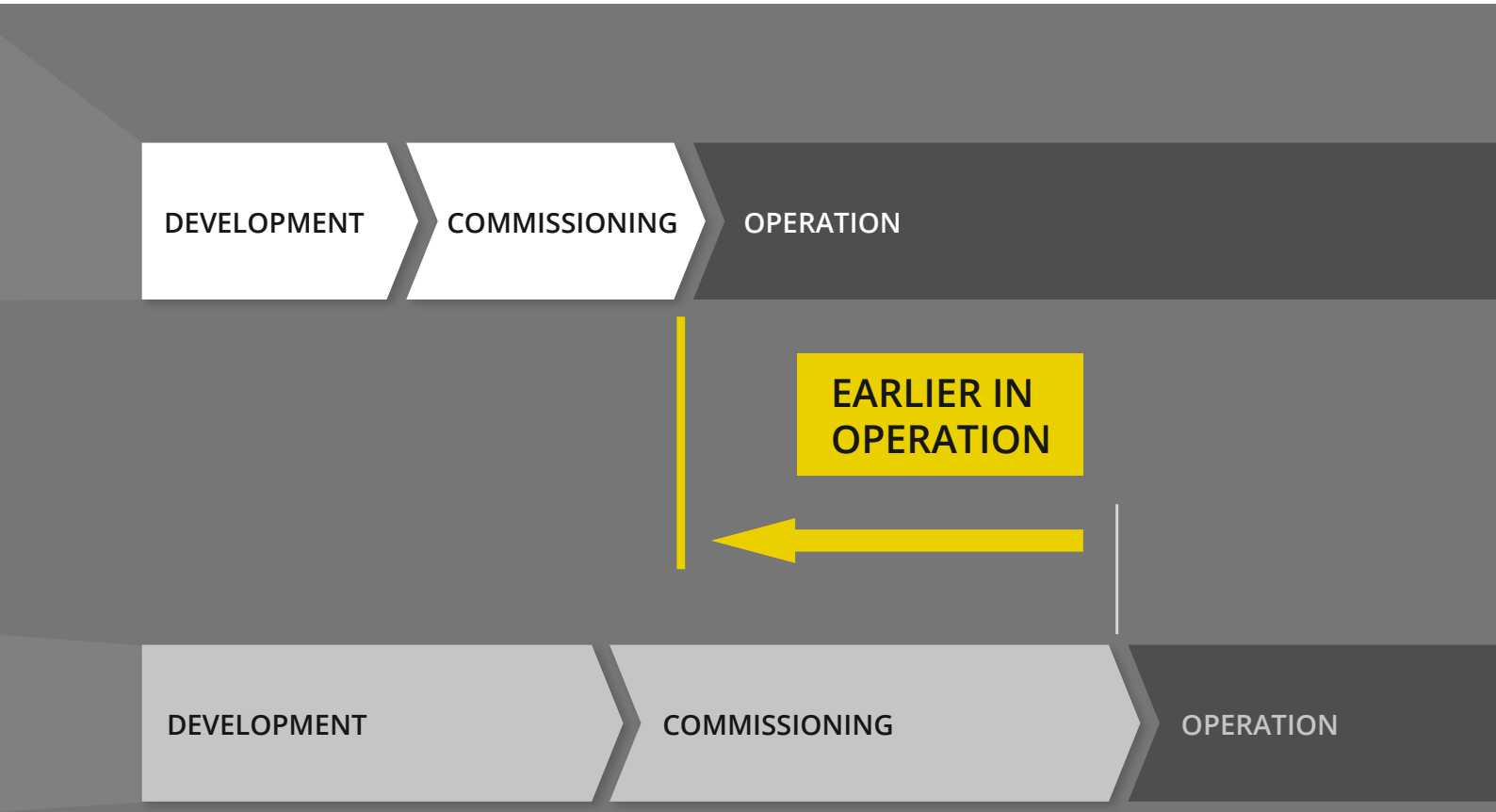




When plants are becoming increasingly more complex mechatronic systems, when more and more variants of a machine are required increasingly faster, when knowledge is becoming a critical success factor and the key metric for productivity – a new concept for machine and plant development is also required.

Extraordinary engineering solutions therefore perfectly link the different systems from mechanical engineering, electrical engineering and IT. Machines are broken down into logically independent function units (components) and thus reduce complexity. This increases engineering quality, decisively reduces time-to-market – and also provides sustainable and future-proof solutions.

