



Innovations 2016

PERFECTION IN AUTOMATION
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reACTION
 TECHNOLOGY

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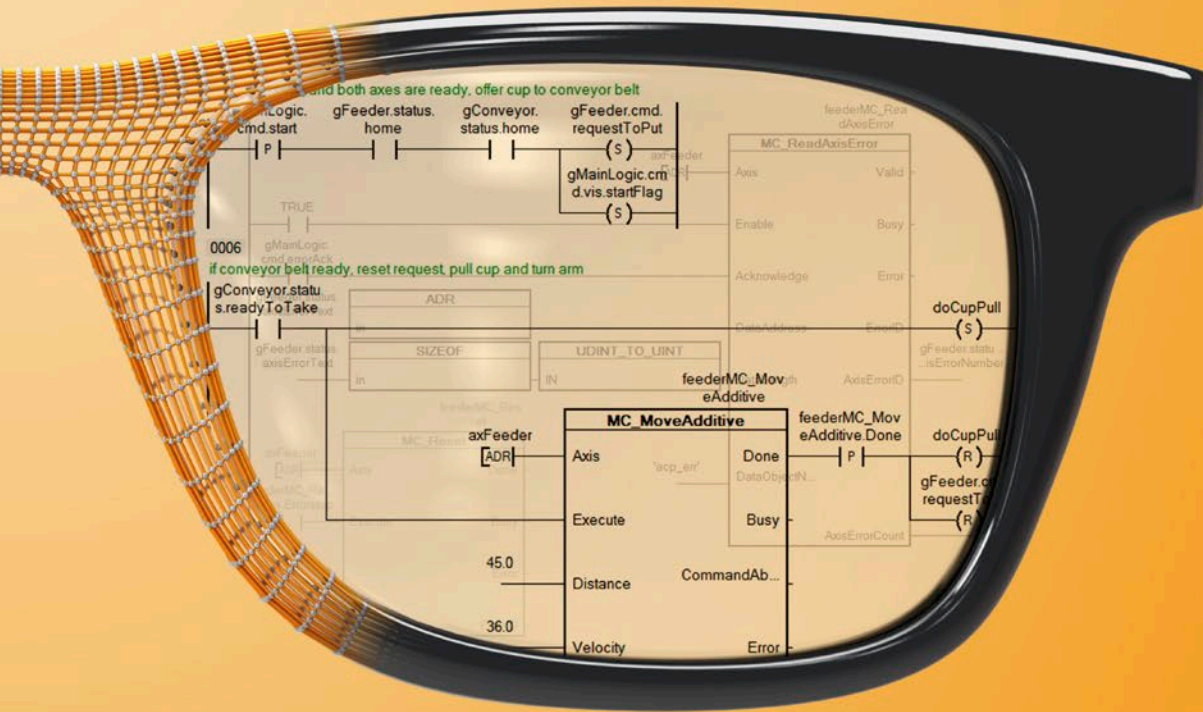
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Web meets automation



mapp

VIEW





The smartphone is the poster child for high-performance electronics with ultimate interface usability. Unsurprisingly, operators of industrial machinery and equipment desire nothing less for the interfaces they use every day. With mapp View, B&R now offers direct access to the wide world of web technology right from the engineering environment. For the first time, automation engineers have all the tools they need to create powerful and intuitive HMI solutions – and they don't have to be an expert web developer to do it.

Modern websites and smartphone operating systems are designed by large teams of usability, design and ergonomics specialists. An OEM doesn't typically have those kinds of resources at their disposal. To bridge the gap, what they need are easy-to-use tools integrated in their familiar programming environment.

The right info at the right time

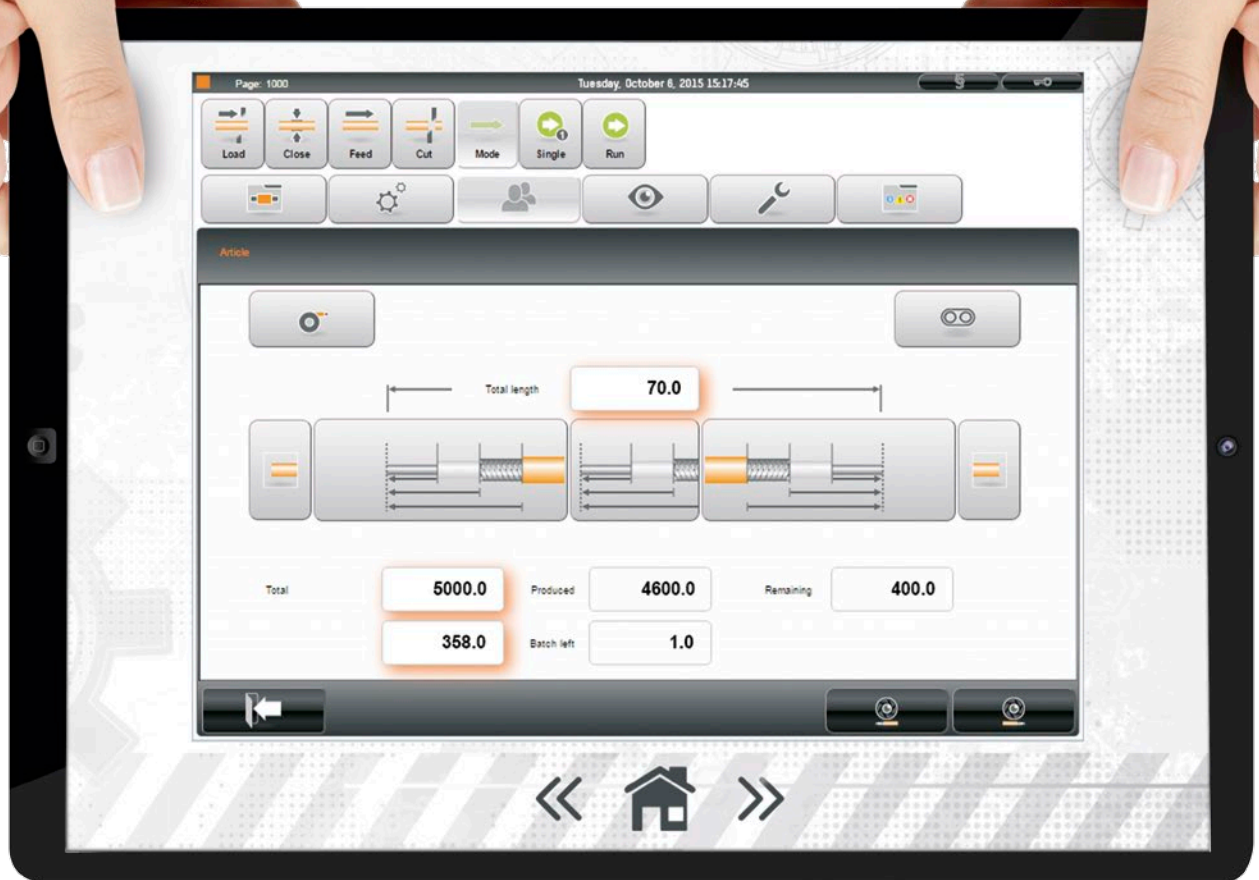
Operators aren't impressed by fancy graphics and multi-touch navigation alone. The HMI needs to directly facilitate the primary goals of industrial production: maximum productivity and minimum downtime.

The key to both of these goals is having the right information at the right time. Important notifications need to reach their intended audience every time, whether that happens on the main operator terminal, a small info screen, a smartphone or tablet. At the same time, the design must be able to prevent human error.

100% web technology

With mapp View, B&R solves these challenges by relying 100% on web standards. These technologies allow content to be displayed optimally on

With mapp View, automation engineers have all the tools and knowledge they need to create powerful, intuitive HMI pages.



any output device or even customized for specific users or user groups. Conventional approaches require considerable resources and expertise to develop pages for all the different output media.

Working in a familiar environment

What makes mapp View unique is the way it integrates web technology right into the engineering environment. While mapp View is built on HTML5, CSS3 and JavaScript, automation programmers

never need to deal with these languages. Instead, they can continue to focus on their own areas of expertise. HMI pages are built in the familiar Automation Studio environment. All GUI functionality is encapsulated in modular control elements called widgets, which are simply dragged and dropped into place and configured.

One of the main advantages of web technology is the way it separates content and layout. Even after



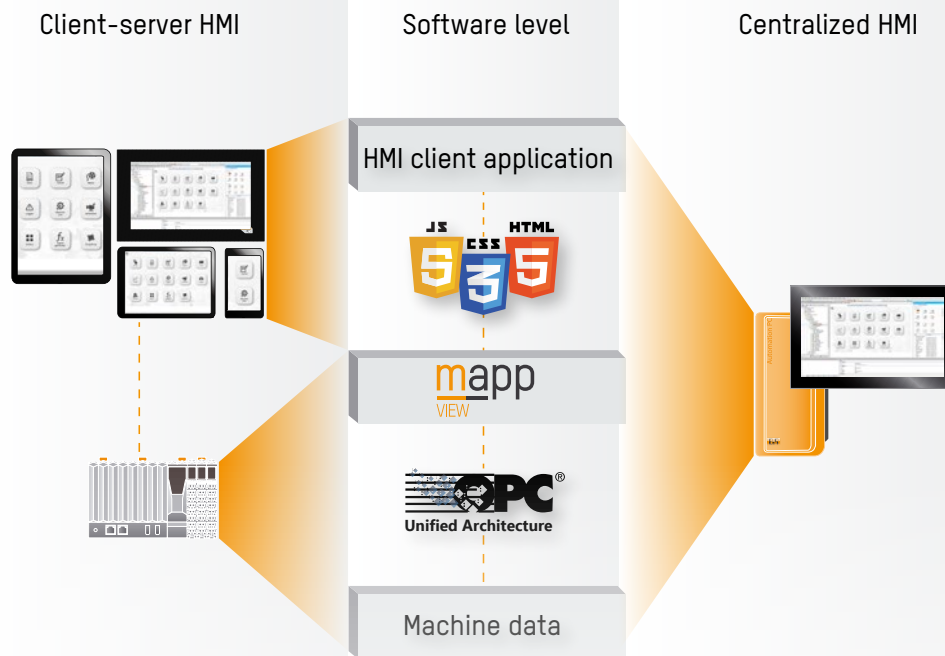
mapp View offers a large selection of preprogrammed HMI widgets in various design themes. The design is independent of the HMI application and can be modified at any time.

mapp VIEW

the content of the HMI application has been finalized, developers can fine-tune the layout and style to optimize usability after initial field testing. Widgets are available in a number of standard themes, or they can be customized with the user's corporate design. Thanks to the use of web technology, the content can easily be adapted to different output media – whether it's a widescreen operator panel or a small smartphone screen.

Ideal for modular architectures

It's not just the content and layout that are separate from one another. The machine control and HMI applications are also completely decoupled. The HMI software or individual GUI components can be reused and modified at any time, making mapp View ideal for flexible, modular machine architectures. This also reduces maintenance costs and improves overall quality.



With its modular organization, mapp View can just as easily be used as a centralized HMI solution or in a client-server architecture.



The web is subject to continuous change and progress, yet web technology itself has remained remarkably constant over time. HTML pages created 20 years ago are still displayed correctly in any of today's browsers. mapp View is built on the globally accepted web standards HTML5, CSS3 and JavaScript. Unlike proprietary platforms like Flash or Silverlight, these standards are updated continually and remain usable for decades.

