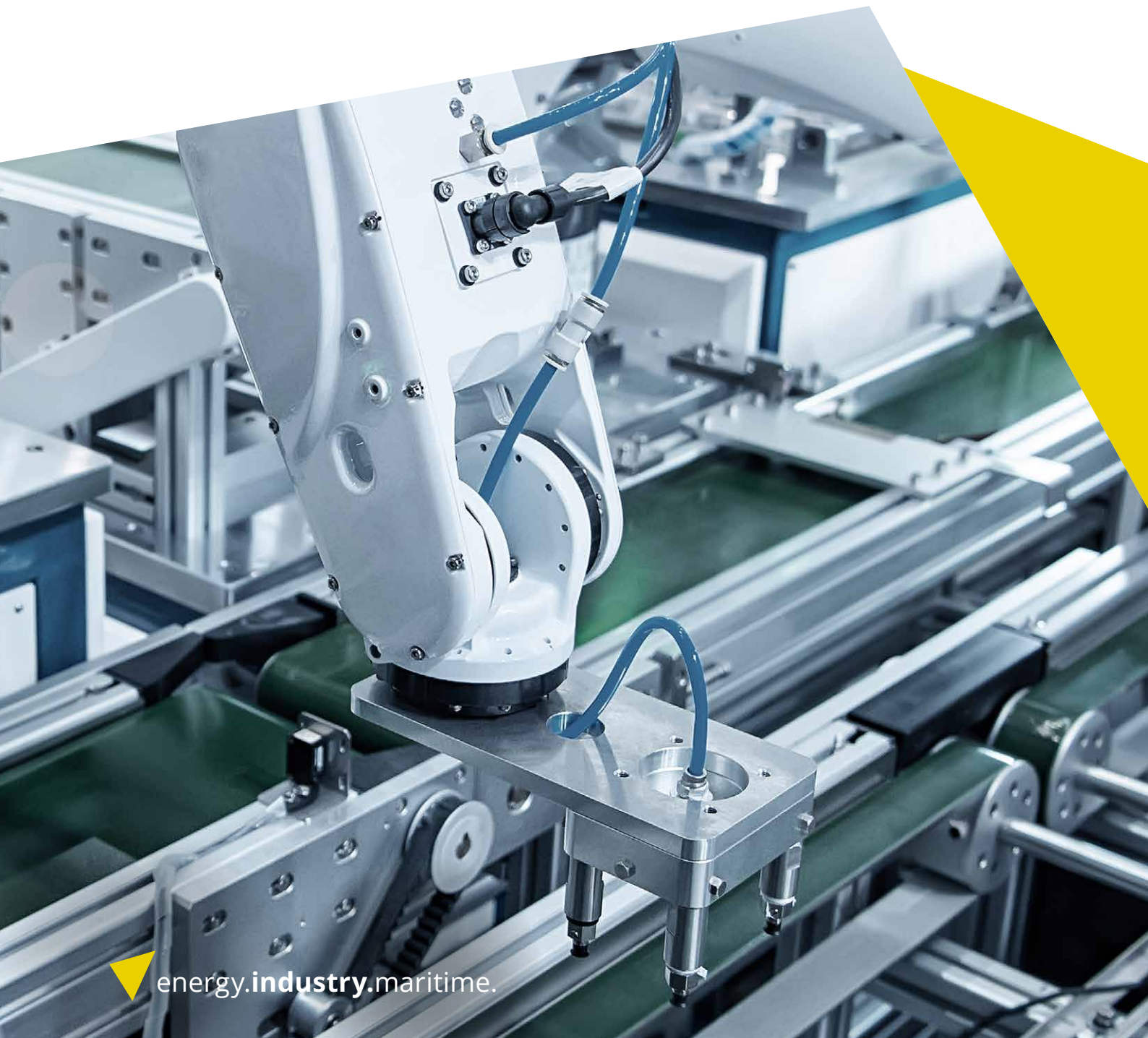


the power to control

bachmann.

Industrial Automation

Mechanical Engineering. Plant Engineering.
Customized Solutions.



energy.industry.maritime.



Sophisticated system solutions for all sectors

Challenges wanted

Bachmann electronic offers customers worldwide in industry and mechanical engineering innovative and highly available automation solutions even for the most demanding requirements and extreme conditions. We supply tailored solutions that meet specialized market and customer requirements. Today and in the long term.

50 years of automation experience in the following sectors:

- Steelworks and rolling mills
- Casting and primary forming
- Forming
- Productronics
- Plastic
- Special machine building



Big Data and other big Requirements

*No major challenge for Bachmann,
but a long-standing technological standard*

The automation world is varied and correspondingly complex. Just as large is the demand placed on the technologies, which may vary according to the type and location of the application. Bachmann system solutions are at home anywhere in the world, and the meeting of international requirements in terms of innovation and security has always been part of our standard program.

Investment Protection

- Scalability – the same software for all CPU performance classes
- Compatibility – for long-term availability
- Robustness and availability – 99.96% availability, confirmed by customers
- Harsh environmental conditions – shock and vibration, EMC and high temperatures (+70 °C) are no problem

Technological Functions

- Die cushion solution including pressure and position control
- Metal powder presses – upper and lower piston, stamp, central pin, and feeder
- Die cast controller for cold and hot chamber machines
- Drive control for rolling mills
- Adaptive multi-zone temperature control
- And much more...

Industry 4.0

- Private Cloud – fleet management for machine monitoring in the field
- Graphical evaluation (dashboards) in pure web technology
- Over 15 years of condition monitoring experience – 6,500 systems installed
- Communication protocols for networking (OPC UA Server and Client, PROFINET, EtherCAT, Modbus, etc.)

Visualization in Pure Web Technology

- Pure HTML5 with SVG and Javascript
- Scalable solutions – integrated PLC, SCADA, and private cloud systems
- Comprehensive project design in one engineering tool
- Extensive user libraries and examples

Innovative Engineering

- Free choice and combinability of programming language (IEC 61131-3, C/C++, MATLAB®/Simulink®)
- Software modularity – component-oriented development
- Model-based development (code generation without manual intervention, SIL, HIL)
- Integrated diagnostics, online data recorder (sampling rate of up to 100µs)
- Graphically configurable logic functions e.g. for end-user enhancements, safe and non-reactive

CMS for Industry / Predictive Maintenance

- High-quality vibration measurement with the AIC214
- Real-time ISO vibration levels for machinery protection
- Periodic, high-resolution measurements to enable predictive maintenance
- Expert vibration analysis
- Special solutions for high-load, slow-moving components
- Anomaly identification for early fault indicator detection
- Supports machine operation under fault conditions
- Extensive web-based visualization, reporting and data access

The Future in View

*Our automation solutions set new standards –
worldwide and around the clock*

With an innovative mindset driven by years of experience and a passion for knowledge, we focus our attention on four areas:



b.control



Automation: Scalable. Robust. Versatile.

Thinking further, always keeping one step ahead, staying open for everything that the future will bring – this is our mission at Bachmann and what makes our automation solutions so special. A holistic system, perfectly tailored to the individual requirements of our customers – today and in the future. The core of every Bachmann system solution is the Bachmann automation system: a modular hardware and software concept that guarantees maximum availability, future investment security and engineering efficiency.



b.grid



Grid Measurement, Protection and Control: Safe. Fast. Stable.

A scalable range of integrable, multifunctional power meters are available as plug-in modules for the Bachmann automation system. The measurement of all characteristic grid variables such as voltage, current, power or frequency directly within the control system allows significant correlation with other operational data, as well as an excellent reaction time. The measured data is rapidly calculated without additional delays due to fieldbusses or transceivers.



b.operate



Visualization and Operating: Visualize. Web compliant. Versatile.

In the automation industry, approaches such as Industry 4.0 and the associated breakdown of the rigid automation pyramid are widely discussed but rarely followed through. Unfortunately, solutions closely following this rigid principle are still frequently found in the field. The visualization solutions from Bachmann take a different approach. To advance the digitization in automation, our solutions focus on flexibility and freedom.



b.guard



Condition Monitoring System: Planning. Detecting. Preventing.

A Condition Monitoring System (CMS) integrated in the automation system can provide all information, in order to detect failure hazards early on and plan maintenance tasks in good time. With increasingly competitive markets and industries, companies are challenged to run their organizations with ever more output and greater efficiency. Knowing the health of assets has become key to increasing company productivity and profit.



The Bachmann Automation System

Solutions for industry and machine building

We understand the big picture and are always thinking ahead for you. Our innovative solutions ensure efficient engineering of your plants. This is what the intelligent automation of state-of-the-art industrial plants looks like.

For the toughest Requirements

The controller system that does everything

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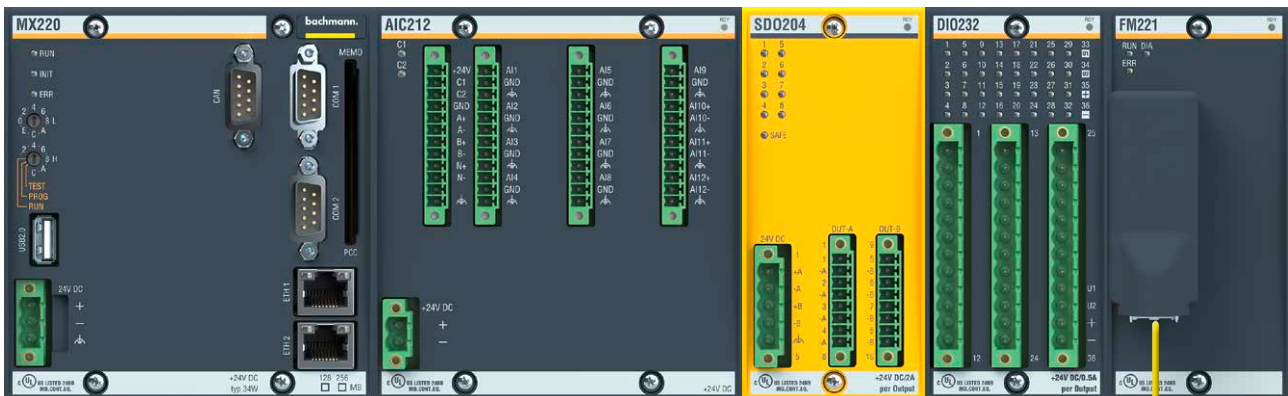
For the Toughest Requirements

The controller system that does everything

The Bachmann controller is the core of Bachmann's innovative and holistic automation solutions and offers maximum availability and robustness. This enables use even in the most challenging environmental conditions.

Individual requirements can be met without any problem with a wide range of powerful CPUs based on industrial processors and with an extensive range of I/O modules. Real-time capable bus systems enable the automation to be decentralized without any losses in performance. The Bachmann

controller perfectly combines here the openness of a PC-based controller with the reliability of industrial hardware platforms. Thanks to a system architecture with all-round networking capability it can be integrated easily in the area of the controller and plant peripherals.