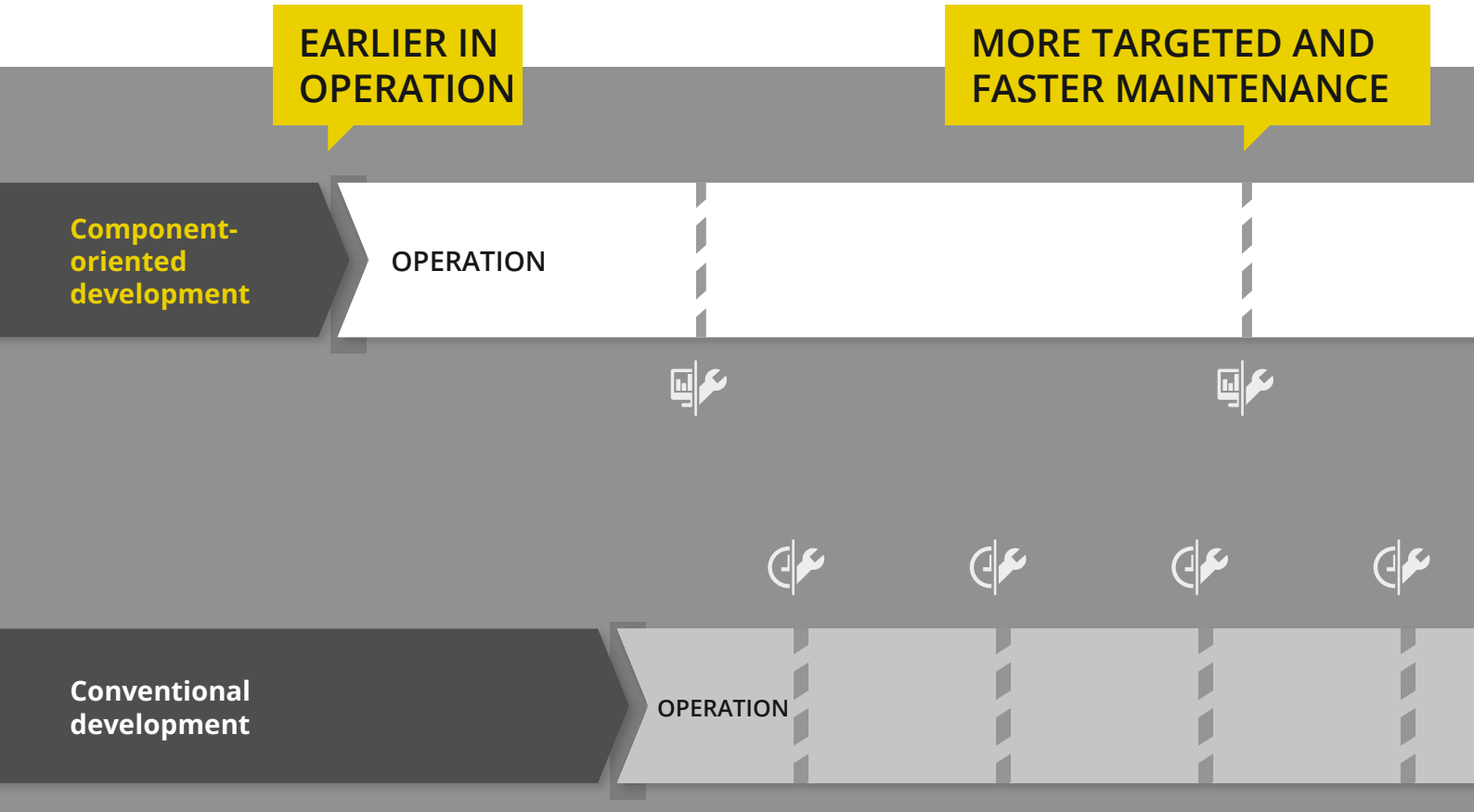
Faster to the market with parallel development: Combine software creation, mechanical engineering, electrical engineering and service already in the engineering phase.