Open with OPC UA

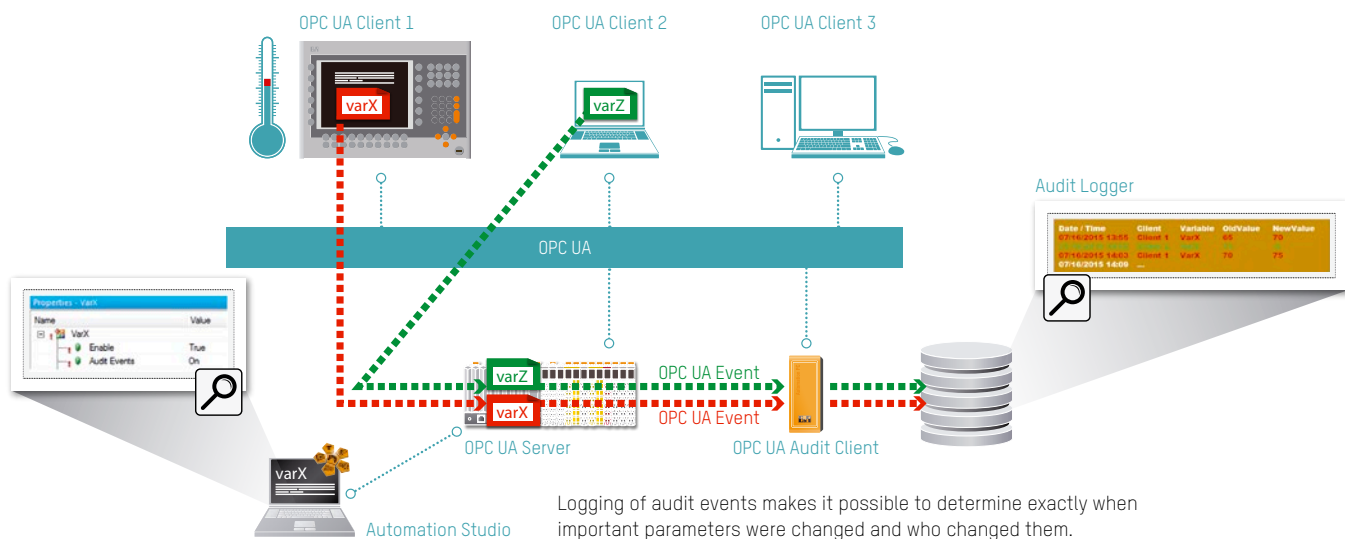
mapp View is fully integrated in B&R's Automation Studio engineering environment. Controllers from other vendors can easily be incorporated in the

HMI via OPC UA. mapp View is the first web-based HMI solution in the world that doesn't require knowledge of web programming languages.

Highlights

- All the advantages of web technology
- Fully integrated in the engineering environment
- Highly reusable
- Optimal display on all devices

Event-triggered communication with OPC UA



B&R continues to integrate the OPC UA concept more extensively into its automation solutions. It has already been possible for several years to transmit and process changed process data. With the newly added UA_Event functionality, it is now also possible to trigger events and implement event-based control.

A UA server was previously able to communicate changes in process data to one or more UA clients using what are known as monitored items. Now, event items can be used to communicate all types of events. A client can be informed automatically of newly added network nodes or any other changes in the OPC UA address space.

Audit events

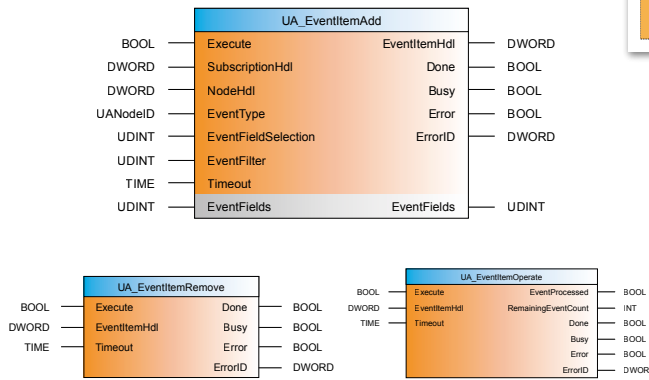
An audit event is a special type of event that is used in the area of quality management to log process data in order to later identify whether users have changed important values. If an operator changes a temperature setpoint from 60 to 80 degrees, for example, the audit client documents the change in a log file. The server uses audit events to inform an authorized audit client that another client has made changes or performed actions on the server.

Standardized access

The OPC Foundation's PLCopen group has developed three standardized function blocks to give

UA clients uniform access to audit events. These function blocks can be used to publish events, add them to subscriptions or remove them from subscriptions.

When events are added to a subscription (UA_EventItemAdd), a client can specify which type of events it wants to subscribe to and which data fields should be provided for each event. When

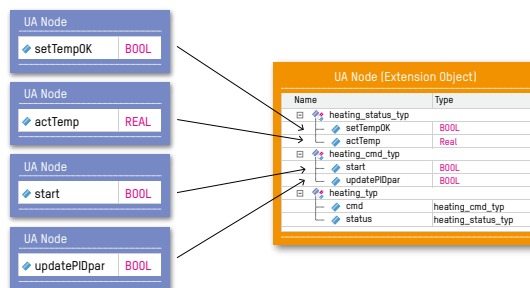


The OPC Foundation's PLCopen group has developed three standardized function blocks to give UA clients uniform access to audit events.

the events are processed (UA_EventItemOperate), the event data is transferred to the controller's variables.

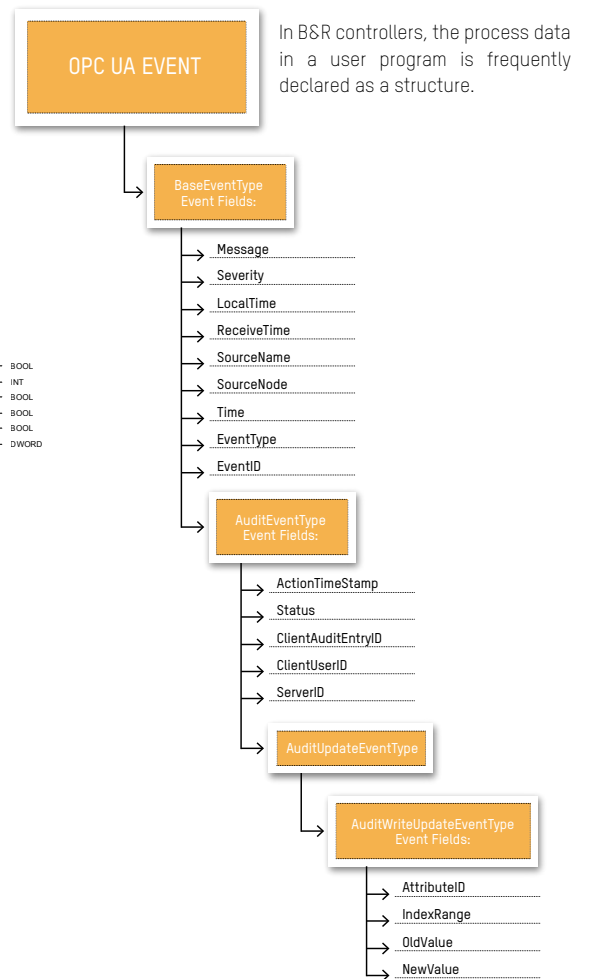
Easy configuration

In B&R controllers, the process data in a user program is frequently declared as a structure. The ability to transfer structures is a requirement of the communication layers of the OPC UA system. Extended objects can now also be used to trans-



Extended objects can now also be used to transfer nodes between controllers as complete structures.

fer nodes between controllers as complete structures. This reduces the amount of work involved in configuring an OPC UA system, because it is no longer necessary to set up each individual structure element as a node.



In B&R controllers, the process data in a user program is frequently declared as a structure.

Highlights

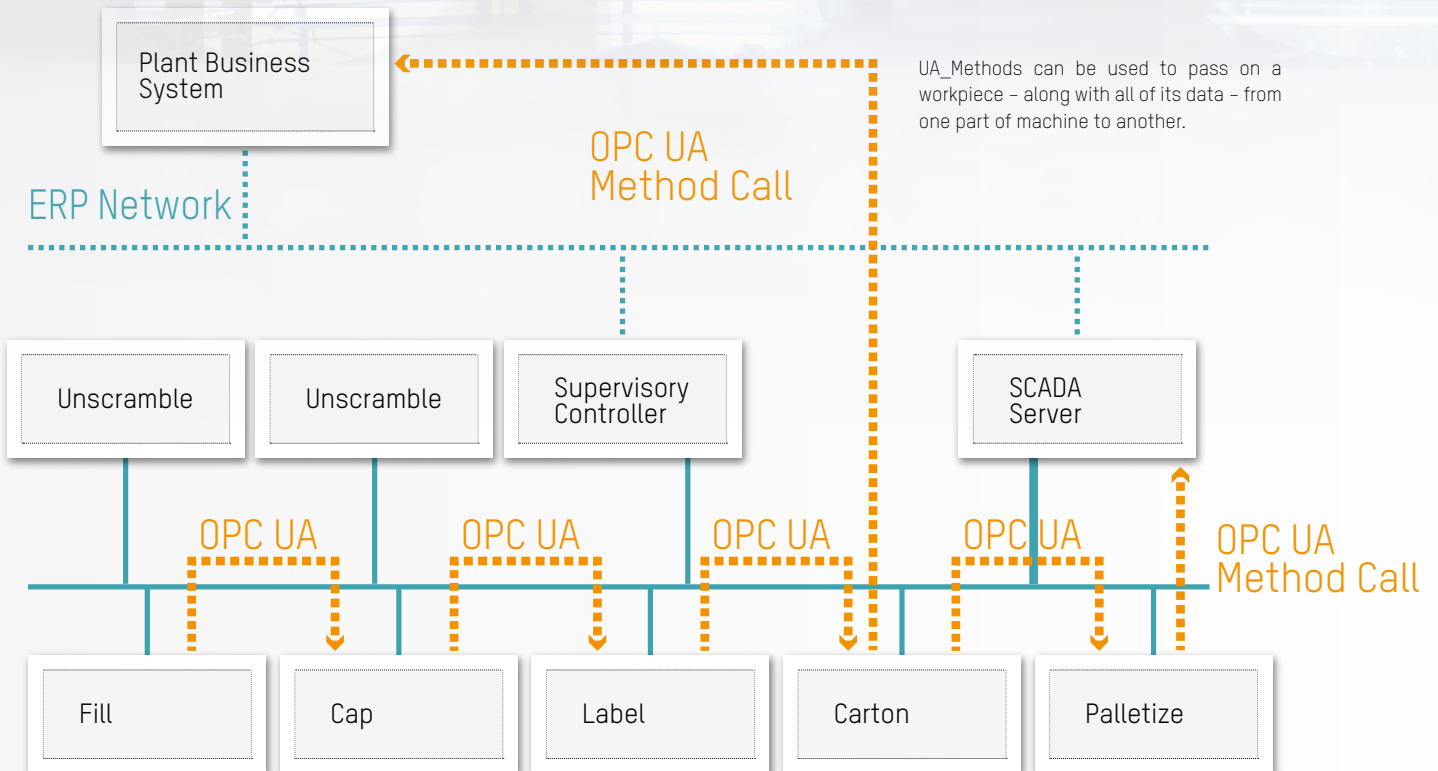
- Trigger events with OPC UA
- Easy audit trail setup
- Easy configuration

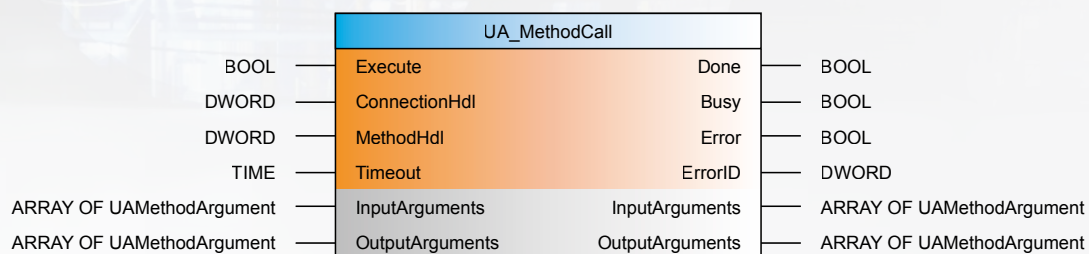


Call remote procedures with OPC UA

B&R has integrated UA_Methods directly in Automation Studio. This allows an OPC UA client to call remote procedures on a server. UA_Methods can be used to pass on a workpiece – along with all of its data – from one part of machine to another.