Programming

- Multitasking, unlimited tasks, 256 priorities, 256 different software modules
- C/C++, IEC 61131, MATLAB®/Simulink®, 20-sim, UML-enabled
- Libraries for software controllers, protocols, sectors
- Universal function and variable interfaces

Visualization

- Pure web-based visualization with M1 webMI pro and atvise® scada
- Vector-based display (SVG)
- Open standard interfaces such as OPC UA
- Ready-to-use sector libraries, templates

I/Os

- Dedicated I/Os with high signal density
- Multi-purpose I/Os (GIO), each channel can be individually configured for any signal type
- Special I/Os, e.g. precision measuring, ...
- Condition monitoring, grid measurement/synchronization
- Proportional valve amplifier (PVA)

Modularity

- Wide range of modules right up to special modules
- Safety modules, central or decentralized solutions
- Function modules with flexible I/O features
- Intelligent remote I/O stations

Safety and Service

- Integrated safety – up to SIL3/PLe
- IT security, including encryption, access control
- Teleservice, web server
- Removable memory – easy replacement for servicing

Recommended CPU

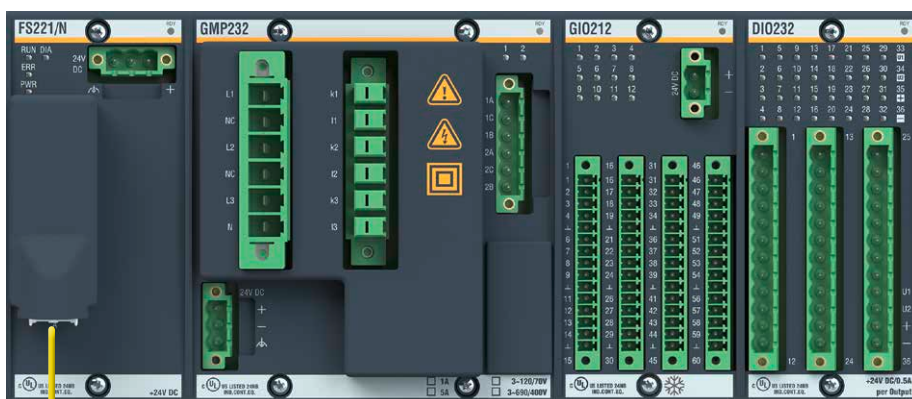
- Scalable CPUs with 1 to 50 fold performance
- I/O accesses in μ seconds
- Interfaces integrated: RS232/485, CAN, Ethernet, USB, ...
- Integrated equipment (nvRAM, large working memory, removable memory)
- Asynchronous program starts in response to (signal) events possible within $<10\mu$ s

Networking

- Standard fieldbuses
Profinet RT, IRT, CAN, CANopen
EtherCAT, DeviceNet
Modbus UDP, TCP, RTU, ASCII
- OPC solutions
OPC Enterprise Server, OPC Standard Server
OPC UA Server, OPC UA Client
- Server and client for telecontrol protocols
IEC60870-5-10x
IEC61850 (MMS + GOOSE)
IEC61400-25 (MMS)
DNP3

Robustness / Reliability / Availability

- Stable, field proven metal housing
- Vibration-proof screw fastening of connectors and modules
- Climatic range from -40 to $+60$ (70) $^{\circ}\text{C}$, fan-free
- Integrated diagnostics in continuous operation
- Long-term continuity, downwardly and upwardly compatible
- Quality – traceability (barcode sticker, DB recording)
- 100% sample testing, e.g. via 48h run-in test



Operating the Future

— *With web visualization in machine and plant engineering*

The question of what is the right visualization solution arises with every new generation of machine or plant, or often through the undesired consequences of product discontinuations. The requirements placed on the user interface are varied. It must be modern, intuitive and user-friendly, and must also represent the mostly unseen technology, quality and reliability.

Besides the main task of a visualization solution, the safe operation and visualization of a machine or plant, there are a number of non-functional requirements today that users wish to see implemented: for example, the user-friendly and intuitive handling that they are accustomed to from the use of smartphones and tablets.

New requirements placed on visualization

The increased expectations of users also present the developers with new challenges which have to be met with state-of-the-art solutions on the one hand, whilst not exceeding a reasonable budget limit on the other. From a financial point of view, the initial development effort required for a new visualization solution is critical and depends on various factors, such as know-how and the qualification of the development team. However, it also depends on the integration capability of prefabricated components as well as the underlying system architecture. Software maintenance and re-usability also play an important role in the cost estimate.

Less dependence through standardization

In the field of communication there have been quite a few advances in visualization hardware: The times when proprietary field-

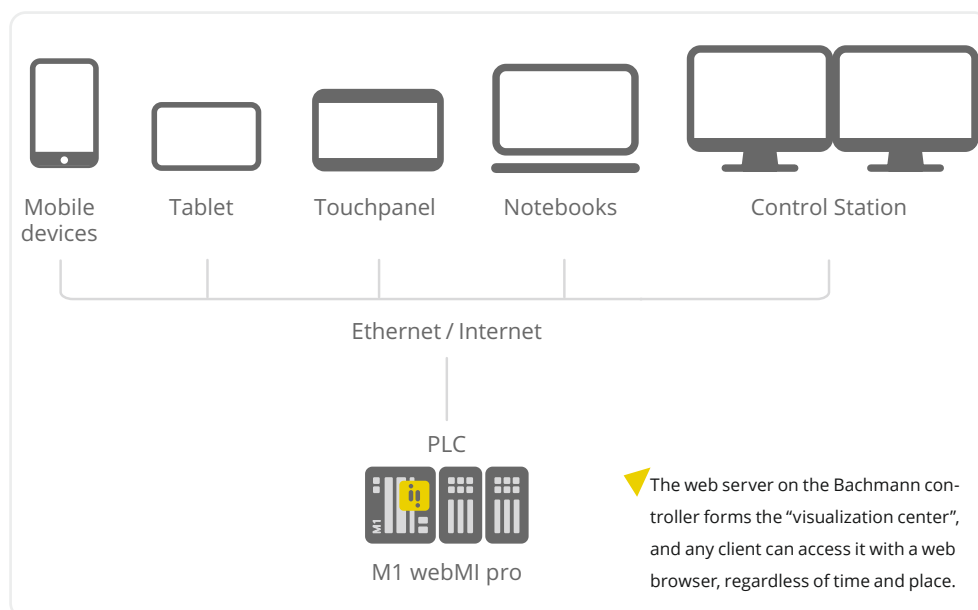
bus communication restricted customers to the already specified controller manufacturers have long passed. Nowadays, solutions that cannot communicate via Ethernet must always be considered questionable. In terms of software, web-based solutions have long been the industrial standard. Today, the requirements placed on visualization devices are only restricted to the provision of an Ethernet interface and a web browser.

Web-based visualizations on the rise

The use of a web-based visualization offers a large number of benefits. Several panels in a plant can be used in multi-client mode without any additional effort required. The integration of mobile terminals thus becomes child's play. With the client-server principle, data storage and application are run centrally on a server and redundantly if necessary. Ideally this is integrated directly in the controller. This reduces software and hardware costs as well as work effort – also for repairs. An important criterion when selecting a web-based solution is that it is a native web-based technology and that it doesn't depend on browser plug-ins, which are now less commonly used.

Benefits of a complete solution

The freedom to choose the products of differ-



ent manufacturers also means having to take on some of the responsibility for the smooth functioning of the overall system. This includes increased integration and testing requirements, and possibly also additional development effort in order to adapt the software on the visualization system accordingly. On the other hand, with a complete system, made up of a single-sourced controller platform, visualization software and hardware, the responsibility for fault-free interaction is clearly placed at one specific location.

Widescreen and multi-touch

The trend towards visualization with wide-screen diagonals and projective-capacitive multi-touch glass interfaces has long arrived in the industrial sector. When you consider that the coming generation of machine operators has grown up with smartphones and tablets, it becomes clear that even simple gestures like pinch-to-zoom will soon become indispensable, and should also therefore be supported by the visualization solution and its development tools.

The Bachmann visualization platform

Bachmann electronic's M1 webMI pro web visualization and the OT1200 web terminal product series are a perfectly matched complete package, which masters the visualization requirements mentioned with flying colors. The M1 webMI pro web server runs as a lean and high-performance software directly on the controller. With pure web technology with HTML5 and freely scalable SVG graphics, any device with a web browser can be used as a user interface regardless of the operating system. Alarms and data historization are provided as well as user management, access security and the possibility of language selection. The web terminals of the OT1200 series, with their brilliant displays and well thought-out functions, provide the perfect hardware platform that is optimally integrated. Depending on your requirements for the touch technology, you can choose between the analog-resistive touch screen and the projective-capacitive multi-touch screen – both with Bachmann's usual high standards in terms of quality, robustness and long-term availability.

BENEFITS

- Any browser-based device becomes an HMI
- Loss-free scaling on all screen sizes
- Use of the application on different devices (smartphone, tablet or stationary HMI devices)
- Short refresh in the browser instead of time-consuming software rollouts
- Integration in higher-level SCADA applications
- As safe as Internet banking (HTTPS)
- Operation and visualization when and where you need it



More on this topic is provided on our website

Progress as a Standard

*For independent operation and visualization
with atvise® scada*

Local operation, teleservice and control center with just one solution, operation and visualization from any terminal device, anytime and anywhere – everything without the need to install a specific client: Industry expects a great deal from today's HMI and SCADA systems. Adequate and flexible solutions require modern systems developed in line with standards. atvise®, the market leading solution, shows how it functions.

BENEFITS

- *Web browser as client, without additional plug-ins*
- *User interfaces in pure web technology*
- *Device and operating system independent (HTML5, SVG) PC / Mac / Unix, tablet, smartphone, iPad ...*
- *OPC UA process connection*
- *Online engineering / multi-user*
- *Incremental historization and OPC UA-compliant aggregation of untreated values*
- *Online/offline in pure web technology*
- *Online language/font selection*
- *Server-side Javascript run-time environment*
- *OPC UA data access and alarm conditions interface to higher-level systems*



*More on this topic
is provided
on our website*

“native web technology” vs. “web based”

Whilst the web, with its several browsers, offers many benefits for the operation and visualization of systems and processes, one should pay special attention to the wording when selecting tools. There is a great deal of difference between “native web technology” and “web-based” HMI. As atvise® solutions are implemented in native web technology, users of the powerful HMI only need a web browser without any additional software installations or plug-ins such as Java, ActiveX, Flash or Silverlight. Only native web technology actually only needs a standard web browser and nothing else! Only then do you have free choice as to which device you use to call up your visualization: Windows PC, Android and Apple devices, Blackberry, industrial panels, etc.

Combined with OPC UA

atvise® HMI & SCADA solutions have been implemented seamlessly on the basis of the modern OPC Unified Architecture (OPC UA) standard. This is a platform-independent, industrial communication protocol which was developed as the successor to the classical OPC. OPC UA not only supports the properties of this protocol but logically enhances it in

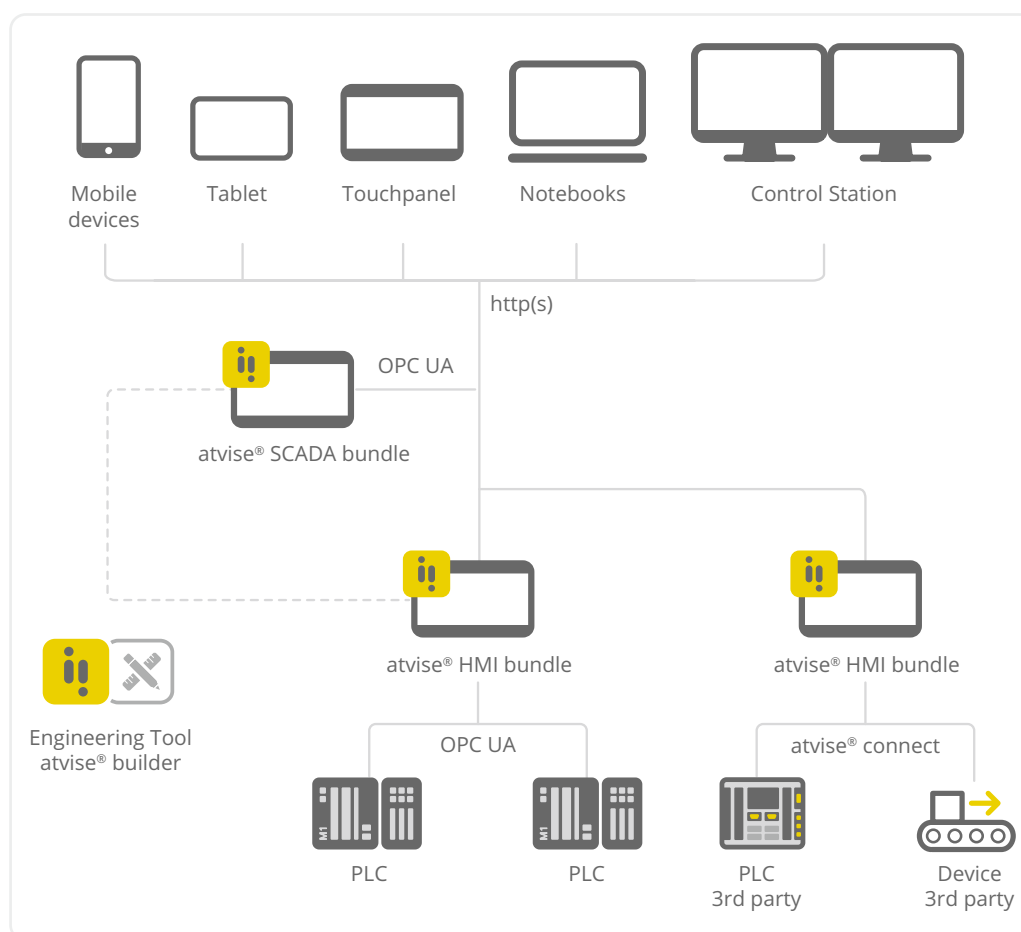
many areas. In this way, OPC UA now provides the infrastructure required for interoperability in the entire company – from M2M via M2Business and everything in between.