Engineering for the long term

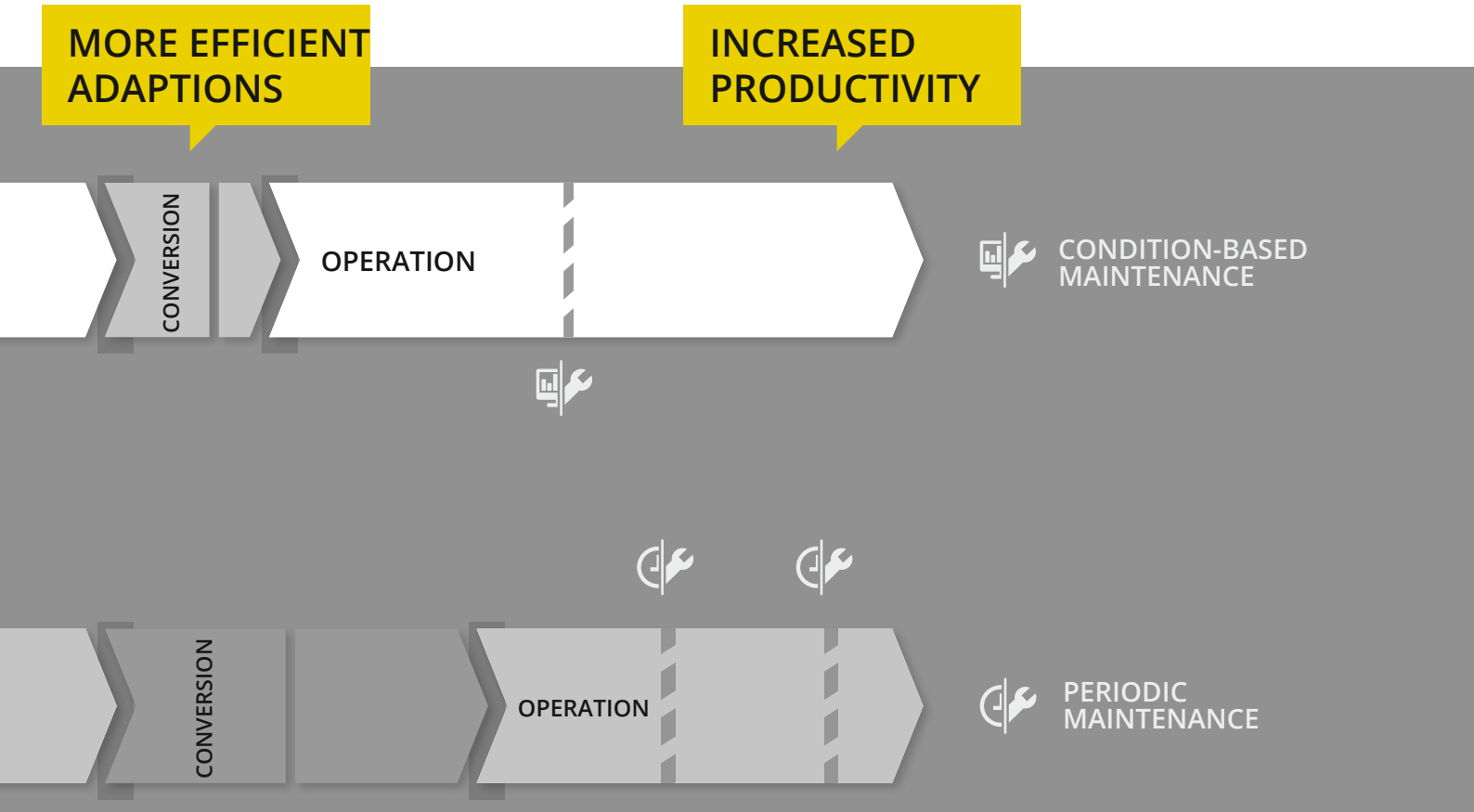
Future automation

Machines and plants are often in operation for more than 20 years. In this time, machines are mostly converted multiple times, plants extended, new functions implemented. A consistently implemented component-oriented approach in the engineering not only ensures that the software can be reused several times, but also makes it possible to make adaptions simply and efficiently – and thus adapt to customer and market requirements that are changing faster and faster.



With the help of intelligent software concepts, turning an actual store of knowledge into a machine becomes reality: Usage data gives valuable suggestions for optimizing the processes. It also provides facts about the actual use and wear.

This is useful, for example, for condition-based maintenance – precisely at the right time, planned and therefore highly efficient. Downtimes are reduced, availability maximized – and machines and plants stay in operation for longer.



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