Retaining the consistency of input/output data while the method is being processed is a huge advantage. Even if machines on a line are using different control systems, all of the data is processed and communicated consistently.





The OPC Foundation's PLCopen group has developed standardized function blocks to give UA clients uniform access to UA methods.

Choice of programming language

These UA_Methods are developed and tested in Automation Studio and then configured as a method in the OPC UA system. As for programming languages, you can choose from the full range of options provided by Automation Studio, including Ladder Diagram, Structured Text, C/C++, and more.

Registering and calling methods

The OPC Foundation's PLCopen group has developed standardized function blocks to give UA clients uniform access to UA_Methods. These func-

tion blocks can be used to identify and call the UA_Methods. When a method is called (UA_MethodCall), the input and output parameters are transferred as well.

Highlights

- Data consistency
- Vendor-independence
- Choice of programming language

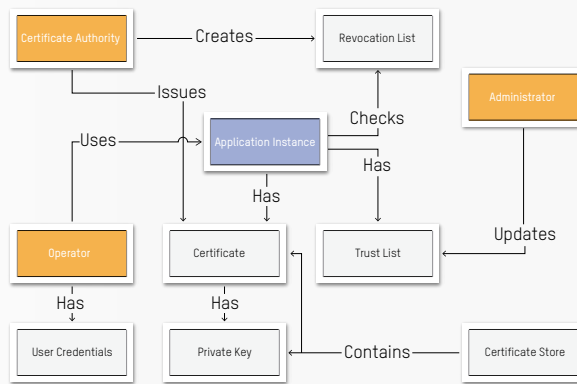


No access for unauthorized users



The new user role system in Automation Studio makes it easier than ever to manage access rights in OPC UA. This feature prevents unauthorized users from accessing an OPC UA system, modifying data or performing certain actions.

Any number of roles can be defined, which can then be assigned individual access rights for each node. Typical access rights include reading, writing or browsing. It is even possible to completely hide a node so that it is invisible to members of a specific role group. To make configuration even easier, the rights of a parent node can be inherited by its children.



The Transport Layer Security (TLS) subsystem in Automation Studio and Automation Runtime support the management of these certificates, which can be displayed, created and transferred to the certificate store on the OPC UA server.

User role system

A user can be assigned one or more roles, with additional protection provided by an encrypted password. By assigning all users of the OPC UA system defined roles, it is possible to precisely define the access rights they have for each node.

The user role system can also be updated in Automation Runtime during operation. This includes, for example, assigning a username and password to a new system operator. These functions are available directly in the application program on the controller using function blocks.

Roles	Users			OPC UA System										
	Mary Brown	John Smith	Anonymous	Node : VarX				Node : VarY						
				Visible	Browse	Subscribe	Read	Write	Visible	Browse	Subscribe	Read	Write	
Everyone			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operator		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maintenance		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Administrator	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

A user can be assigned one or more roles.

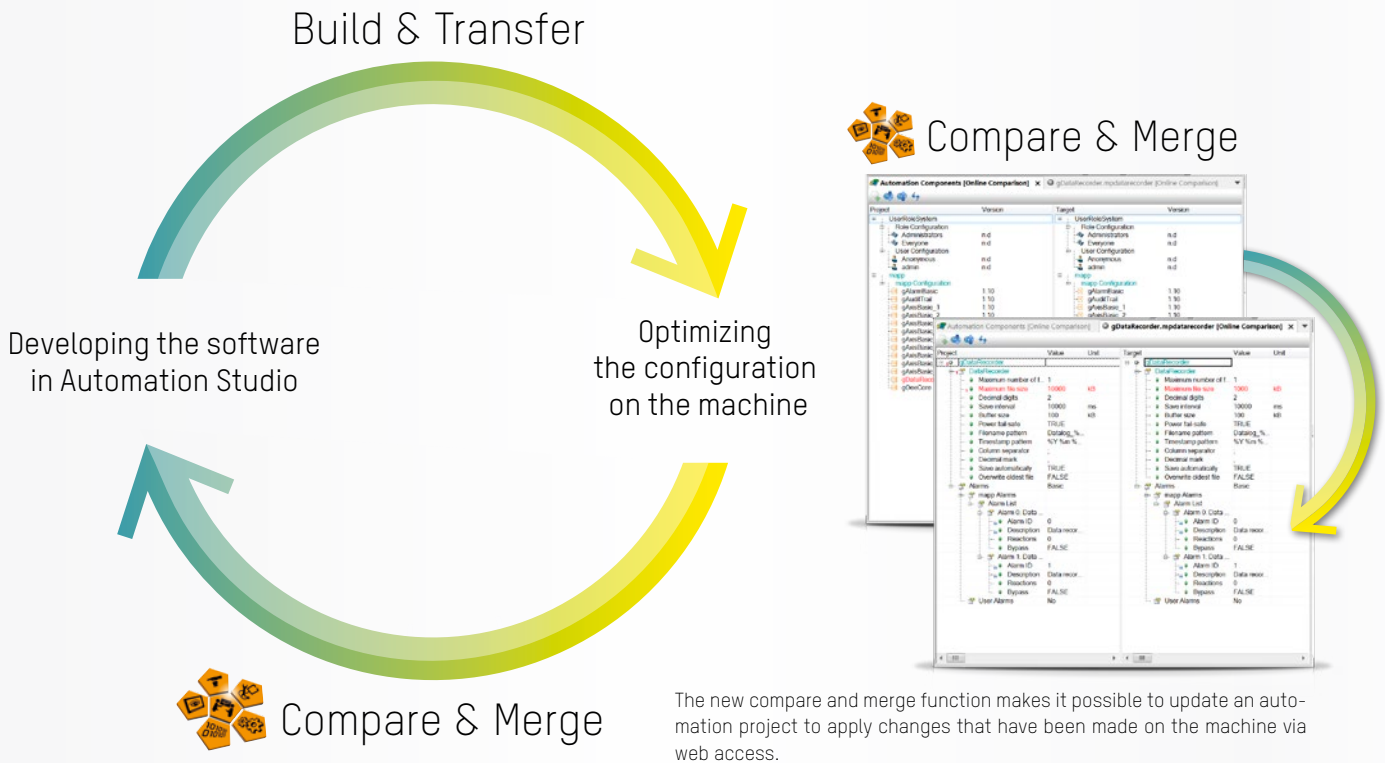
Security with certificates

In order to ensure secure and trusted data exchange, digital certificates in accordance with the X509 standard can be used in the OPC UA system. The Transport Layer Security (TLS) subsystem in Automation Studio and Automation Runtime support the management of these certificates. Certificates can be displayed, created and transferred to the certificate store on the OPC UA server.

Highlights

- Secure data exchange using certificates
- Easy-to-use role system
- Optional password protection

Configuration replaces programming



With the new compare and merge function, developers can update their automation project with parameters that have since been changed on the machine. This convenient tool for comparing configurations is particularly helpful in combination with B&R's modular application framework – mapp

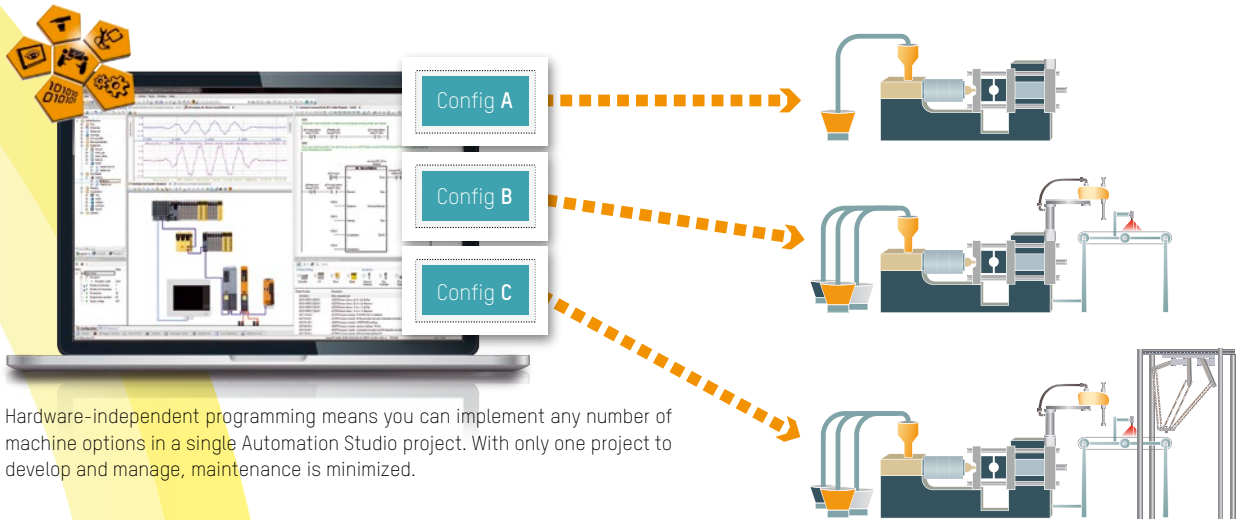
technology – which turns tedious software programming into simple configuration.

In the "Compare" dialog box in Automation Studio, the programmer can view all configurations that have changed on the controller and decide for



The configuration of a machine generally changes over its service life, for example through the addition of new equipment on machine tools. Via web access, the configuration can be synchronized in next to no time.

Automation Studio



Hardware-independent programming means you can implement any number of machine options in a single Automation Studio project. With only one project to develop and manage, maintenance is minimized.

each change whether it should be applied in the software project or not.

Manage machine options efficiently

Hardware-independent programming means you can implement any number of machine options in a single Automation Studio project. With only one project to develop and manage, maintenance is minimized. Different machine variants are represented by different configurations within the project. The configurations of the individual machine variants can be fine-tuned either in Automation Studio or directly on the controller via the web.

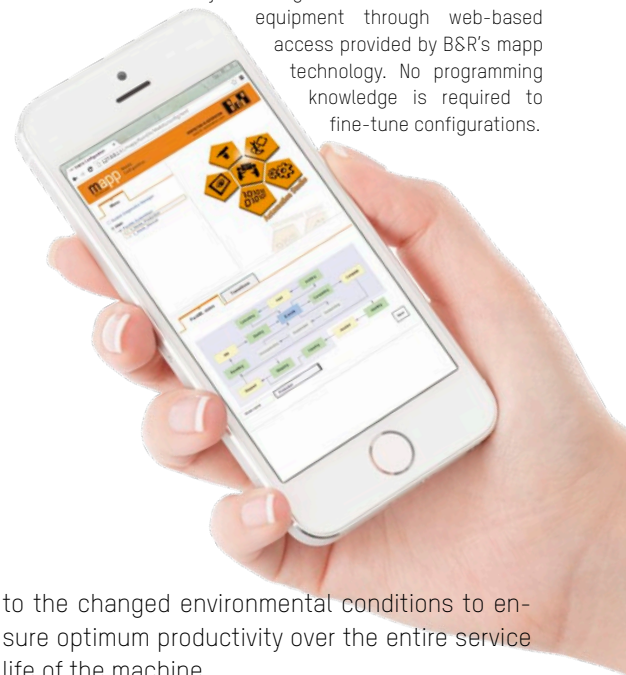
Configure the machine in a web browser

Technicians can adjust configurations on the machine or equipment through web-based access provided by B&R's mapp technology. No programming knowledge is required to fine-tune configurations. Technicians can set parameters conveniently in a browser during commissioning, or work on the machine's operator terminal, via remote maintenance or using a smart device.