Supported by Bachmann

When deciding to modernize systems and also completely redesign the necessary controller technology, you should consider a seamless implementation based on OPC UA. Bachmann is one of those controller suppliers that have been supporting this communication standard all along.

“Standard” benefits

The benefits resulting from an OPC UA implementation are easy to outline with atvise® scada. If a compliant PLC system is docked via OPC UA, all object types and their instances can be transferred 1:1 into atvise® scada. Alarms, historization and displays for the visualization in SCADA can now be added to these objects from the transferred data structure and can then be inherited by the instances. This means that data point lists no longer have to be kept in duplicate and time consuming export/import processes or multiple inputs finally become a thing of the past. The reduced complexity and thus improved



▼ The world of control technology in entire production plants is not uniform. That's why atvise® scada speaks to all manufacturers.

legibility and simpler commissioning also make programming more convenient than ever, just like the automatic transfer of changes to all connected systems. As the atvise® server is also an OPC UA server, it makes its data available – open and standardized – to external third-party systems if required, such as operational control systems. The historized data can also be queried accordingly via OPC UA.

Different display options

The scalability of the visualization has proved its worth considerably: The graphical display for different operator panels can be implemented with one and the same system just as easily as for the full-fledged SCADA control center. atvise® enables convergent displays to be implemented in just a few actions. This therefore enables different visualizations within a project to be accessed with different terminals without any problem. A further option in the HMI display for different terminals using atvise®

solutions is the responsive web design. Whilst several displays were needed with the previously described variant, responsive web design only requires one single version for the visualization. Also here, atvise® scada offers the technical possibilities for seamless integration of responsive web design.

atvise® product line from Bachmann

The possible applications described, the straightforward use of firewalls, the elimination of the need for client installation and maintenance because only a web browser is required on the terminal, are only some of the benefits that have caused Bachmann to be impressed by pure web technology for HMI applications, and have an atvise® product line in its portfolio.

This enables efficient object-oriented engineering as well as extensive plant operation at any location and with any device and any standard web browser.

Optimum Protection for the Worst Case Scenario

— With ready-to-use security for Industry 4.0

Modern business models for plant and machine manufacturers require access to controller networks and control consoles via Intranet and via the Internet. This advanced networking makes unauthorized access to unprotected plants a lot easier. A problem that Bachmann recognized a long time ago and as a result secured its products accordingly.

Teleservice requires security

In the face of increasingly tougher competition, developers of machines and plants are forced to reduce their costs. The focus here is on reducing the time required for onsite service and the development of dynamic maintenance measures. This requires the ability to acquire machine data and transfer it to the service center. All plants are continuously monitored here, whilst an expert uses specified criteria and experience to determine the correct time for the next maintenance.

Cloud services make it possible to ensure that the schedule of the service personnel is updated weekly according to maintenance priorities and that the required parts are available in stock. It goes without saying that the transmission and storage of data must be implemented securely. For the machine operator, the ability to control the data and access individual machines is even more important.

Encrypted memory areas and files protect critical data such as log files or recipes. A highly granular access control enables access to individual files and even variables to be granted or forbidden for any user. This is monitored

by means of a central security protocol which logs each login and logout, as well as all modifications, and thus also serves as a useful tool when warranty claims arise.

Danger from faults and operating errors

Selective security management not only helps with unwanted and potentially destructive hacker accesses. In the protected environment of production plants in particular, accidental changes to machine parameters, the failures of network components or configuration errors in the machine network are more frequent, but are equally significant in terms of symptoms and consequences as security threats. Unlike other security measures, the added value of fault detection can only be achieved if the appropriate protection measures function directly on the controller.

For example, Bachmann equips its controllers with functions for limiting the band width of the network in order to increase the protection against intentional and unintentional network faults. Real-time processes are not affected by the overloading of the network interface. The measures already described for access control

BENEFITS

- *SSL encryption*
- *Convenient user and password management*
- *Access protection to variables level*
- *Memory protection*
- *Access logger in the operating system*
- *“Out-of-the-box”*



More on this topic is provided on our website

and monitoring also function here. These help to prevent unauthorized function calls and also in the worst case to identify any potential error sources.

Security for all – “out-of-the-box”

By using our security solutions, our customers can rely on the fact that their data and ideas have the best protection. Bachmann is fully aware of this responsibility. Conformity with the latest requirements and standards, such as the BSI compendia for ICS (Industrial Component Systems) or ISA99/IEC 62443, is ensured. The entire CPU product range of the MC200 series is supplied with all security functions. This therefore provides the user with an optimized ready-to-use security package and all this at no additional cost.

Bachmann regards the large-scale application of security functions as its responsibility, even if there are no comprehensive security concepts in place and the users are not security experts. Based on its many years of experience in the equipment of critical infrastructure plants, Bachmann offers a broad and nevertheless easy to manage overall concept for security already today for the entry into Industry 4.0.



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)



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
- Protocol support for certificate management (SCEP), authorization (LDAP) and logging (syslog)



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

Safety without Compromise

— Thanks to a fully integrated safety solution

Whether for a simple emergency-stop function at the machine console or distributed safety technology with optical sensors, redundant cabling and the control of emergency-stop categories in modern servos: The SLC284 programmable safety module, the SCT202 safety encoder module and the SDI208 and SDO204 safety-related digital I/O modules from Bachmann offer a safety solution that is fully integrated in the Bachmann automation system.

The two-channel safety modules enable input and output channels to be connected redundantly in pairs. The SCT202 is the new pulse counter module in the product portfolio with integrated speed measuring for detecting safety-related (rotary) movements. All modules can also be operated without a configuration remotely in the network. The configuration and programming of the safety functions are integrated in the SolutionCenter all-in-one engineering tool, thus enabling standard PLC tasks to be linked seamlessly with the requirements of functional safety.

Man at the center

Fast reaction times, intuitive operation and extensive diagnostics options are at the center of the Bachmann safety solutions. The user obtains an optimum level of safety: Established standards such as ISO 13849, IEC 62061, EN 61511, EN 61508, PLCopen Safety and IEC 61131 are used, and the development of proprietary solutions is consistently avoided.

Integrated safety solution

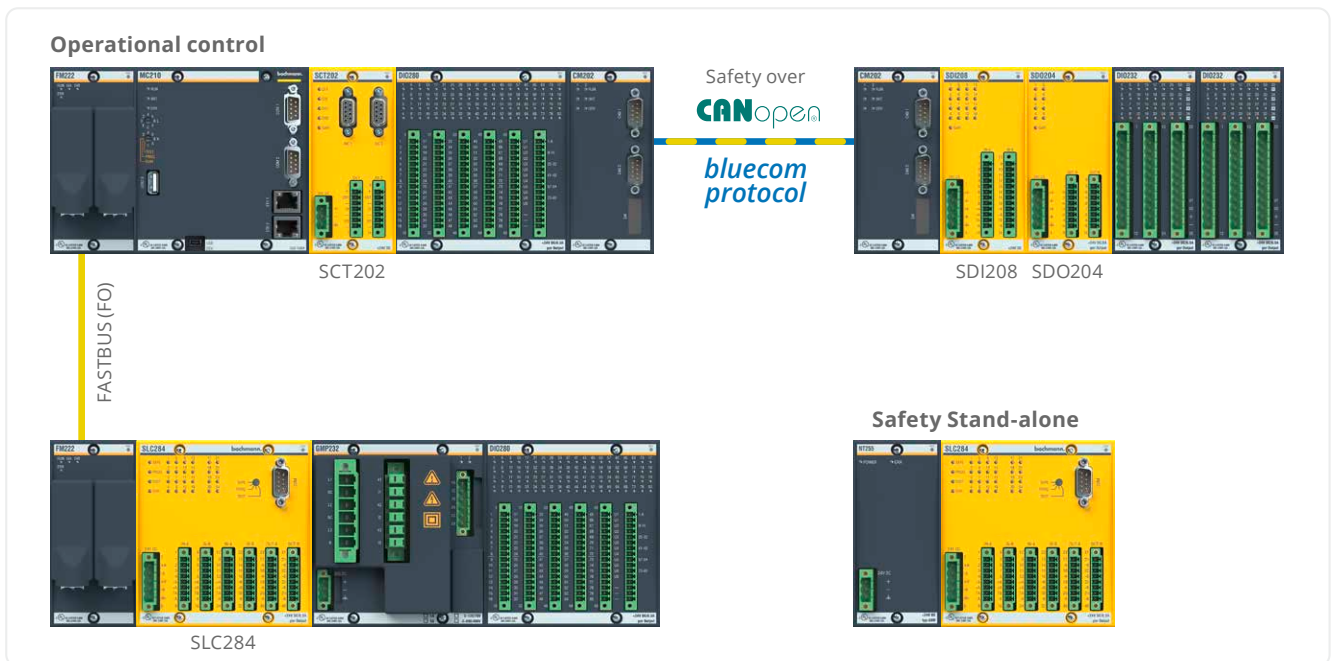
Through the possibility of mixing safety and non-safety channels, and the availability of all I/Os in the software, double wiring can be avoided, thus considerably reducing costs.

Tools for safe application programming

Bachmann offers a collection of tools for safety-related application programming to round off the fully integrated programmable safety solution. The Safety Developer is a central interface between the programmer, user and hardware, and provides support together with other elements of the SolutionCenter for an economical implementation and the high safety standard specified by the hardware.

Configuration, project management and programming for the most demanding requirements

The safety modules are fully integrated in the Bachmann controller system and are therefore also integrated in the SolutionCenter all-in-one development environment. As with all system components, online and offline configuration, firmware updates and extensive monitoring, in tables and also via the Scope functionality, are carried out in the Device Manager. The engineering environment also includes the user-defined project management function, if required also with server-based version control. This enables several developers to operate on the same project at the same time, and test phases as well as release procedures become simpler. It also enables the normative requirements for the full documentation of safety-related application software to



▼ Safety technology fully integrated in the Bachmann automation solution.

be implicitly fulfilled as an additional benefit. The actual programming of the safety applications is carried out in the FBD editor, supported by an extensive library of certified function blocks. More than forty function blocks fully tested in accordance with IEC 61131-3 and PLCopen Safety provide the basis for implementing applications of different complexity.

Creating user-defined templates with simple Copy & Paste

A central strength of implementing safety concepts in the software compared to the use of “wired solutions” is the fact that once programming is completed, they can be kept in a secure archive after successful verification and validation and used in series. Furthermore, reusable sections can be taken out later in easy steps in the Safety editor and handled as user-specific compounds. This improves management and reduces the possibility of errors, whilst saving time for future programming projects at the same time.

Safety in series

The “modular machine” function was specially developed for series machine building. It supports the developers in the simple implementation of safety systems in the plant series and machine options. The basic idea behind this is the fact that a plant often consists of several machine sections around a basic machine (see graphic). Expansions, such as feeders, automatic removal and packaging units, are not required by every customer or are only ordered later.

Safety Developer – the safe choice

The Safety Developer supports programmers in many ways. Safety applications can be programmed, visualized and maintained more safely and quickly with this toolbox. The Safety Developer provides extensive help in documenting the safety project in order to support the validation of safety application programs.

BENEFITS

- *Modular safety system (SIL 3/ PL e)*
- *Simple linking of safety and non-safety possible*
- *Integrated development tool with safety debugger*
- *Machine options and expansions possible without reprogramming*
- *Safety modules can be located as required in distributed systems, no separate communication routes required*



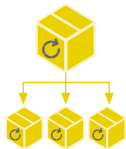
More on this topic is provided on our website

The Engineering of the Future

SolutionCenter – the all-in-one engineering tool

Modern – flexible – efficient

The call for greater modularity is getting increasingly louder. The controller platform of Bachmann electronic is ideal for a flexible hardware structure. The flexibility provided here is not just restricted to hardware modules – the software is just as flexible.



Good maintainability through modular application structure

A monolithic, software solution that covers all variants is difficult to maintain, let alone test. Dividing up software into several components is therefore the obvious solution and is supported on the controller by the software module concept and the multi-project management function in the SolutionCenter engineering tool.



Efficient use of the control system through the free choice of programming language

The software components for the particular task can be optimally created and debugged using the most suitable programming language. These components can be created and debugged efficiently in the latest editors. System-level C functions can be integrated easily in PLC applications via libraries.