Change configurations flexibly

Web-based access to the configuration also holds advantages during operation. The production environment typically changes over the life-cycle of the machine, for example as tools are replaced with newer generations. Via web-based access, the configurations can easily be adapted

Technicians can adjust configurations on the machine or equipment through web-based access provided by B&R's mapp technology. No programming knowledge is required to fine-tune configurations.



to the changed environmental conditions to ensure optimum productivity over the entire service life of the machine.

Highlights

- Easily apply changed parameters
- Clear view of changes
- Configuration via web-based access

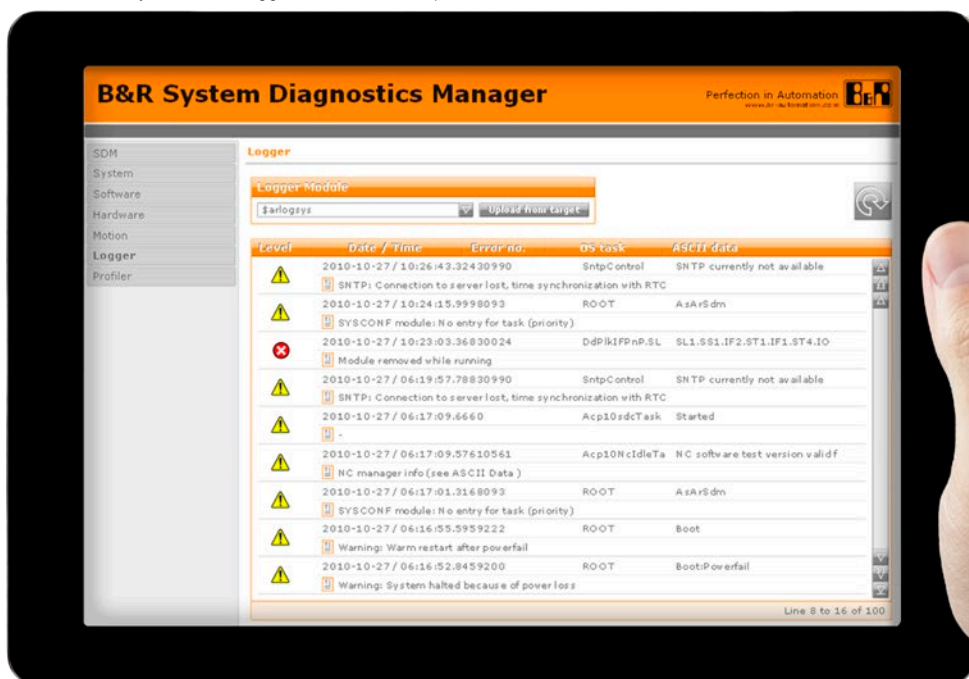


The black box for machines

With its advanced logger function, BSR offers improved software analysis options for machinery and equipment. The logger on the machine acts like the black box on an airplane, keeping track of critical events that occur in the machine software. The logged data can be used later on to determine exactly what happened.

The logger function is based on relevant events that the system is familiar with. They are logged automatically. What's new is that causal relationships between events, such as faults triggering other faults, are documented in the entries. When performing diagnostics, it is easy to retrace processes to determine whether a given fault is the root cause or merely a secondary effect.

Readily available: Logger data can be output in various media, such as a web browser.



Suitable for any application

Entries from the machine application are added to the notifications logged automatically by the system to tailor them to the respective machine software. It is also possible to enter texts in multiple languages to be displayed for each error number. This makes analysis much easier down the road.

Quick access to data when it's needed

The logger data can be saved to a file or output in various media, such as on the operator terminal or in B&R's web-based diagnostics tool, SDM. This allows the information to be passed on to support personnel during operation so that appropriate corrective measures can be taken as quickly as possible.

Precise timestamps for log entries

When troubleshooting machine faults, timing is key. The B&R logger automatically assigns precise timestamps. Alternatively, entries can be assigned a timestamp manually with nanosecond resolution. The logger is able to reconstruct the order of events within individual logbooks, even if the system clock has since been changed.

Seamlessly integrated in the overall system

The logger function complements the existing

mapp components for the audit trail and alarm system. The audit trail makes it possible to identify who made changes on the machine and when. The alarm system shows the operator when alarms have occurred, materials have been used up or oil needs to be replaced and provides instructions on how to proceed.



For applications subject to the FDA's Title 21 CFR Part 11 requirements, mapp Audit means both accelerated development and reduced investment risk.

Highlights

- Trace and analyze processes with ease
- Identify causality between events
- Implement corrective measures quickly

Optimized temperature control

With the addition of new functions to the Automation Studio package for temperature control, users are now able to operate temperature-related processes closer to their physical limits. More efficient, more productive machines are the result.

The package allows, for instance, automatic multi-zone synchronization via the integrated communication interface. A Kalman filter has also been integrated, which improves control quality even for very noisy measurement signals.

Temperature control made easy

In addition, users can make use of fully automatic controller tuning at the operating point. Multi-zone controller tuning allows automatic synchronization with the slowest zone.

Other new functions include:

- Load balancing for PWM signal generation
- Generation of a temperature setpoint with the output of the corresponding feed-forward signals
- Solution sample of multi-zone temperature control on a 5-zone extruder

In addition to that, B&R developers have made the closed-loop control and automatic tuning algorithms more powerful and, at the same time, have greatly simplified how they work.

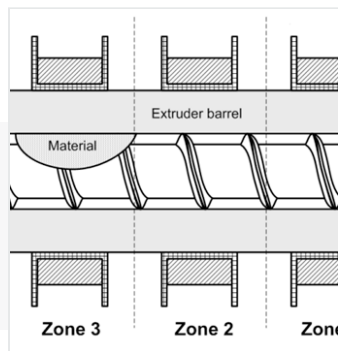
Important industrial subprocess

Regulating the temperature of a medium is a challenging subprocess in many industrial applications. Heating and cooling processes often take hours, creating very slow sluggish system dynamics. A significant dead time can occur between the actuator and the measurement due to thermal conduction, for instance.

A further challenge is that the heating bands or cooling units typically lie next to each other and influence each other – resulting in a MIMO system.

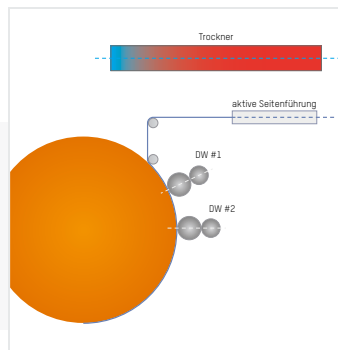
Additional challenges:

- Unknown system parameters: The system parameters are not well known and can change during operation.
- Differing system dynamics: Because the heating process fundamentally differs from the cooling process, it can be expected that the system dynamics are also different.



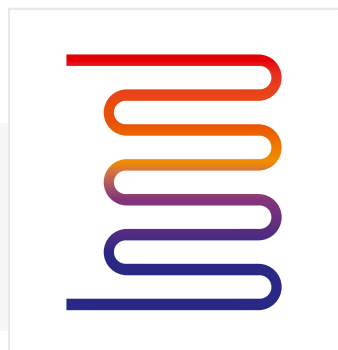
Extrusion process:

Automatic tuning procedures are used in extrusion processes to optimize startup and parameterization of the machine.



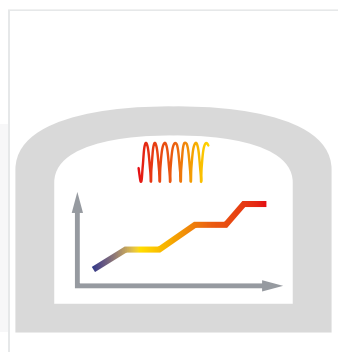
Drying zone in a printing press:

The temperature of the print substrate plays a decisive role in overall print quality.



Supply temperature of a heating/cooling medium:

Subsequent temperature processes can be controlled more effectively when the temperature of the supply medium is regulated in a subordinate control loop.



Annealing:

Particularly in the semiconductor industry, it is important that heating processes follow a defined setpoint profile. This minimizes stress in the materials.

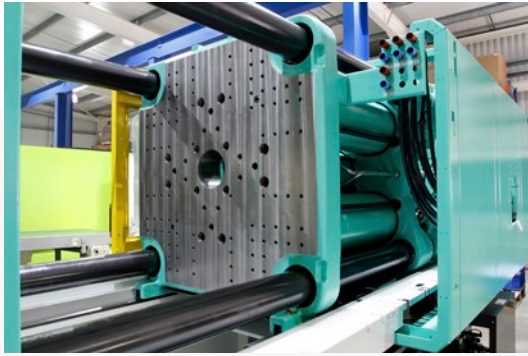
All these factors demand an extremely efficient and robust control design. B&R offers the right solution with its software packages.

Highlights

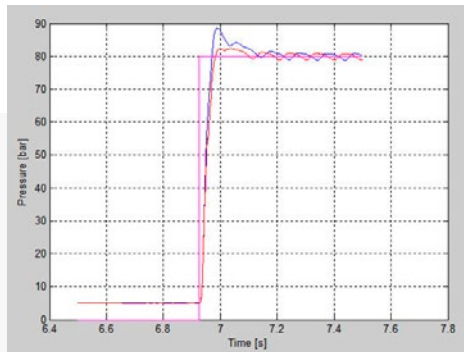
- Get more out of temperature control processes
- Develop better performing machines
- Efficient and robust control concepts

Optimal tuning for hydraulic controls

B&R offers new functions for hydraulic control in its Automation Studio engineering environment. Users benefit from more powerful diagnostics and improved commissioning and maintenance. With automatic tuning for pump drives and valve-based hydraulic controls.



Automatic tuning for hydraulic drives are used in the plastics industry, for instance, to simultaneously improve and simplify startup processes.



Powerful diagnostics options based on frequency response can help optimize hydraulic controls efficiently to the conditions of the machine.

To utilize the advantages of electric drive technology in hydraulic applications, servo pump drives combine a servo motor and a hydraulic pump. B&R handles speed and pressure control for hydraulic axes directly in the ACOPOS servo drive.

Automatic pressure control loop tuning

A new function in Automation Studio makes it possible to automatically tune the pressure control loop for hydraulic axes to the process conditions, saving users considerable time during setup. The automated process identifies the frequency response of the hydraulic system using a wideband speed signal and tunes the control loop parameters accordingly. B&R offers automatic tuning for more than just pressure control. Users have already been able to automatically tune the speed and current control loops on ACOPOS drives.

Monitor your own processes

During automatic tuning, the dynamic behavior of the hydraulic system is identified. This allows users to view the system's frequency response and monitor their own processes more efficiently. Changes in the dynamic behavior or signs of wear

can be identified in this way. It is also possible to display the control loop settings in the frequency response and make targeted manual adjustments.

Efficient valve control

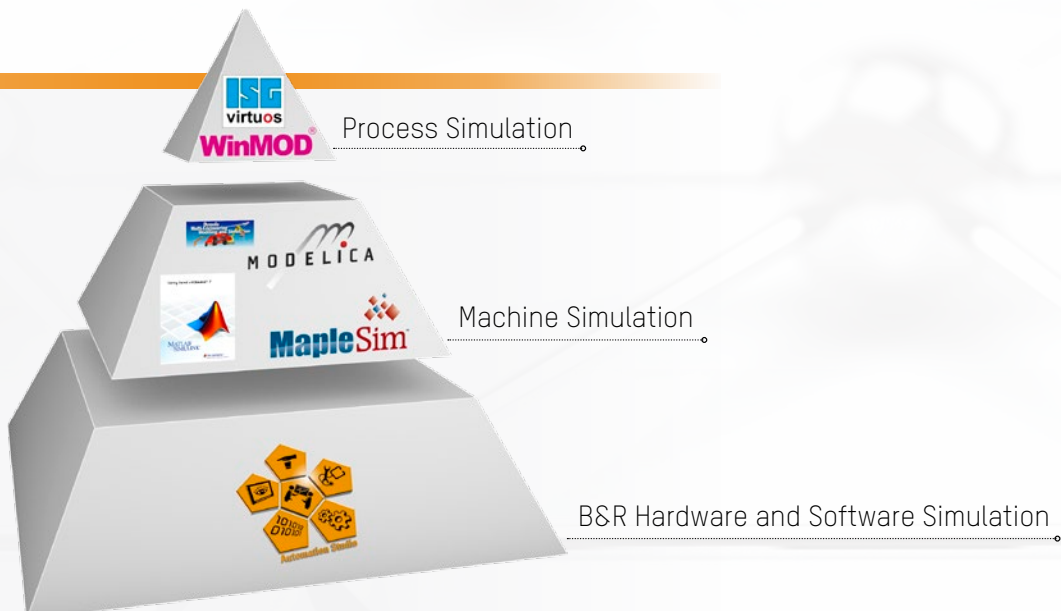
In valve-based hydraulic control loops, the hydraulic valve is used to regulate the hydraulic drive (cylinder). Unfortunately, the characteristic curves provided in the data sheet for valves are very often imprecise or the behavior changes over the product's service life. That's why B&R has developed an automated process for identification of valve characteristic curves. The curve is calculated by taking cylinder speed measurements with the valve open to varying degrees. The B&R hydraulic control kernel uses the characteristic curve to control the valve efficiently.

Highlights

- Powerful diagnostics
- Automatic control loop tuning
- Accelerated setup
- Optimum hydraulic system utilization



Even more real-time simulation on B&R controllers



Simulation and modeling tools are used at various levels of a project. Machine simulation is performed with the goal of replicating the dynamic behavior of a subprocess with the greatest precision possible. Process simulation, on the other hand, focuses on overall system functionality.

B&R has developed an import mechanism for Functional Mockup Units (FMUs). This offers users numerous additional options for real-time simulation on B&R target systems in the Automation Studio engineering environment.

A source FMU is a package of XML and C files that is generated using a simulation tool. It enables the exchange of simulation models between different tools.

When the FMUs of a simulation model are imported, a function block appears in Automation Studio that outwardly reflects the behavior of the model. With this, the user can simulate the model on any B&R target system and link with the machine application in the real-time context of the controller. Typical applications are virtual commissioning and hardware-in-the-loop testing for verification of machine software.

Highlights

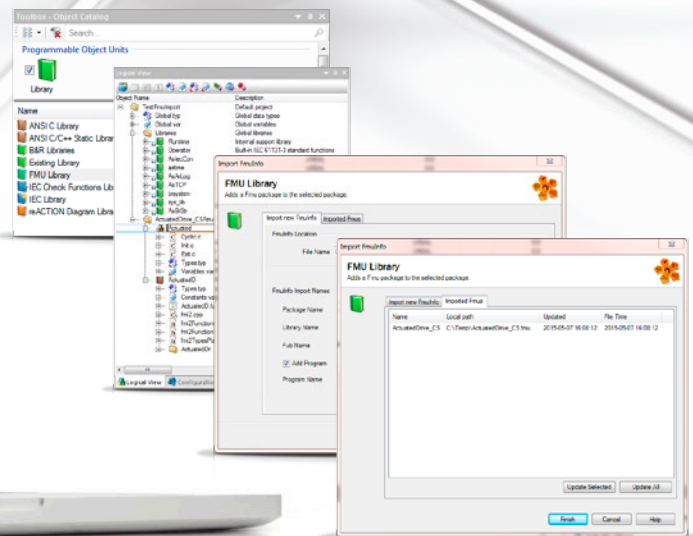
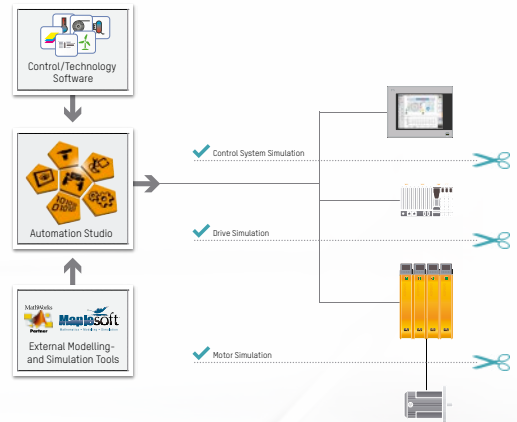
- Simulation of entire machines on B&R controllers
- Use of extensive simulation models
- Efficient verification of machine programs

All simulations in Automation Studio

Users benefit in general from B&R's extensive simulation options. They allow the operation of every single B&R component to be simulated. Apart from that, Automation Studio enables simulation models from numerous external tools to be imported. This allows developers to simulate an entire machine on the B&R controller, even when different tools have been used.

More than 70 tools worldwide support the Functional Mockup Interface (FMI) standard, including MapleSim from MapleSoft, Dymola from Dassault Systems and open tools, such as OpenModelica. In many of these tools, additional modeling libraries, such as those from Modelon, can help create simulation models even more efficiently.

With B&R, hardware and software can be simulated at every level, allowing developers to test their software early on in the project.



Dragging and dropping Functional Mockup Units (FMUs) into Automation Studio opens a convenient import wizard. Updating previously imported FMUs is even easier.

mapp

TECHNOLOGY

70 new mapp components



mapp technology reduces the development time for new machines and systems by an average of 67%. At the same time, mapp solutions are much more convenient to service and maintain. On top of the 70 components that were available when mapp was launched in December of 2014, another 70 have now been added.

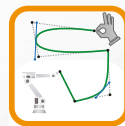


mapp RoboX

Object-oriented mapp technology consists of individually encapsulated components that streamline development of new software. The components provide basic functionality and are configured graphically. They drastically reduce the amount of programming required. All mapp components are connected via mapp links. Each mapp component retrieves the data it needs from other components using a client-server model. Glue code is almost entirely unnecessary.

With mapp RoboX, you can control any robot kinematic system. Developers have complete freedom with up to 15 axes per instance of the mapp RoboX component, while still enjoying all the conveniences of mapp technology. The robot is simple to parameterize, with visualization and diagnostics already on board. This saves valuable time, both in development and during operation.

As a practical example, mapp's motion functions are able to provide energy data. As soon as mapp's central energy management component is added to the application, it automatically collects and prepares this data. With just a few clicks of the mouse, you can set up a comprehensive energy monitoring solution.



mapp Teach

For the next step there is mapp Teach, which provides intuitive teach-in functionality for defining and managing the robot's movement sequences. mapp makes robot commissioning child's play.

mapp technology is not a separate software tool, and there is virtually no learning curve. The components are seamlessly integrated into the BSR Automation Studio environment. Users who are already familiar with Automation Studio can start using mapp components today. mapp components are configured and diagnosed via an easy-to-use web interface.

Highlights

- Process optimization made easy
- Improved efficiency
- More time to focus on what's important



mapp AlarmX

With mapp AlarmX, managing alarms is easier than ever before. Rather than programming each alarm individually, you can now configure and manage them all centrally. mapp AlarmX functions independently of the HMI application. Alarms can also be sent via text message or email. Alarms can trigger actions such as opening a PDF file, playing an instructional video or displaying a virtual model of the machine with the location of the fault highlighted. These options all accelerate troubleshooting and boost productivity.



mapp Energy

All axes, robots and other mechatronic units consume energy. mapp Energy automatically collects this data for the entire machine via mapp links and displays it in a clear overview on the HMI screen. mapp Energy can also automatically convert consumption into costs using the current utility costs for the respective country. mapp Energy helps optimize the efficiency of processes and save production costs.



mapp OEE

mapp OEE calculates overall equipment effectiveness (OEE) and displays it clearly on the HMI screen. Simply drag this mapp component into your Automation Studio project and it is ready to use with zero programming. The ability to view multiple OEE values – from different shifts, for example – in side-by-side graphics quickly highlights opportunities to increase productivity.



mapp Data

The functionality of mapp Data has been expanded considerably: With only a few clicks, you can configure the graphical display of process data directly via the user's HMI application for fast and easy system diagnostics. Relationships between variables and their behavior over time can be visualized clearly in graphic form. Operators can see at a glance how to further optimize their production process.

ETHERNET 
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SAFETY





Safety without the switch

Mode selector switches can now be implemented in software form. mapp SafeOPTION enables safe selection of operating mode via the user interface. It is also possible to define safety parameters via the HMI application. This is made possible by new mapp blocks and visualization objects certified for safety applications.

Any B&R panel can serve as the HMI, and no extra safety certification is required. Changes to the operating mode are archived in a log file and can be retraced at any time. The same applies to modified safety parameters such as limit values for pressure and temperature.

Existing access protection mechanisms such as passwords, RFID tags and other technologies can now be used to make sure that the operating mode is selected safely. It is also easy to continue using existing user rights systems.

Highlights

- Safe selection of operating mode
- Renders mechanical switches obsolete
- All operator actions logged
- No costly specialized hardware



Break free from hardwired safety

B&R has added a new series of safe digital mixed modules to its X20 SafeIO family – breaking down the barriers to entry for programmable safety technology. Even in the smallest applications, integrated safety technology is now no more expensive than a conventional relay solution.

B&R's commitment to absolute scalability is nothing new. From entry level to high end – all B&R products are fully interchangeable without having to make any major functional changes. The new mixed modules take scalability one step further on the low end of B&R's safety portfolio. Many safety solutions can now be implemented with a single X20 SafeIO module.

Up to 8 safe digital inputs, 6 safe digital outputs and the SafeLOGIC-X safety controller are available in a single module only 25 mm wide. And, for

the first time, B&R also offers a safe digital input module only 12.5 mm wide.

Wear-free semiconductors

B&R's programmable safety technology is based on semiconductor components that are not subject to wear like conventional electromechanical relays, which have to be replaced periodically to maintain the functionality of the safety application. Semiconductor-based safety technology is also considerably faster than relay-based solutions.