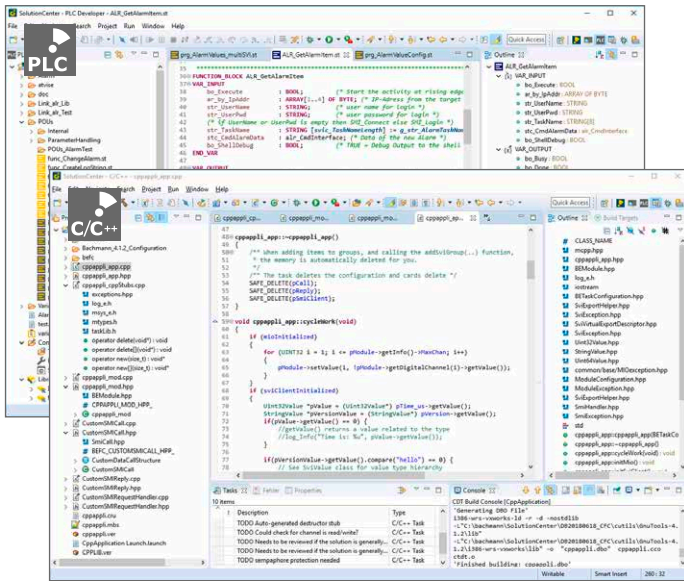
Ensuring functionality through component tests

Each component can be tested separately by applying test data to the inputs and comparing the resulting output signals with the expected values. Performing the tests on the target system also makes it possible to assess the time response.

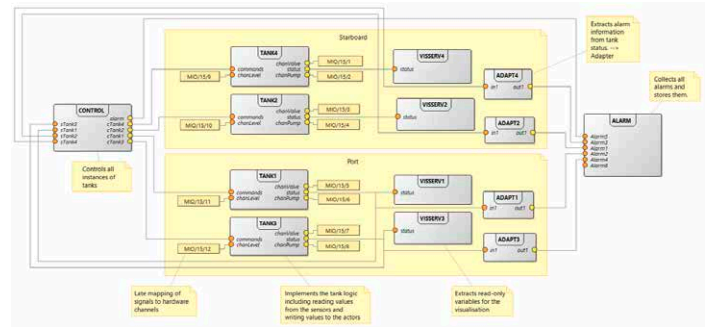


Reduction of complexity through commissioning in stages

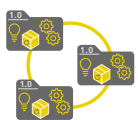
Individual mechatronic components can be developed, tested and partially commissioned before the entire application is completed. This means that the overall commissioning only involves the testing of the interaction between the individual components. The application logic is programmed independently of the hardware.



State-of-the-art editors for maximum programming convenience.



Easy linking of ready-to-use application logic with hardware signals and variables in the Application Developer.



Reduction of development times by reusing components

Components can be instantiated several times in an overall application. The linking to other components is carried out by configuring in the Application Developer. By reusing components for new developments, development times and the associated costs can be reduced considerably.



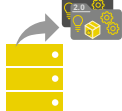
Increased quality through the versatile use of a component

It is possible to use one component in several applications. So-called technology components here can be implemented also for general tasks and thus provide versatile solutions. The quality of a component can be increased by incorporating user feedback to the interface and function.



Fast component exchange through clearly defined interfaces

Communication between the components requires the use of defined interfaces. This also enables software components to be exchanged easily. The interface description is stored in the software component and is used to validate the connections between the components.



Modular design through a centrally managed component catalog

The tested and documented components can be managed clearly in the Catalog view of the SolutionCenter. This catalog can be shared and extended in a team using SVN or GIT. An overall application can be combined in the Application Developer with drag and drop, and then transferred to the controller.

THE OPTIMUM ENGINEERING TOOL FOR EACH PROJECT PHASE

- Draft
- Programming
- Test
- Hardware mapping
- Commissioning
- Operation
- Optimization
- Service



More on this topic is provided on our website

Perfection in Motion

— *Through individually tailored drive solutions*

The requirements of modern drive technology are becoming increasingly more specific and customized. Even the most advanced systems with the most innovative drives include special drive solutions which have to meet the particular specifications set by the customer. Not a problem for Bachmann: On the Bachmann automation system, drive controllers can be selected irrespective of drive type.

Bachmann customers and partners can now make use of proven and highly optimized software regulators for different applications. Startup and diagnostics tools designed by experienced users and with graphical user interface simplify use. The selection of ready-to-use components ranges from the simple motion control of several axes to CNC and virtual shaft controllers up to special modules for sophisticated pressure or temperature applications.

“Drive Middleware” standardized drive control

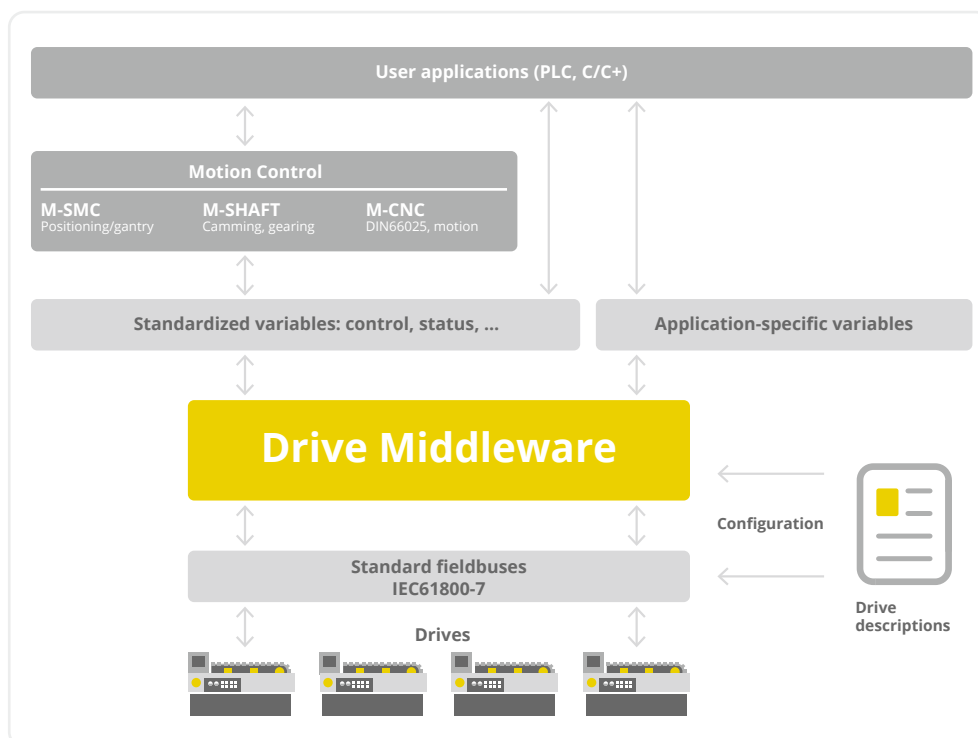
The Bachmann automation system features an open and universal interface to the drive engineering called “Drive Middleware”, which is implemented in accordance with the IEC 61800-7 standard. This makes it possible to create a motion application from logical drives, which use a standard vendor-neutral drive profile. Both the transmission through to the actually used physical drive, as well as its connection, are implemented intuitively and conveniently through the “Drive Middleware”. The investment made in a Bachmann motion application is therefore not lost when changing the drive supplier and therefore ensures long-term investment security.

Fieldbus independence

The standardized profile brings together the manufacturer-specific status machines, error routines, referencing methods and motion profiles by defining a logical drive based on PLCopen Motion. This is possible irrespective of the portfolio of the drive manufacturer. The independence from the type of fieldbus, and the standardization of the fieldbus profiles at the same time enable ready-made motion control applications to be implemented in a very short time and significantly reduce the training/maintenance costs of the different drive worlds. It is also possible to add more fieldbuses to the “Drive Middleware”, and manufacturer-specific parameters to the interface description.

Dynamic positioning

In order to position coordinated single axes or complex master slave systems (gantry axes) the highly efficient M-SMC Soft Motion Controller is available in the form of an easy-to-configure function module. Infinitely variable acceleration profiles enable jerk and machine dynamics to be adapted optimally to the requirements at hand. The integrated “Move-in-Move” function not only enables motion parameters to be changed online



Application development irrespective of the fieldbus used.

during operation but also the target position without having to stop the axis.

Shaft

The M-SHAFT motion function module simplifies the mapping of several synchronized positioning sequences in relation to a virtual master axis. Up to 32 different types of axes (position axes, switch cams, analog signals, ...) can be configured – in the same way as a classical camming shaft. Graphical or table-based settings for the position profiles, as well as the choice of different acceleration types provide a solid basis for complex machine sequences. Alternatively, the Table Interpreter can use individual support points to calculate an optimum positioning profile for maximum machine throughput.

Path movements according to DIN 66025

Machining systems using servo electric axes can be implemented in many cases directly from the design data. The geometry and

machining definitions in accordance with DIN/ISO 66025 have become widely established as a popular exchange format in computer-aided manufacturing (CAM). M-CNC provides a ready-to-use motion controller to convert this information into synchronized multiple axis motion. The simultaneous movement of two CNC controlled systems is also permissible in the same workspace. The systems are protected here by collision monitoring.

Model-based path generation

The use of M-Target (see page 28/29) perfectly combines the worlds of model-based development and drive technology. Mathematical models enable even complex motion sequences to be described simply in MATLAB®/Simulink®.

Cyclical setpoint definition is no longer a major challenge thanks to the automatic code generation. The Bachmann motion package offers everything required for a future-oriented automation solution – open, simple and functional.

BENEFITS

- Open for all drive manufacturers and many fieldbuses
- Library for the rapid commissioning of new drives
- Model-based path generation with MATLAB®/Simulink®
- Motion controller “out-of-the-box”
- Shaft controller for synchronizing different movements
- Powerful CNC controller
- End-to-end transparency and flexibility



More on this topic is provided on our website

Functional Support

M1 ServiceCenter

With the constantly increasing requirements of today's technology, service operations on machines or machine parks are unavoidable. The M1 ServiceCenter from Bachmann electronic offers the customer maximum support in the design of service operations, such as software updates or hardware replacements, and enables the simple execution and monitoring of the defined process operations directly at the plant or by remote access – even simultaneously on many plants.

BENEFITS

- *Software for automated service tasks (updates, backups, hardware replacement and configuration) on the Bachmann automation system)*
- *Catalog with "ready-to-use" operation functions*
- *Offline engineering*
- *Step-by-step instructions*
- *Live monitoring of the running processes*
- *Implementation for individual plants or large machine parks*
- *Automatic reporting (protocol of changes)*
- *Software can also be run without USB installation*

Versatile tool: The M1 ServiceCenter is a software tool that supports the user with recurring tasks for the Bachmann automation world. Software updates on existing plants, the backup of the running system beforehand, the loading of new programs, modifications to configuration files or even the connection of new hardware – these are routine tasks in the field of machine and machine service operations. In the M1 ServiceCenter, Bachmann has gathered the experience of customers performing these tasks and the obstacles they face. The resulting software implementation features normal applications from actual cases, thus enabling the customer to complete tasks easily, quickly and automatically.

Offline engineering

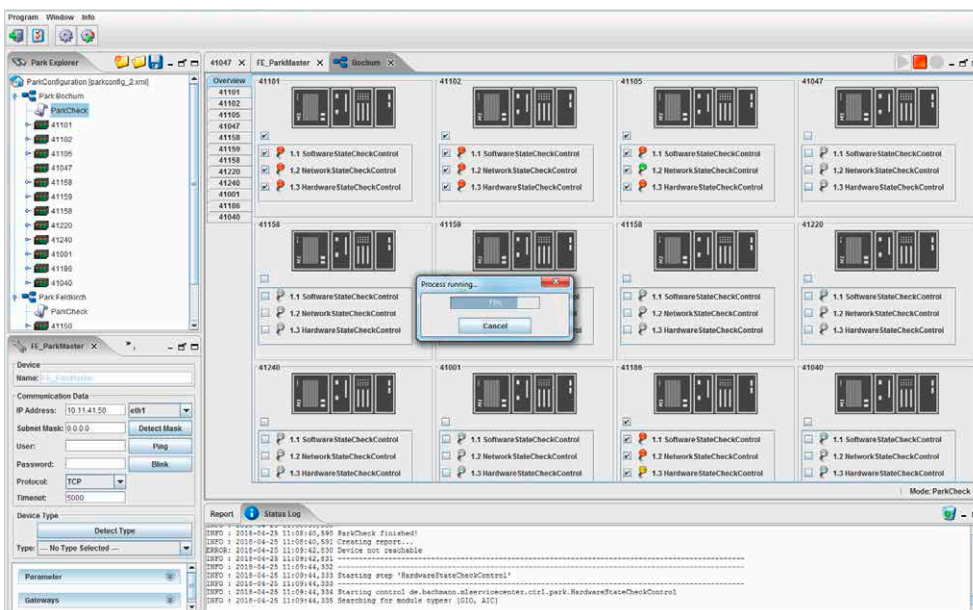
Service operations can be designed really

easily. A process configurator is used to collate and configure the individual process steps, such as an "M1 Applications" backup, by selecting them from a catalog of ready-to-use components. More complex process steps, such as the replacement of an Bachmann CPU with automatic backup and retention of data, are also included in the catalog. These contain step-by-step instructions, so that unskilled personnel can also complete these tasks without any extensive training.

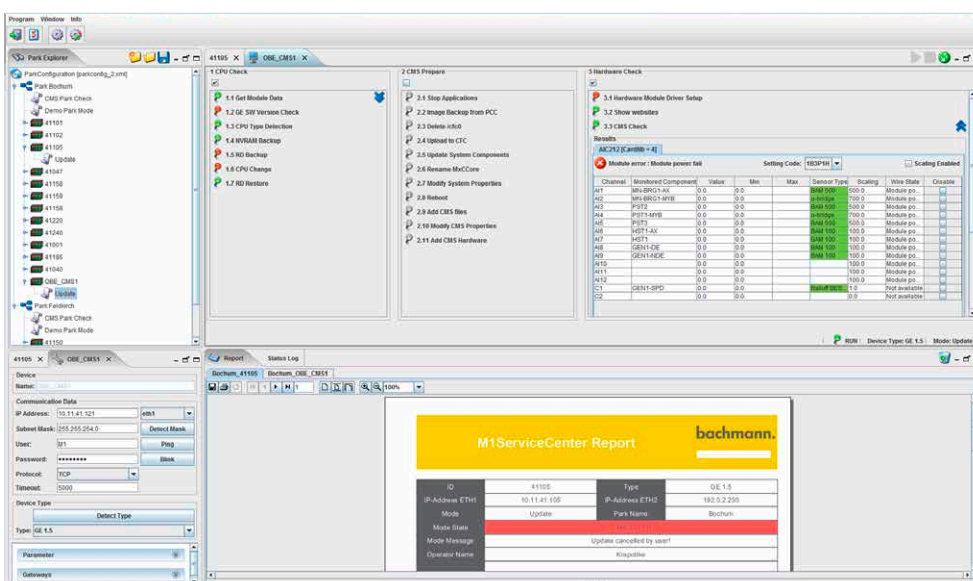
The process configurator also allows several process definitions to be managed clearly in a tree structure and also logically linked. The Process monitor view is used to manage the plants and farms in a tree structure. This topology can likewise be created and configured offline – access to an Bachmann controller is not required.



More on this topic
is provided
on our website



Machine park view:
Process started.



View of an individual plant:
Result of the process sequence.

LIBRARY FUNCTIONS

Software

- Information
- Start/stop of applications
- System version check
- Reading/writing variables
- "Mconfig.ini" manipulation
- Device protocol

Hardware/firmware

- Version check
- Firmware update/downgrade
- Safety (SLC) program upgrade
- Replacement
- Reboot

File handling

- Loading/storing/copying
- Automatic update
- Zip functions

Licenses

- Checking of RT licenses
- Automatic update

Communication/security

- Connection test
- CAN-SDO read/write
- M1 secure storage operation

Process sequence and monitoring

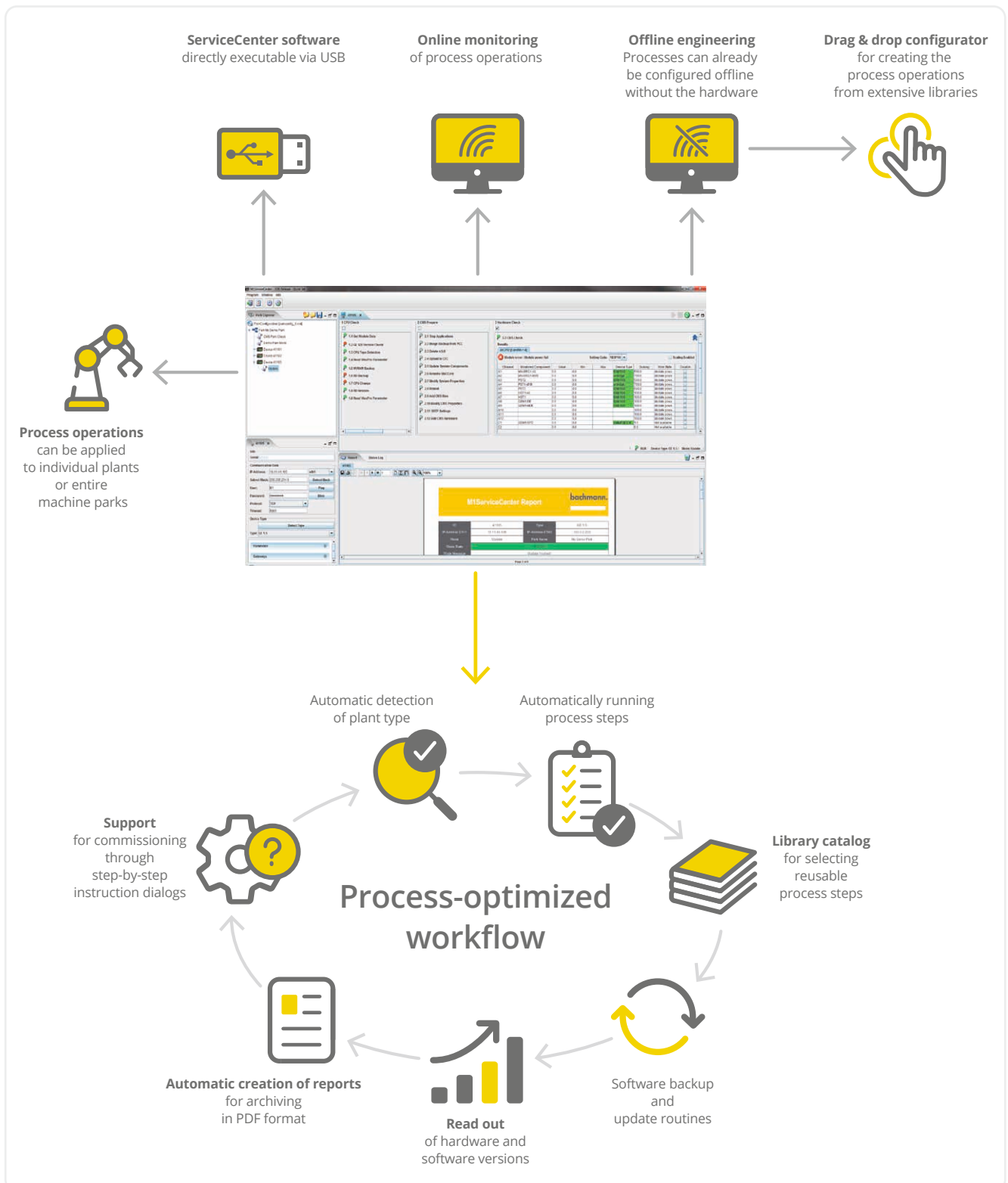
If a service operation has to be performed, the appropriate Bachmann controller, representing for example a press, is selected, and the process operation from the already created process definition assigned to this plant. The process steps are shown individually and, once the sequence has started, the user is shown the status of each individual step via color markings in the live view.

If a step fails, the appropriate message is written to a log file which can be analyzed both online in the program as well as later via a text editor. A report is created automatically after each pass, logging all executed process steps as well as their status. These reports are also made available in the program for viewing and are stored as PDF files.

The created service operations can also be assigned to the entire previously configured collective (e.g. machine park) and monitored in live view during execution. This application is particularly suitable for fetching remote information, such as the status data of controllers, information about installed software or hardware, as well as for performing file backups.



M1 ServiceCenter Service made Easy



Simulation and Model-based Design

— With M-Target for Simulink®

The growing size of industrial plants and the use of new technologies are increasing the requirements placed on the automation used. Leading manufacturers are meeting the growing complexity of operational control and the control algorithms required for it with new development techniques. These enable technically mature and highly available plants to be brought out whilst saving development effort at the same time.

- *Development of automation algorithms (open-loop and closed-loop control) with integration in the target hardware directly in MATLAB®/ Simulink®*
- *Simulation modes for the I/O modules used in the application*
- *Automatic code generation and transfer to Bachmann controller without additional parameter setting*
- *Online communication between the Simulink® development environment and the PLC program for parameter assignment and diagnostics*
- *Integrated interface to automation programs created in conventional programming languages (IEC 61131-3, C/C++)*
- *Integrated interfaces to visualization systems and other PLC systems*
- *Support for hardware-in-the-loop systems with regression tests and environmental simulation*

The design of comprehensive industrial plants instead of individually isolated subsystems presents engineers with a new set of challenges. Simple analytical calculations provide insufficient information on the behavior of connected systems. One possible solution is an empirical approach, in which the information acquired is used in the solution process. What do you do, however, if a prototype is too expensive or its operation too dangerous?

Simulation

Today's solution is: digital simulation. This enables the engineer to model the behavior of the entire industrial energy plant in the simulation environment of choice. Irrespective of the software used, mathematical interrelationships are ultimately used to describe the response of the system. The use of M-Target for Simulink® enables the automation solution

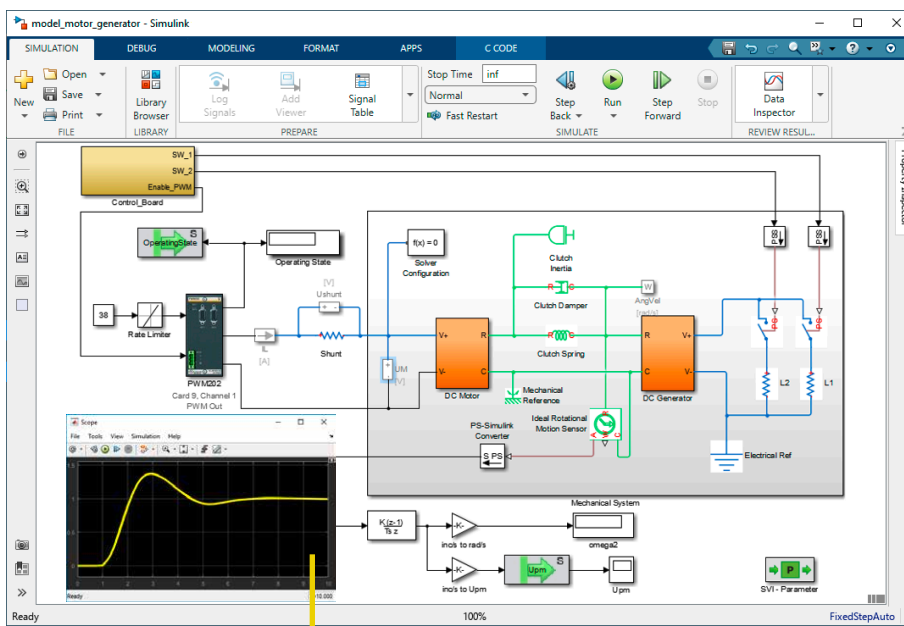
that is actually installed to be incorporated. The resulting virtual prototype is simulated as often as required, and the parameters used derived from the design versions. The viability and design risks of a new plant generation can thus already be drastically reduced during the development phase.

Quality and efficiency

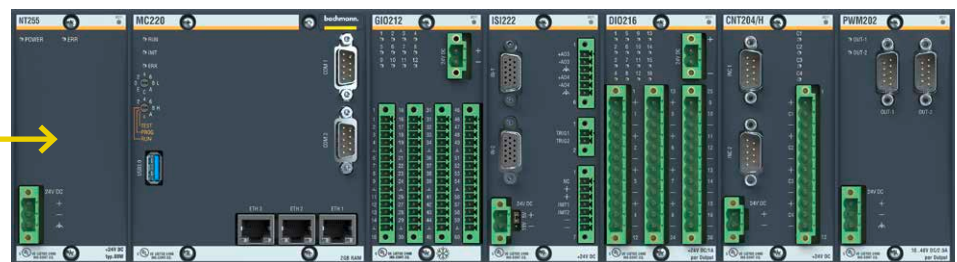
The engineer uses the simulation program not only for modeling plants, but also for designing the sequential and closed-loop control programs required for them. The use of new control concepts available increases the resulting product quality. Furthermore, the optimization algorithms used increase the yield of the industrial plant concerned. Solutions that were developed with M-Target for Simulink® come into their own in this discipline. The MATLAB®/ Simulink® tool from MathWorks is a well-established software



More on this topic is provided on our website



Simulation: Solution development on the computer model and direct download to the Bachmann controller.



in the market. The program package provides an extensive range of toolboxes and help for creating the simulation model. It also provides interfaces to other domain-specific simulation programs, in which subsystems were already simulated. The functionality of the entire model is then checked and adjusted until the required results are achieved.