Highlights

- Minimal space requirements
- Integrated safety technology
- Cost-effective hardware





Safe I/O modules

→	X20 SI 8110	X20 SC 0402	X20 SC 806	X20 SC 842
→	X20 SLX 811	X20 SLX 402	X20 SLX 806	X20 SLX 842

System	X20 SafeIO	X20 SafeIO	X20 SafeIO	X20 SafeIO
Module type	Digital module, single-width	Digital module, double-width	Digital module, double-width	Digital module, double-width
Digital inputs	8x 24 VDC, configurable software filter	4x 24 VDC, configurable software filter	8x 24 VDC, configurable software filter	8x 24 VDC, configurable software filter
Digital outputs	-	2x 24 VDC, 0.2 A	6x 24 VDC, 0.2 A	4x 24 VDC, 3.0 A 2x 24 VDC, 50 mA
Analog inputs	-	-	-	-
Analog outputs	-	-	-	-
Technology	SafeIO SafeLOGIC-X	SafeIO SafeLOGIC-X	SafeIO SafeLOGIC-X	SafeIO SafeLOGIC-X

Turbo-charged safety technology

B&R is proud to present the world's fastest programmable safety technology. reACTION technology achieves safety response times down to 100 μ s. It's time to start rethinking what your machine can achieve safely.

B&R has extended the use of reACTION technology into the area of safety applications. This technology makes it possible for time-critical sub-processes to be executed directly in the I/O modules, which reduces response times by a factor of 100 or more. What's more, no expensive special hardware is needed to use reACTION technology, and programming is just as easy as it is for conventional control solutions. The reACTION modules are just as compact as B&R's standard SafeIO modules.

Relief for controller and network

The reACTION module handles a portion of the processing, relieving both the controller and the network and in many cases allowing them to be scaled down. In most cases, the resulting savings more than outweigh the added cost of the reACTION modules.

Highlights

- Programmable safety technology
- Safety response times of 100 μ s
- Relief for controller and network



reACTION I/O modules →

	X20 SRT 402	X20 SRT 806	X20 SRT 842
System	X20 SafeI/O	X20 SafeI/O	X20 SafeI/O
Module type	Digital module, double-width	Digital module, double-width	Digital module, double-width
Digital inputs	4x 24 VDC, configurable software filter	8x 24 VDC, configurable software filter	8x 24 VDC, configurable software filter
Digital outputs	2x 24 VDC, 0.2 A	6x 24 VDC, 0.2 A	4x 24 VDC, 3.0 A 2x 24 VDC, 50 mA
Analog inputs	-	-	-
Analog outputs	-	-	-
Technology			

Even more ultrafast automation

B&R presents new X20 system I/O modules featuring reACTION technology. In addition to the digital inputs and outputs, the new modules also have 2 analog outputs or 1 analog input and 1 analog output. The analog inputs and outputs are designed for ± 10 V and are digitized with 12-bit resolution.

With reACTION technology, response times down to $1 \mu\text{s}$ can be achieved – easily and cost-effectively. The appropriate programs are executed in the Automation Studio function block editor and

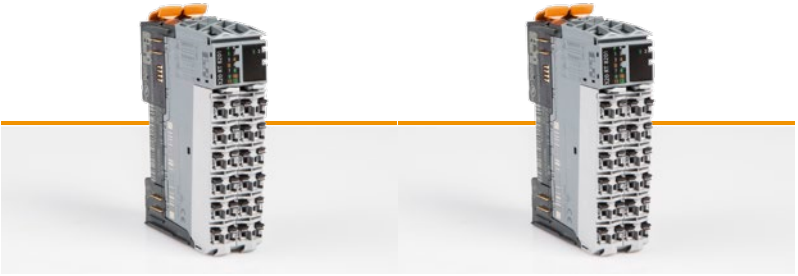
then directly in the I/O modules. All reACTION modules are standardly equipped with 4 ultrafast digital inputs and 4 ultrafast channels that can be configured as either an input or output.

Highlights

- Response times down to $1 \mu\text{s}$
- Analog inputs and outputs
- Simple programming

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reACTION I/O modules →

	X20 RT 8202	X20 RT 8401
System	X20	X20
Module type	Digital/Analog module, double-width	Digital/Analog module, double-width
Digital inputs	4x 24 VDC, <2 μs	4x 24 VDC, <2 μs
Digital inputs/outputs	4x 24 VDC, 0.1 A, <2 μs	4x 24 VDC, 0.1 A, <2 μs
Analog inputs	-	1x ±10 V, 12-bit, 5 μs configurable software filter
Analog outputs	2x ±10 V, 12-bit, 25 μs	1x ±10 V, 12-bit, 25 μs
Technology	reACTION TECHNOLOGY	reACTION TECHNOLOGY

Ultrafast I/O for ultrafast response times: μs values refer to physical conversion times.

5 V encoder connection for DC motor module

B&R now also offers its X20 series PWM motor bridge module for 5 V incremental encoders. This module can be used to control 4 DC motors operated with a rated voltage of 24 to 48 VDC and a rated current of up to 6 A. The module can be re-configured and used in current controller mode for controlling inductive loads.

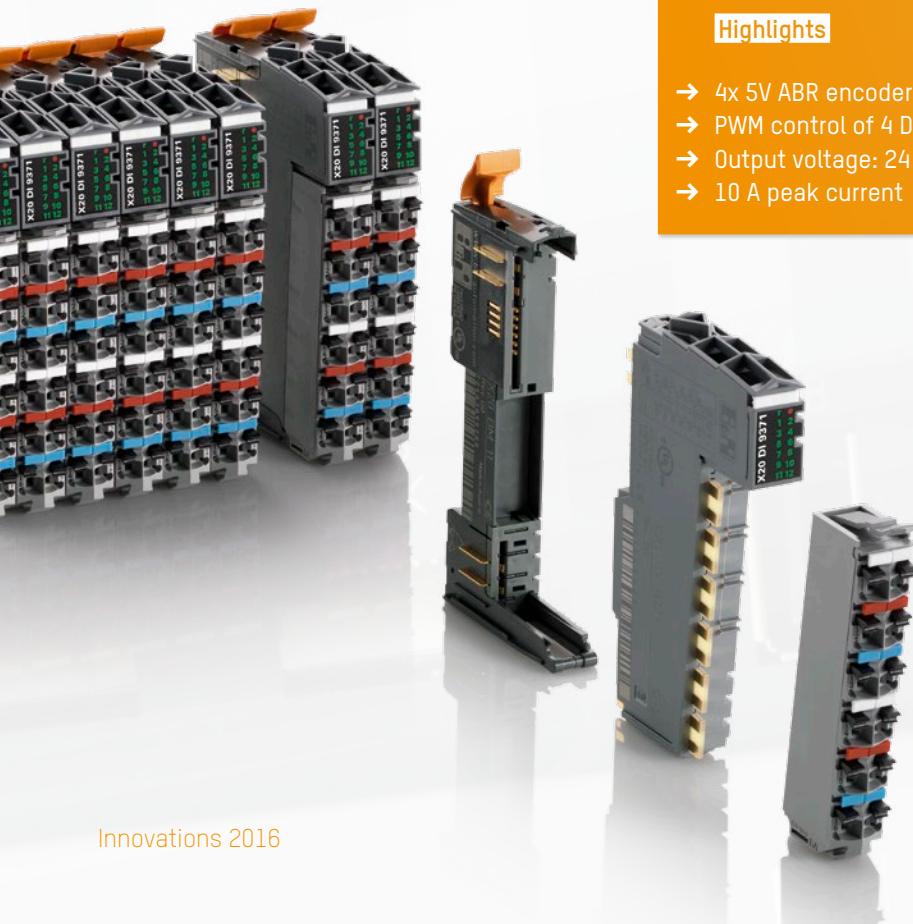
Until now, there was only an X20 module for 24 V incremental encoders. The product range now in-

cludes a variant that allows four 5 V incremental encoders to be connected. The 4x3 inputs can also be configured as simple digital inputs for 5 VDC. The module is also equipped with a 5 VDC sensor supply.

The power supply for the module is identical to the one on the existing module. Each motor is controlled with a separate full-bridge (H-bridge). This enables the motors to be moved in both directions.

Highlights

- 4x 5V ABR encoder inputs
- PWM control of 4 DC motors
- Output voltage: 24 to 48 VDC
- 10 A peak current



Digital input module for 48 VDC signals

The X20 product range has been expanded to include a digital input module for 48 VDC signals. Using 1-wire technology, the single-width X20 module provides 10 input channels in a space only 12.5 mm wide. The input filters for the module are configured using software and can therefore be easily adapted to any application.

Highlights

- 10 digital inputs with 48 VDC
- Configurable software-based input filter

Energy measurement made easy

B&R has expanded their X20 I/O series to include 3 additional modules for energy metering. The X20AP3122 and X20AP3132 modules allow measurement coils to be grounded and are equipped with current inputs for 1 or 5 amps. The X20AP3171 module supports power measurement using Rogowski coils.

The 3 new modules complement the previous variants, which can be used to connect 20 mA, 1 A and 5 A current coils. A module with four 333 mV inputs is also available. All X20 energy metering modules provide measured values for effective, reactive and apparent power. The phasing is also detected and frequencies and harmonics are calculated with a high level of precision. The measured values for all modules are evaluated in an

identical manner – regardless of the sensor. The user can therefore use different current measurement sensors with the same application software. Rogowski coils are very robust and easy to install. They can be integrated into existing systems without having to disconnected the circuit.

Highlights

- Measurement coils can be grounded
- Support of Rogowski coils
- Phasing detection
- Calculate frequency and harmonics with high precision

The compact S-class controller

B&R presents its new Compact-S family of controllers within the X20 system. The new controllers combine 2 previously conflicting characteristics: They are both powerful and compact. Customers can choose between 5 different variants to get the product that best meets the requirements of the machine – technically and economically.

Highlights

- Controllers with cycle times from 4 ms to 400 μ s
- From simple machines to CNC applications
- Fully compatible with other B&R products
- Full scalability without limitations

Completely scalable
 5 performance classes
 Up to 2 expansion slots

Powerful
 ARM Cortex A9
 Up to 256 MB RAM

USB 2.0
 For program/system updates
 Freely available for the application
 and for Technology Guarding



Integrated flash drive
 Up to 2 GB of internal flash memory
 Up to 64 kB NV RAM

Totally maintenance-free
 No fans
 No batteries
 Battery-backed real-time clock

Local expansion
 Complete X20 product range
 Up to 250 I/O modules
 Connected directly or at distances
 up to 100 m

Integrated interfaces
 Serial interface: RS232
 Optional: CAN connection

Flexible slots
 X20 interface slots
 For all X20 fieldbus modules
 Modular: For 0, 1 or 2 IF modules

Standard Ethernet
 Gigabit Ethernet
 For higher-level communication,
 e.g. with OPC UA

POWERLINK
 For remote connection of I/O
 modules, axes and safety equip-
 ment with complete freedom to
 choose a topology

As standard, the new controllers are equipped with USB, POWERLINK and Gigabit Ethernet interfaces and are fully compatible with all other X20 controllers. The most powerful version of the Compact-S controllers achieves cycle times down to 400 μ s and has 256 MB of RAM and 2 GB of internal flash memory.

If this performance is not needed, a variant with a maximum cycle time of 800 μ s or 1 ms can also be selected. For machines that do not require a real-time network, the two smallest Compact-S variants can be used. They have Fast Ethernet and can achieve cycle times as low as 2 or 4 ms.





Compact-S CPU module →

	X20 CP 0410	X20 CP 0411	X20 CP 0482	X20 CP 0483	X20 CP 0484
CPU	ARM Cortex A9-66	ARM Cortex A9-133	ARM Cortex A9-266	ARM Cortex A9-500	ARM Cortex A9-766
Fastest cycle time	4 ms	2 ms	1 ms	800 µs	400 µs
RAM	64 MB	128 MB	128 MB	256 MB	256 MB
Nonvolatile RAM	8 kB	16 kB	16 kB	32 kB	64 kB
Onboard flash drive	256 MB	512 MB	1 GB	1 GB	2 GB
Ethernet	1x 10/100 Base-T	1x 10/100 Base-T	1x 10/100/1000 Base-T	1x 10/100/1000 Base-T	1x 10/100/1000 Base-T
POWERLINK	-	-	1x	1x	1x
USB 2.0	2x	2x	2x	2x	2x
CAN	Optional	Optional	Optional	Optional	Optional
RS232	1x	1x	1x	1x	1x
Interface slots	-	-	Up to 2x	Up to 2x	Up to 2x
Removable memory	Via USB flash drive	Via USB flash drive	Via USB flash drive	Via USB flash drive	Via USB flash drive
RTC buffer time (typical)	1000 h	1000 h	1000 h	1000 h	1000 h
Maintenance-free	No fans, No batteries	No fans, No batteries	No fans, No batteries	No fans, No batteries	No fans, No batteries

Completely scalable

The new controllers have a width of only 37.5 mm, including the power supply, making them the most compact in their class. With POWERLINK, Ethernet, USB and RS232 as standard equipment, they offer ample communication options. A CAN interface is also available as an option without increasing the size. If the application requires additional interfaces, the controller can be modularly expanded by one or two X20 interface slots. This allows the entire product range of X20 fieldbus interfaces to be used.

Secure remote maintenance – Anytime and anywhere

The new remote maintenance solution from B&R makes diagnosing and maintaining machinery and equipment easier than ever. The solution utilizes the latest IT and security standards and allows for significant savings with low investment costs.

Like consumer goods, machines and systems are now sold in all corners of the world. Modern communication and transportation bring distant locations ever closer together. Modern production and logistics systems enable markets on a global scale.

But for OEMs, having customers around the world also comes with its share of new challenges. The situation becomes more difficult when it comes time for more extensive maintenance. To avoid the cost of flying service technicians and engineers halfway around the world, OEMs are increasingly relying on remote maintenance.

Simple and secure

With B&R's remote maintenance solution, a service technician can access machines from anywhere in the world to retrieve logbook entries, application data and much more. This is done via a certificate-secured and encrypted VPN connection between the SiteManager on the machine and the GateManager at the machine manufacturer's service center.

Fast maintenance response times

When a customer's equipment or machine isn't working, every minute counts. If a service technician isn't available on-site, it can be hours or days before expert assistance is available. With the B&R remote maintenance solution, a technician can connect, run diagnostics, adjust parameters and resolve the error – all in a matter of moments.

Use cases

Secure remote maintenance

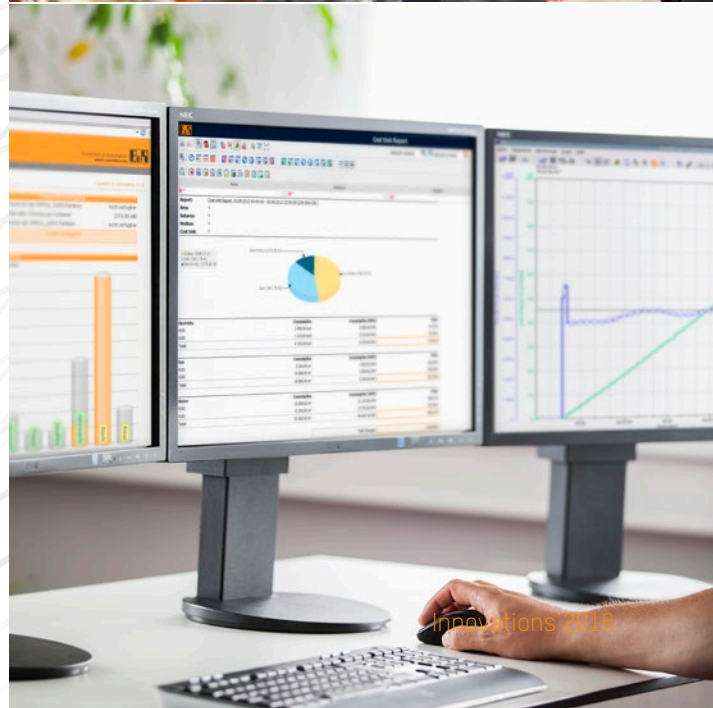
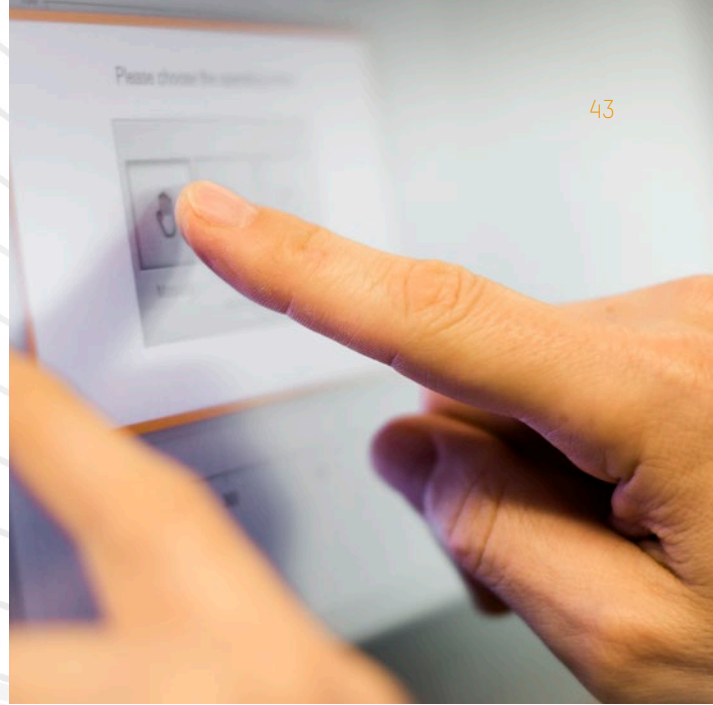
As a machine manufacturer, you want the ability to connect to your machines in the field quickly and easily when problems arise. Establishing a connection takes only a few seconds, and then you're ready to troubleshoot and make the necessary corrections.

Secure remote programming

As a machine manufacturer, you want to actively support your commissioning team on-site at your customer's location from the convenience of your office. Your software developers need access to the machine being installed in order to adjust system parameters and the software configuration to the customer's needs.

Secure remote data logging

As a machine manufacturer, you want access to the machine parameters of all your installed machines so you can store them centrally. Analysis of the collected data makes it possible to identify faulty parts early on and plan service intervals optimally.



LinkManager

Service technicians have the ability to connect with machinery and equipment using software. They can do so via a PC-based system or using a smartphone or tablet (iOS or Android). All access is logged and archived for later traceability.



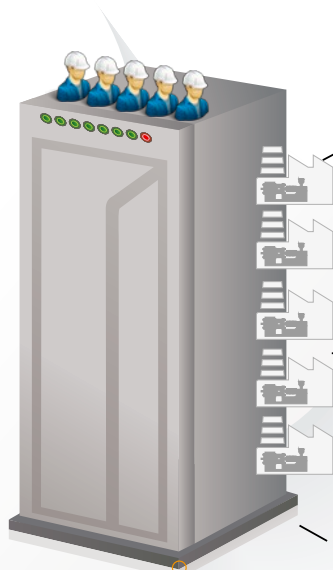
World Wide Web

Data transfer

www – three letters, infinite possibilities. With Internet access now reaching the farthest corners of the earth, it is clearly the ideal way for service technicians to connect to machines. A prerequisite for this is the ability to transmit data securely and reliably. B&R's remote maintenance solution utilizes a secure VPN connection. No data is transferred until the sophisticated authentication process has completed successfully. The connection to the Internet can take place via LAN, WLAN or a mobile network. All three connection variants are protected by firewall.

SiteManager

A SiteManager is part of the machine network and provides access to the network via the GateManager. All SiteManager variants are equipped with integrated inputs and outputs as well as at least one Ethernet port. The integrated firewall manages all access to the machine network – on both the IP address and protocol layers. All SiteManager variants can be configured in Automation Studio.



SiteManager 1115
Ethernet
Integrated I/O
LAN



SiteManager 1135
Ethernet & 3G/GSM
Integrated I/O
LAN 3G/GSM



SiteManager 1145
Ethernet & WiFi
Integrated I/O
LAN WiFi

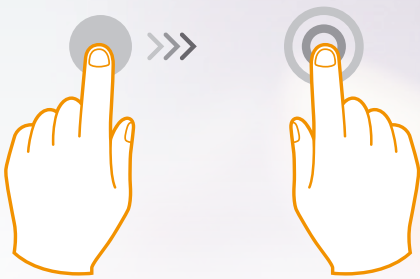
GateManager including machine pool management

Machine manufacturers have many customers – and even more machines in the field. To improve the efficiency of remote maintenance, the B&R remote maintenance solution features a GateManager with integrated machine pool management. This manages the machines in the field, and also manages the access rights of service staff operating the individual machines. The Machine Pool Management service included in B&R's remote maintenance solution is easy to use without any special IT knowledge.

Range of functions

- Diagnostics with Automation Studio and System Diagnostics Manager (SDM)
- Access the HMI application directly
- Read logbook entries and application data
- Change machine settings and parameters
- Update programs and firmware

Glass touch comes standard



B&R has added 2 models to its Power Panel T-Series featuring a glass screen and multi-touch technology. The new Power Panel T50 is available with a 7" or 10.1" display. These HMI devices are compact, easy to configure and ideally suited for premium machine designs.

The high sensitivity and accuracy of the projected capacitive touch screen improves HMI usability. The multi-touch technology also makes it possible to integrate convenient gestures like zooming and swiping.

Compact and versatile

The Power Panel T-Series are compact HMI devices that can be operated with an integrated web browser in full screen mode or as a VNC client. The mode can be easily configured on the device. The Power Panel communicates via standard Ethernet, so cabling is simple and inexpensive. Two USB ports are also provided.

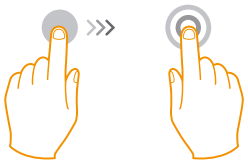


Highlights

- Quality design for all machines
- State-of-the-art multi-touch operation
- Easy configuration

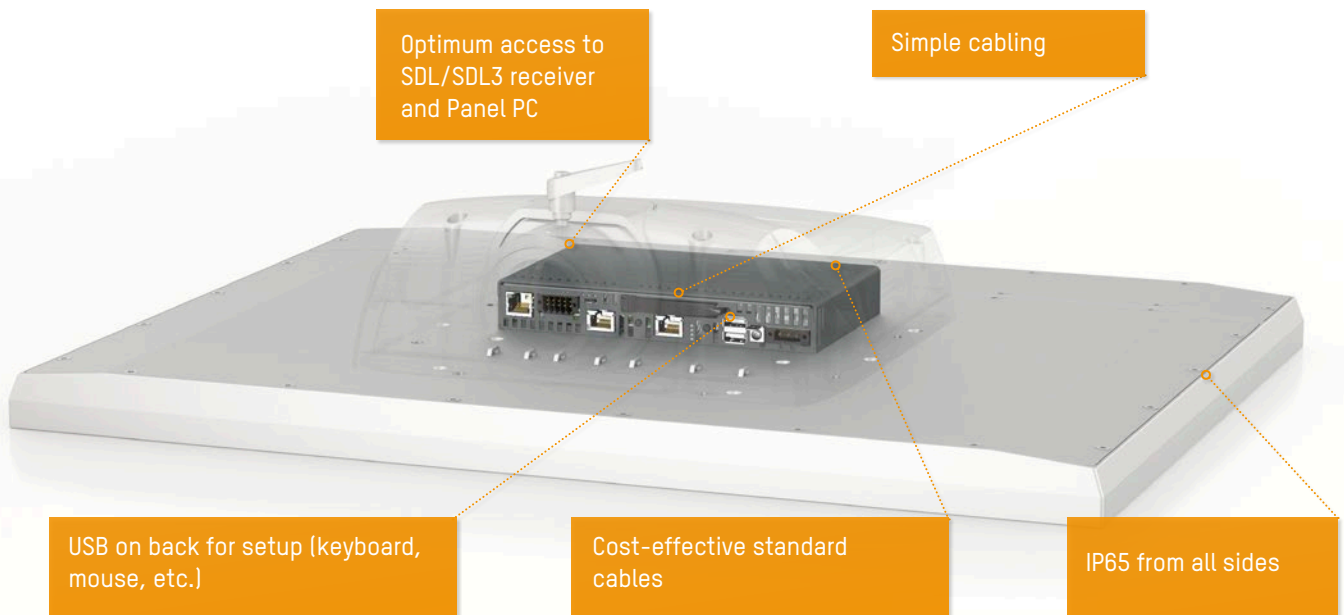


Automation Panel 5000 - modular swing arm systems



The continuing reduction of control cabinets in particular is increasing the need for input stations that can be installed flexibly. Fully enclosed panels with IP65 protection offer decisive advantages when it comes to positioning operator terminals at the most convenient locations on the machine. For this reason, completely enclosed Automation Panel and Panel PC variants are available for mounting on swing arm systems.