Automatic code generation

In line with the model-based development methodology, the Bachmann controller code is then generated directly out of the simulation model. The code is generated with a single click and implemented by M-Target for Simulink[®] as a separate software module on the controller. Alternatively, M-Target for Simulink[®] can generate a library for IEC 61131-3, as well as C/C++ directly from the simulation model. This process is fully automated and does not require

any subsequent parameter setting on the controller. In this way, any subsequent compilation and configuration errors are excluded from the simulation from the start. The programmed controller is then available for use in a hardware in the loop (HIL) test setup, including regression tests, or can be operated directly in conjunction with the actual plant.

Cost optimized

The ability to also equip complex plants with advanced automation quickly offsets the inexpensive initial investment required. A transparent license model that does not require any quantity-based runtime licenses also simplifies the pricing of a completed industrial plant.

M-Target for Simulink[®] thus makes an essential contribution to the aim of “bringing better goods to the market faster”.

Temperature Control Reconsidered

— Adaptive Temperature Controller (ATeC)

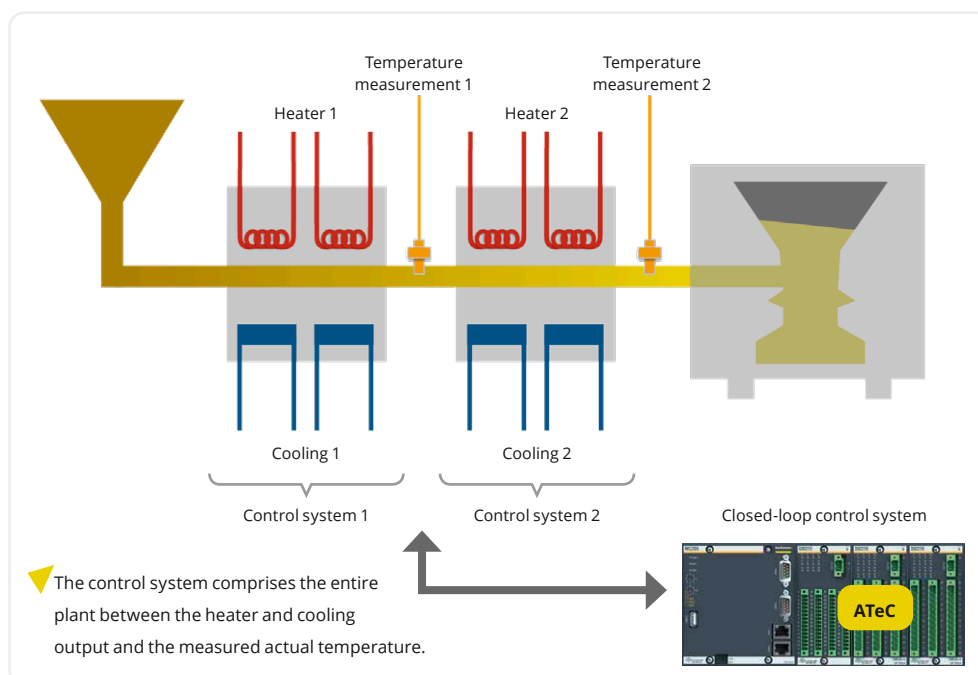
Stable thermal process conditions form the basis for any production plant. The fast implementation of these basic requirements automatically frees up the time available for the other development tasks. New innovative algorithms put this goal within reach.

The heating of large masses can take several hours. Designing the right temperature control here in several iteration steps is often a test of patience. This process is all the more difficult if fluctuating temperatures cause the processed material to solidify before being introduced into the mold. For this task and beyond, the engineer is provided with valuable support through

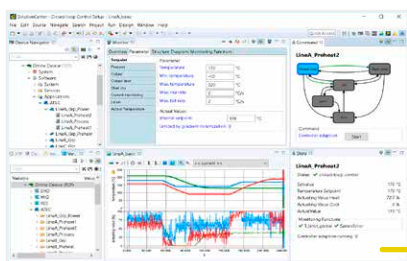
the adaptive temperature controller (ATeC).

Determining parameters automatically

The adaptive temperature controller is designed for both straightforward heating systems as well as for combined heating and cooling systems. An initial learning routine identifies



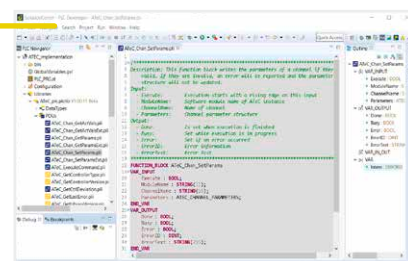
Complete integration in SolutionCenter
for simple commissioning



Entire functionality for the rapid implementation
of temperature control tasks
on the Bachmann real-time controller



Libraries in PLC, C/C++ for rapid integration
in other software modules



▶ An ATeC software module contains the complete intelligence
for determining the correct controller parameters.

the control systems without any other previous knowledge required. The appropriate control parameters are calculated automatically from the result at the click of a mouse. A single ATeC software module uses up to 256 temperature systems in parallel on the Bachmann real-time system.

Taking linked systems into account

It is often not enough to view an individual control system in isolation. Multiple heating and cooling systems tend to interact with each other instead. The controller is tuned precisely to these conditions with an adaption in the operating point. Known disturbance factors can also be taken into account in the control system. This ensures that optimum results are achieved even under production conditions.

Monitoring included

If a control circuit does not behave as expected, this can be diagnosed very early on. The monitoring of temperature limits, control deviation or a tolerance band is included as standard functions. These are also provided with a heating current monitoring in order to determine any impending failure of a heating element or any that have already occurred. In the event of a fault, the response to be performed can therefore be selected according to what the process needs. If material hardens in the worm conveyor, the heating is continued at a constant output. On the other hand, the system is switched off if an exceeding of permissible maximum temperatures is expected.

Optimized energy control

The pulses output for controlling the actuators are automatically distributed within one period. This makes it possible to ensure that the power consumption of the installation is stable. The integrated startup time optimization ensures that each controlled system reaches its set temperature at the same time. This saves valuable energy without any additional effort required. The power and energy management system enables the released power to be limited for a short time or permanently in order to adjust the plant to the grid codes.

Fully integrated in the engineering tool

The full integration of the ATeC adaptive temperature controller in the Bachmann SolutionCenter offers even more convenience for commissioning tasks. A separate commissioning interface is provided for configuring the ATeC, assigning parameters and operation. Alternatively, the adaptive temperature controller can be integrated in applications by means of IEC 61131-3 and C/C++ libraries. The temperature control concept is rounded off with the Bachmann Scope3 tool for recording and visualizing data, both during the commissioning process and afterwards.

The ATeC adaptive temperature controller thus provides ideal assistance and support for temperature control tasks with the Bachmann real-time control system.

BENEFITS

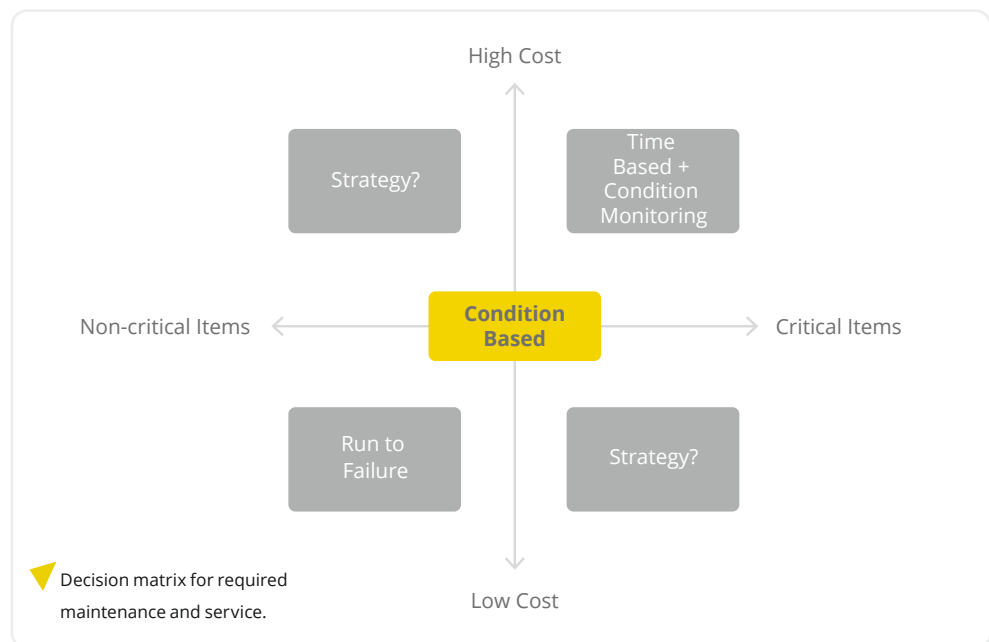
- Software temperature controller for up to 256 systems
- Identification of different control systems possible
- Automatic calculation of the correct controller parameters
- Control of isolated or coupled systems
- Monitoring and protection functions already integrated
- Early fault diagnostics through heating current monitoring
- Allowance for grid codes through output and energy management
- Complete integration and convenient operation via the SolutionCenter
- Alternative control from PLC and C/C++ applications



More on this topic
is provided
on our website

Condition Monitoring for 4.0

— On the journey from reactive to predictive maintenance and service



BENEFITS

- Reduction in maintenance costs through coordinated planning, timely procurement of spare parts and prevention of significant hardware damage
- Greater utilization of the lifespan of machine elements thanks to accurate condition information
- Practical risk assessment in relation to the failure of important industrial plant components



More on this topic is provided on our website

Digitalization, Industry 4.0 and Big Data are currently major features in the development of service and maintenance. The data acquisition of plant states is thus coming under the spotlight. However, this is not an end in itself and does not provide added value or an action recommendation on its own. The challenge is to gain understanding: from data to information to knowledge and understanding of the mechanisms and interrelationships. That is why Bachmann is convinced that the way to predictive maintenance and service involves a new strategic use of condition monitoring.

The times in which reactive maintenance, i.e. operation till breakdown, were the standard approach are long gone. While maintenance costs during operation are low, a fault may result in extremely high costs in certain circumstances due to unforeseen plant downtimes. Experience has also shown that preventative maintenance in intervals is not ideal. Although planned maintenance times reduce the frequency of unforeseen malfunctions, this increases costs for spares procurement, since the remaining lifespan of components is not fully exploited. Data now also improves preventative maintenance that is often still required in critical situations. Machine data is used in order to obtain a picture of the remaining service life of a component. However, complex operation-related measures are necessary in order to ensure the optimum lifespan of components.

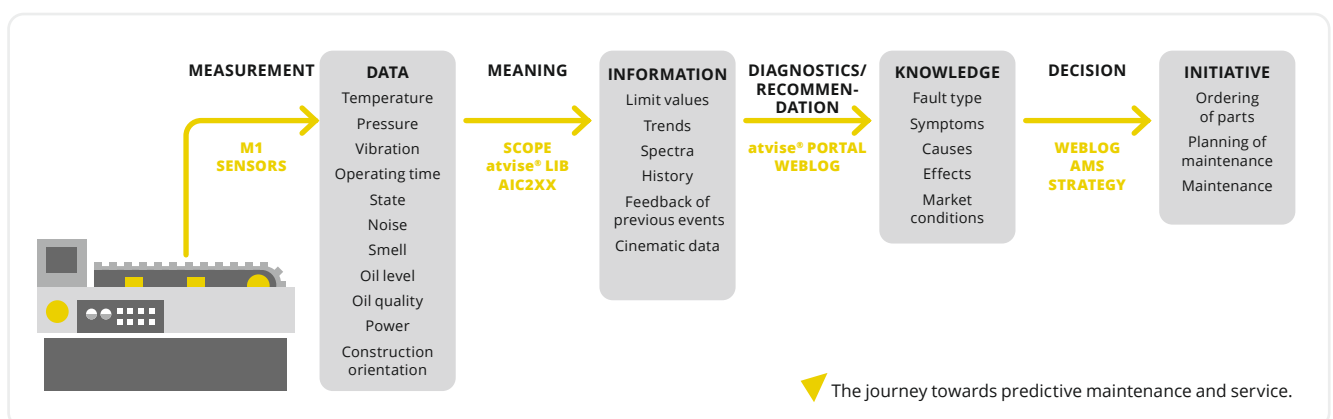
In this respect, predictive maintenance has clear benefits. It is based on the condition of the components and detects damage already when it develops. Requirements-based maintenance eliminates the cost-related problems of the reactive and preventative approach. Condition-based maintenance is also improved by the feedback of fault effects. This therefore not only notifies that a component was maintained, but also when. This opens up new options, such as running in reduced operation up to the time of the expected failure. However, the procurement costs for predictive maintenance systems, such as those based on vibration analysis or online oil particle counters, were really high in the past. They were therefore only cost efficient in plants with a high level of investment capital. The cost issue is ultimately critical: Although procurement costs for CMS are getting cheaper, the pressure on the plant

builders and operators to innovate has risen considerably as a result of the digitalization process. The use of reactive and preventative maintenance at intervals can therefore be justified when considering costs against possible damage. This is particularly the case with more long-term methods.

However, setting up a heterogeneous system made up of island solutions, such as vibration analysis for gears or pressure monitoring for hydraulics systems, is now not so promising for various reasons. Modern plants and processes are far too interlinked for this. For example, a specific vibration image can indicate impending damage in one particular operating state, but can be the norm in a different operating state. All the relevant process variables must therefore be combined with the fault effects and interlinked in their significance for the malfunction. This has to do with key issues such as clustering, multi-dimension signal analysis right through to big data.

This therefore requires a dynamic and flexible strategy that not only adapts itself to the machine state but also to the actual demand and supply situation in the electricity market. In this respect, companies offering inflexible solutions are highly unreliable.

Bachmann, on the other hand, aims at providing its customers with a software tool chain that can be adapted to the particular application. Simple systems convert the data to information, which can be collected and examined in order to generate knowledge about the plant. This knowledge can then shorten the time required to select measures for the optimum maintenance strategy.



The Fast Way to Reliable Diagnostics

— *Via Scope 3 data recorder and watch list of the Bachmann SolutionCenter*

Regardless of whether during commissioning, troubleshooting or maintenance – the more modern and complex the automated plant, the more important the transparency of information about process states and sequences in the overall system becomes. The Bachmann SolutionCenter provides users of the Bachmann automation system with all the diagnostics tools needed in one software solution and keeps all the data reliably in view – in real time.

Scope 3: Data logging at high speed

With many dynamic processes, the display of a physical variable as a numerical value is not enough. The latest software oscilloscope generation from Bachmann, "Scope 3", shows the values of processes over time and puts them in relation to other process variables. The core of Scope 3 is a powerful data logger: It offers an outstanding scan rate that can be selected in a range from 100 microseconds to 60 minutes. Thanks to the multi-tasking architecture of the Bachmann automation system, several data series can be logged in parallel and with different scan rates. Interfaces for several application programs increase the functionality of the product.

Database with selective access

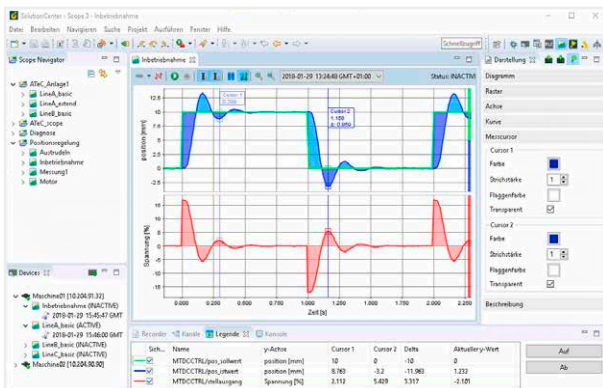
Data archiving and data provision is a central issue for an autonomously functioning data recorder. With Scope 3 a database archives all data in the background and offers selective access to it. Archive size and archiving intervals can be set to individual requirements. All data from the online buffer and also from the database is available at the same interface.

Simple analysis of complex interrelationships

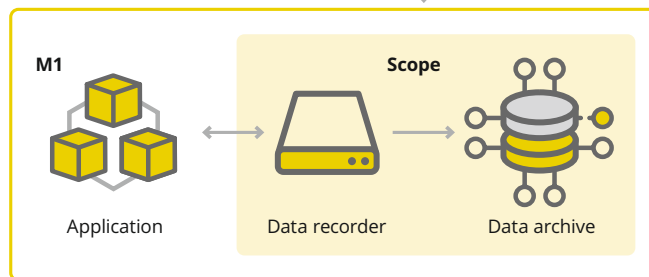
A simple click on the data recorder of an Bachmann controller enables data to be displayed immediately and makes it ready for analysis. The configurations can be managed in the work space and the logged data stored in a structured way. Frequently used graph functions, such as measuring cursor, zooming, color adaptations are supplemented in Scope 3 with important new functions – the stacked curve display, the graphical comparison of logged data or the fast Fourier transform function are also now directly available for the user. It is also possible for users to implement their own calculation methods or export formats.

Simplified maintenance and service

In the event of a fault, a connection to the relevant machine or plant often had to be established in order to fetch the relevant data for analysis. In certain cases, work directly on site was then unavoidable. With Scope 3 this is no longer necessary. The occurrence of a fault automatically initiates the logging of the relevant data. Data generated around this time range can be incorporated easily with the



Scope Tool



High precision:

The relationships of various process variables over time are analyzed and the exact values read out with the measuring cursor.

pre-trigger and post-trigger functions. After logging has been completed, a file with all the relevant data of the event is generated on the controller and automatically sent to the service technician by email.

The Bachmann watch list

When watching process variables, the user sees the controller as a black box: Defined signals are fed to the inputs and the self-adjusting trace of the output variables is observed. If it is possible to read and write variables selectively, this enables conclusions to be drawn about the behavior of the automation system. For efficient work, however, a randomly sorted list of all controller inputs and outputs, as offered by most manufacturers, is not enough. That is why Bachmann offers a freely configurable variable list in the SolutionCenter – a so-called watch list.

The user defines the content

The variable list can be configured quickly by users themselves – by selecting the variables or channels with drag and drop or in the dialog window with an unlimited number of entered

variables. Different filter and sort functions are also provided that simplify the handling of extensive lists. The user can furthermore manually sort the variables and, for example, place the most important ones at the beginning of the list. Variables and channels of different controller systems can be managed in just a single list. In this way, overlapping processes in large machines and plants can be observed and followed.

Integrated setpoint definition

Setpoints for individual parameters can be defined very easily with the help of the watch list. These can be defined with multi-selection in a separate column and downloaded to the controller with just one command. Conversely, actual values from the controller can be entered directly in the list and any changes highlighted in color. The Bachmann SolutionCenter also shows all the selected variables in a trend graph. This makes it possible to trace signals over time without any extensive configurations required: for maximum efficiency with maximum certainty.

BENEFITS

- *Autonomous real-time data acquisition on the controller*
- *Long-term archiving by database configurable*
- *Number of recorded signals only limited by hardware resources*
- *High resolution (from 100 microseconds) and variable sampling priority*
- *Several trigger options as well as pre-trigger and post-trigger functions*
- *Data analysis with outstanding PC software*
- *Recalculation of recorded data (standard algorithms, user-defined algorithms)*
- *Seamless integration in M1 webMI pro web visualization*



More on this topic is provided on our website

For perfect Energy Management

*PLC-integrated power measurement
for energy optimization and uninterrupted supply*

A stable power supply represents the backbone of any manufacturing facility that claims to offer quality. This involves a range of different tasks, depending on the stakeholder, location and production target. On typical offshore locations with an unreliable power supply infrastructure, this primarily involves the monitoring of compliance with the set grid quality in order to ensure product quality and the long lifespan of the machinery. Peak load reduction can be a central task when poor connections or energy intensive processes are involved. Alternatively, grid measurement technology can help to detect machine faults as early as possible from the high-resolution load shape produced during specific process steps.

BENEFITS

- *Integrated acquisition of all energy-related variables*
- *Scalable from simple power measuring to power quality*
- *Connection of standards compliant meters via M-Bus*
- *Determination of the required energy per produced item or time unit*
- *Ensuring operational reliability in grid critical regions*
- *Energy cost optimization, e.g. through energy shaping*



*More on this topic
is provided
on our website*

Energy consumption measurement

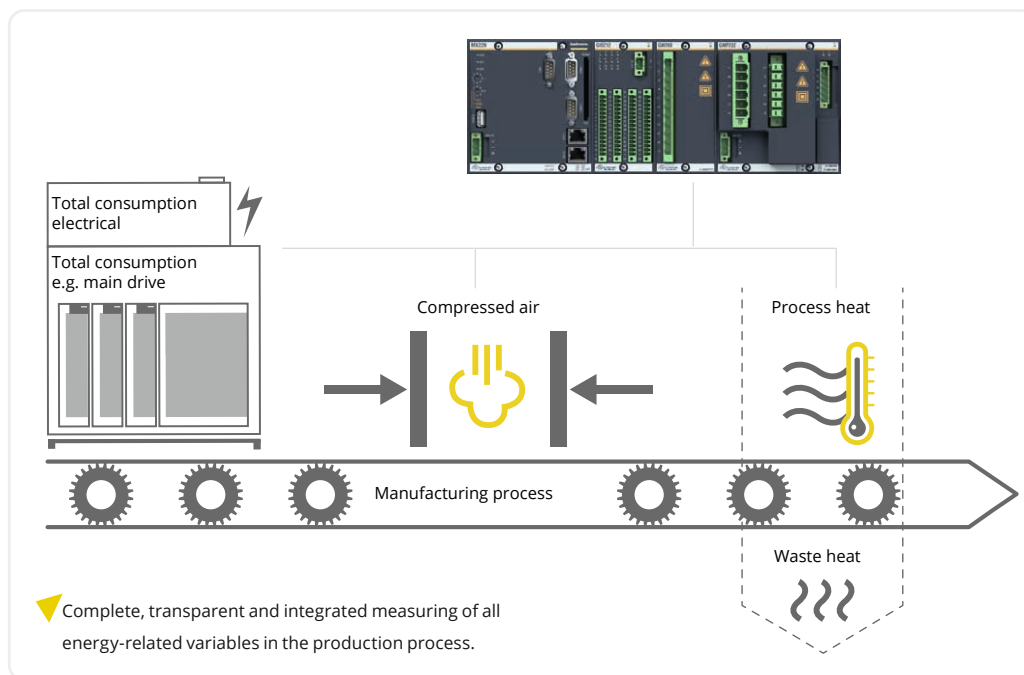
Statistical evaluations are often carried out by a higher-level power management system and are also used for recording energy efficiency. Power management systems such as those compliant with ISO 50001 are becoming increasingly more important. These use so-called energy performance indicators to assess energy efficiency so that it can be continuously improved through suitable measures. However, statistical evaluations can also be used to measure load curves in order to determine the average consumption and base load. The measured grid variables provided by Bachmann's grid measurement modules offer a wide range of statistical indicators, such as min./max. values, energy meters, total harmonic distortion (THD), etc. These grid variables can be accessed easily via the so-called service variable interface or a PLC library and can be forwarded cyclically to higher-level energy management systems via FTP or email.

Keeping a close eye on the power supply

With all the new possibilities offered by "power supply 2.0", power quality is becoming increasingly more critical. Ensuring this ultimately has a positive effect on productivity. No compromises are permissible here. The extent of this and the countermeasures that can be implemented primarily depends on the production process. With plants requiring long startup times, a temporary disconnection (< 1 min) of the power supply may result in protracted new startups for the production process. The aim here should be to achieve interruption-free operation, i.e. in the event of a fault the power supply should be switched with as little interruption as possible.

Trust is good, control is better

This maxim also applies when the power supply is involved. Power supply interruptions, momentary voltage drops and the pollution caused by harmonics can affect product qual-



ity, but also functionality and the lifespan of equipment. This frequently leads to the utility company, production company and the machine supplier blaming each other without a solution being found in good time. In order to deal with these kinds of problems, it is above all necessary to log the relevant events and provide absolutely clear documentation. Only if the actual situation is unambiguous is it possible to work on a solution. Precisely for this reason, Bachmann grid measuring modules are integrated with features, which provide considerable help in the documentation of the power supply quality. This includes event lists and fault recorders:

Sequence of events list

The monitoring of several key parameters can be configured ergonomically via input screens. If an event occurs, this is logged retentively with an exact time stamp. This log can then be exported simply as a .csv file.

Fault recorder

If there is an anomaly, the scan values are recorded in real time with a resolution of up to 100 µs for up to six seconds. This data is then available for further analysis in the Comtrade file format. This format is then also used by signal generators which read in

the exported file and can then generate the same signals from them as were stored on the device at the time of the fault.

M-Bus energy measuring for compressed air, heat and water

The power balance of a production plant very often includes other types of energy in the form of compressed air, process steam or water in addition to purely electrical energy. This area requires the use of flow meters or energy meters. The M-Bus, which is standardized in EN 61334-4-1, is widely used in Europe for the connection of these meters. The robust and easy to mount M-Bus adapter and its practical fieldbus integration also provide the software communication as an integrated solution.

Energy measurement systems to date are generally provided with a Modbus TCP, RTU or Profinet IO interface. The CPUs of the Bachmann controllers can process these protocols as clients or servers and can thus access existing energy data very easily. Whilst this increases competitiveness through the more efficient use of energy, it also increases the complexity of the energy infrastructure. As an experienced partner, Bachmann can offer its services to meet these new challenges safely, reliably and efficiently.



Benefit from our expertise

Bachmann Training Offerings

A solid know-how in conjunction with first-class products is the key to perfect automation. We offer you both. Take advantage of our extensive training program, which we will gladly adapt to your individual needs.



SolutionCenter

The SolutionCenter as an integrated and user-friendly engineering tool for project engineering, commissioning, configuration and diagnostics. The training also includes an introduction to programming and visualization.



Safety Control

This seminar offers a practical and basic understanding of how to implement functional safety. You are shown how to program safety applications based on the Bachmann safety products in hardware and software.



Model Based Design

The MATLAB® program package from MathWorks offers a software tool for the model-based development of controller applications. M-Target for Simulink® enables the user to integrate seamlessly in this development process inside the Bachmann controller environment.



Condition Monitoring System

Condition monitoring involves the monitoring of the machine state through the measuring and analysis of meaningful physical variables. The training covers the basics of condition monitoring as well as providing a detailed knowledge of the hardware and software.



Redundancy Control

This training course provides a rapid introduction to configuring and creating redundant applications with the Bachmann automation system.



M1 webMI Pro

atvise® provides the user with a web-based visualization for different applications and visualizations. Mobile application, HMI up to SCADA solutions can be implemented with only one visualization. Standards such as HTML5, SVG and JavaScript enable very open and flexible solutions for any application. At the end of this training seminar each participant will have created an extensive sample project.



Power Management

The safety and efficiency of the electrical energy supply are placing increasing demands on generation, transmission and consumers. This training seminar provides the knowledge required to use Bachmann grid measurement, monitoring and synchronization modules in the Bachmann controller system.

Always keeping up-to-date

Engineering training seminars

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 combination of the user's sound knowledge with first-class products is ultimately the key to perfect automation.

BENEFITS

- *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*



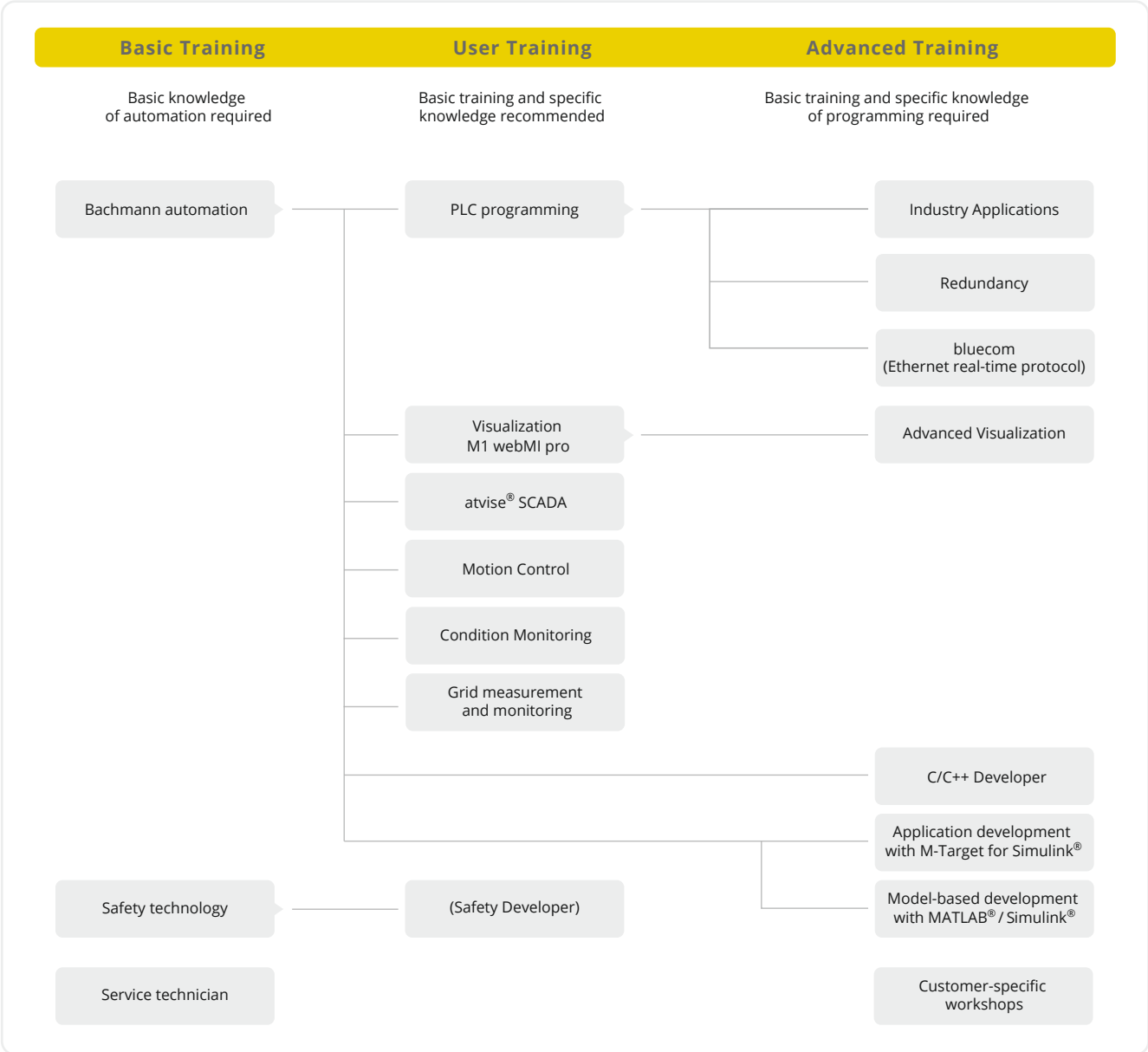
More on this topic is provided on our website

Precisely tailored training seminars

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. The training sessions are held either in a Bachmann branch office or directly on site at the customer's premises. 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.



Trust through Expertise

— Applications in industry and machine building

Many of the leading global manufacturers and operators of industrial plants rely on us. Together with them, we are setting new benchmarks and achieving new successes.



ACHENBACH
BUSCHHÜTTEN



A 24/7 roller production with speeds of up to 2,500m/min, very small coil thicknesses of 5 µm or less, coil weights of up to 32 t and highly inflammable coolants do not allow any room for errors. A Simulink® model of the rolling mill, which validate the automation code created, provides a solution here to prevent them.

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Dorst is a company based in the Bavarian town of Kochel am See, Germany, and is one of the leading international suppliers of machines and plants for the manufacture of ceramic and powder metal components. The manufacturing systems and presses have a modular design and are constructed to meet the specific requirements of the customer.

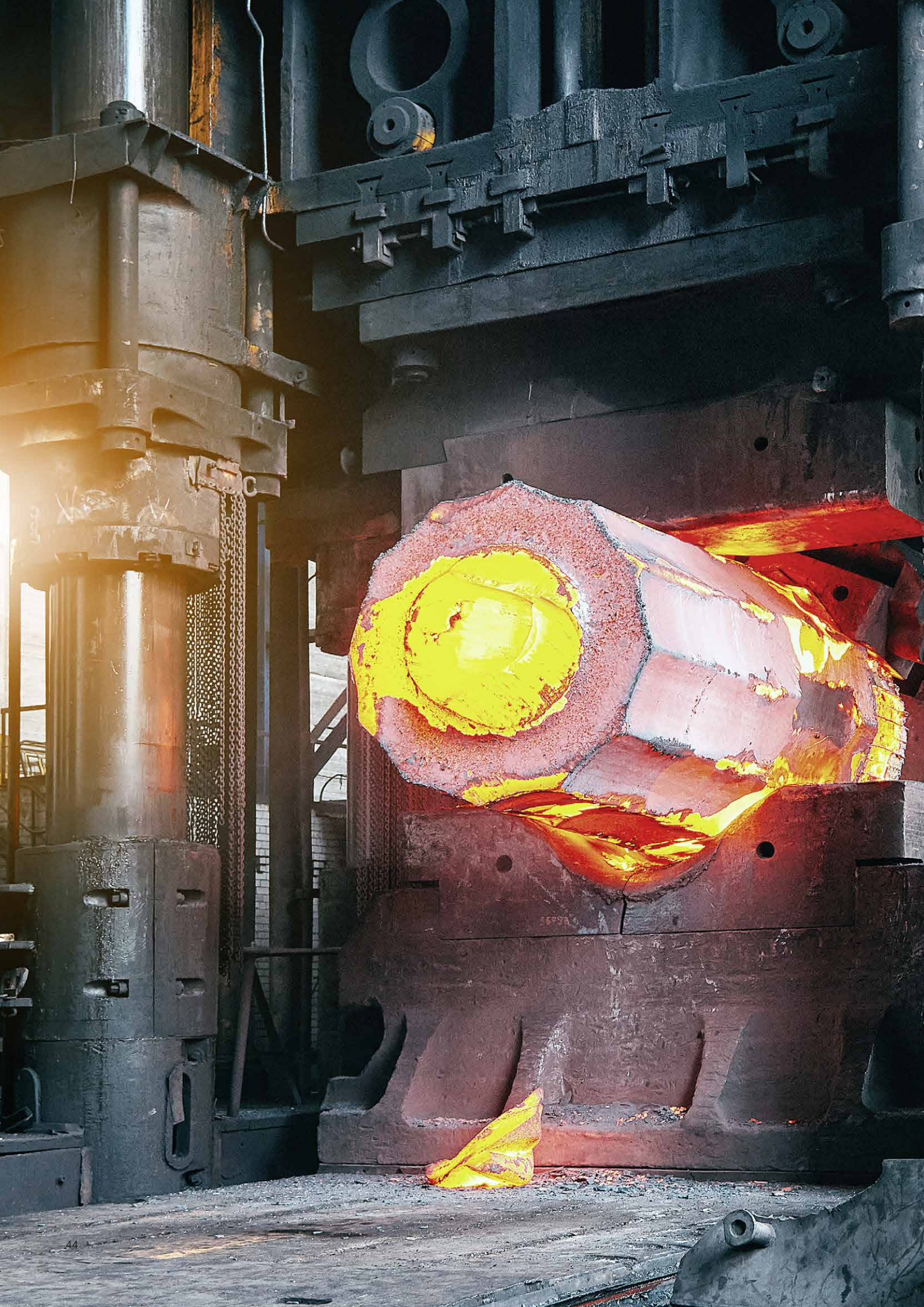
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Soldering system manufacturer Kurtz Ersa has developed together with Bachmann electronic a revolutionary idea in the field of selective soldering into series production. Two objectives had to be reached: a record cycle time and the soldering of several variants without the need for setup operations.

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The ibaPDA of the Fürth-based measuring technology specialists iba AG is a versatile measured value acquisition system for maintenance and production. Its connectivity was further extended with the Request interface for the automation system from Bachmann: Users can now conveniently configure the measuring of data from the controller during ongoing operation.

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Machines from pester pac automation use atvise® scada to provide information in pure web technology directly in the browser. This enables older machines without an IPC to establish the connection to the controller. Logged data can thus be visualized and analyzed.

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The SMS group uses the wide range of possibilities already offered by the basic configuration of the Bachmann controller system for a rotation test stand at its Hilchenbach plant. In this environment, the Bachmann controller also demonstrated its qualities as a platform for plant simulation.

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Thermo Fisher Scientific GmbH, based in Erlangen, Germany, supplies systems for the metal and plastics industry, and uses the automation system from Bachmann electronic and its integrated safety solution.

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Challenge Accepted

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