While their predecessors were connected to a remote industrial PC, today's decentralized control architectures increasingly demand panels with onboard intelligence - in the form of integrated PC components. The Automation Panel 5000 can be set up as a remote terminal or an integrated



Panel PC. This involves equipping it with either a PC unit or a receiver for B&R's high-performance digital display technology, Smart Display Link (SDL/SDL3). Either way, the operator panel itself is identical.

Swipe, zoom, scroll

A wide selection of Automation Panels are available for swing arm mounting. The classic variant is available with analog resistive touch screens in 4:3 format, with sizes ranging from 15" to 19" and XGA or SXGA resolution.

Multi-touch systems, on the other hand, are quickly gaining popularity in industrial environments through benefits such as intuitive swiping, zooming and scrolling gestures as well as two-hand gestures to prevent the inadvertent triggering of critical operations. Widescreen Automation Panels with projected capacitive touch screens are available in sizes ranging from 15.6" to 24" with either HD Ready or Full HD resolution.

Maximum convenience

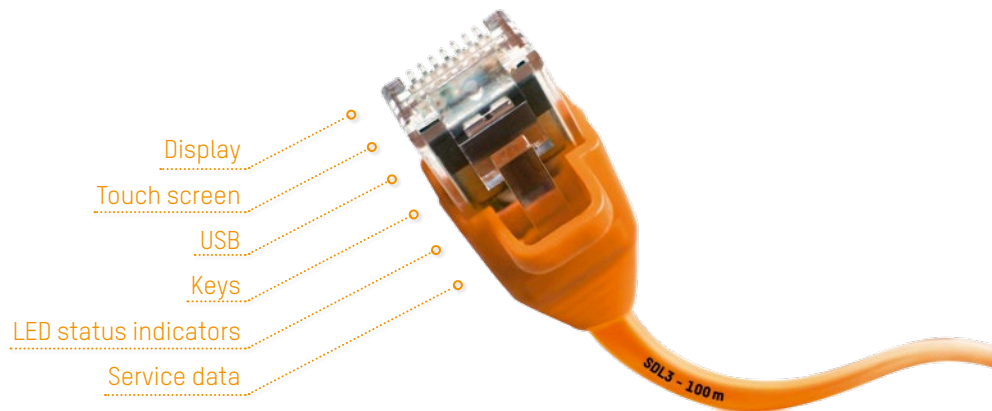
Touch screens open up new forms of user interaction, yet mechanical controls continue to be preferred for certain operations. That's why B&R offers its Automation Panel 5000 with optional push buttons, selector switches and key switches. An E-stop button can also be installed on the swing arm device, where it is always within the operator's reach.

Used to manage access rights in many facilities, RFID keys can just as easily control access to operator terminals.

Highlights

- Connections for DVI, SDL and SDL3
- Optionally available with handles
- Glove operation possible
- Flexible installation on top or bottom

Revolutionary cabling - Smart Display Link 3



New Smart Display Link 3 transmission technology offers clear advantages for cabling Automation Panel 5000 swing arm devices. B&R is excited to introduce Smart Display Link 3, the newest generation of its proven technology for digital display data transmission. This new version allows a maximum distance of 100 meters between the PC and panel, providing clear benefits for modular machine and system manufacturing in particular.

The third generation of this digital display transmission technology represents a new chapter in the success story that is Smart Display Link. Smart Display Link's unsurpassed convenience is owed to two key advantages: complete independence from the operating system and the ability to connect the PC to the operator panel using only a single cable.

Up to 100 m

SDL3 is able to span much greater distances. This allows for optimal placement of Automation PCs and Automation Panel 5000 devices even on more expansive systems. SDL3 uses standard Ethernet cables, which drastically reduces cable costs over longer distances. The thin cable and slim RJ45 connector are a perfect fit in tight situations such as feed-through openings and swing arm systems.

Simple cabling

These types of solutions used to require a thin client with a complete PC design. This not only took up more space, but was also dependent on the software and operating system being used. On top of that were the added costs of the PC architecture. The modular design of the Automation PC 910 and Automation Panel 5000 allows them to be equipped with an optional SDL3 port.

Highlights

- SDL3 transmits all communication channels between PC and panel via a standard Ethernet cable.
- Up to 100 m
- Independent of operating system and software
- Simplified cabling
- Small connector – also suitable for tight feed-throughs
- No need for a CPU in the panel
- No load on the PC system
- Maximum graphics performance
- Long-term availability



Latest Intel Atom technology

The Panel PC 2100 used in the Automation Panel 5000 is a full-fledged, powerful PC system. Its ultracompact housing has the dimensions of an Smart Display Link receiver. The cabinet-mount variant offers these advantages as well.

The PC design is based on the Intel Bay Trail architecture and offers an optimal price/performance ratio. With single-, dual- and quad-core processor technology, it represents a milestone for embedded systems. All Automation Panel 5000 variants have done away with internal fans.

Maximum flexibility

All Automation Panel 5000 devices can be upgraded to a full-fledged PC system by adding a Panel PC 2100, which is no larger than a Smart Display Link receiver. Connecting cables to the Ethernet and fieldbus interfaces is also extremely user-friendly since they are all easily accessible.

Communication in all directions

The Panel PC 2100 integrates all important interfaces, including 2x Gigabit Ethernet as well as 1x USB 2.0 and 1x USB 3.0. Interface modules can also be added to take advantage of fieldbus technology such as POWERLINK and CAN. For data storage, MLC-based CFast cards are available that can store up to 128 GB or more.

Maximum graphics performance

The graphics engine used by Intel Atom processors is derived from Core i technology and provides powerful processing. This is also the first time that support for DirectX 11 is provided in this segment, opening up even more possibilities for enhanced graphic capabilities in SCADA and other HMI systems. All resolutions and screen sizes up to 24.0" Full HD are supported.

Operating systems

Panel PC 2100 technology closes the gap between open and real-time operating systems. In addition to Windows 7 Professional and Ultimate, it is also possible to run Windows Embedded Standard 7 and Windows Embedded Standard 7 Premium. Windows 8.1 Industry and Windows 10 IoT are also supported. The real-time operating system Automation Runtime turns PC systems into fully-fledged high-performance industrial controllers. The combination of Automation Runtime and Windows unites the open PC world with applications that require hard real time. Based on multi-core processor architecture, the real-time operating system runs on one core while the other cores are reserved for Windows.

Flexible mounting

The Automation Panel 5000 supports a customizable arrangement of operating elements.



Easy customization

To adapt optimally to the needs of each machine, keys and switches can be customized according to customer specifications. The list of possible adaptations endless, including virtually any arrangement of standard keys, illuminated ring keys and push buttons in various colors. Custom HMI devices are generally delivered fully assembled. A custom keypad module is also available.

Simple cabling

Cables are installed through the swing arm system and connected to an easily accessible area with IP65 protection, which makes it possible to use inexpensive standard cables. The installed panel is wired directly on the swing arm. Setting up the device is done in the same modular way as mounted devices. Customers who opt for Smart Display Link 3, the latest generation of B&R display transmission technology, benefit from slim

RJ45 connectors, which are perfect for the restricted space available in swing arms.

Powerful processor technology

Systems in the Panel PC 2100 series are equipped with high energy-saving processors that cover a wide performance spectrum ranging from single-core processors all the way up to quad-core. This computing power is otherwise only possible in a cabinet-mounted device. Graphics performance isn't lagging behind, either; features such as DirectX 11 are also supported. Even on a swing arm, the Panel PC 2100 is perfectly suited for the absolute latest SCADA systems with sophisticated graphics.

Easy operation

Swing arm devices are available either with a touch screen or with additional control elements. The implementation of two-hand operation for

critical tasks prevents operations from being carried out unintentionally. Analog resistive single-touch variants round out the product spectrum. Buttons, selector switches, key switches and an integrated E-stop button provide exceptional user comfort. An integrated RFID reader allows the assignment of individual access rights. The practice of jotting down passwords on scraps of paper can finally be put to rest.

Flexible mounting

B&R Automation Panels support both pendant and pedestal mounting. The panels are designed to allow easy access to all operating elements and cables. This is done by removing the entire back cover, which – like panel itself – offers IP65 protection.

Side grips can be installed so that the user can easily move the panel into the optimal position.

The optional swivel-tilt flange allows the panel to be adjusted to an ergonomic viewing angle for comfortable use without fatigue. As an alternative to the swing arm system, the Automation Panel 5000 can also be installed on a VESA monitor mount.

Highlights

- Widescreen formats from 15.6" HD to 24" Full HD
- Projected capacitive multi-touch
- Connections for DVI, SDL and SDL3
- High-quality, scratch-resistant housing
- Optionally available with handles
- Gloved operation possible
- Flexible pendant/pedestal mounting



The Automation Panel 5000 can be mounted in either pendant or pedestal orientation.

Windows 10 for industrial applications



Windows 10 IoT Enterprise offers the ideal foundation for industrial applications. IoT stands for Internet of Things and represents a focus on universal connectivity of all devices. Windows 10 IoT Enterprise corresponds with the full version of Windows 10, plus advanced safety and locking mechanisms. As the ideal basis for HMI applications with touch screen capabilities, it also offers additional possibilities that increase system security.

B&R supports Windows 10 IoT Enterprise for the Automation PC 910, Panel PC 900, Automation PC 2100 and Panel PC 2100 – for both 32-bit and 64-bit systems. The system is designed specifically for industrial applications and combines characteristics of embedded systems with additional lockdown functions that make industrial PCs more secure. The system is based on the full version of Windows 10, which ensures that all applications

and drivers are compatible. It offers optimal touch screen support as the basis for an intuitive user interface.

Individually configure devices

The lockdown functions in Windows Embedded 10 IoT Enterprise make it possible to individually configure the device while making the system more secure at the same time. In addition to locking certain functions in the operating system, Microsoft has also included the unified write filter capabilities from Windows Embedded Standard 7 and Windows 8.

These include "Write Filter", "File-based Write Filter" and "Registry Filter". They can be used to configure a flash drive for read-only access, for example, or to allow only certain registry keys to be accessed. Any changes made to the registry are thus redirected to RAM. As a result, the system



always starts with the same configuration after rebooting. Existing data storage media such as SSD or CFast can be write-protected.

With the dialog box filter, windows and dialog boxes can be suppressed at the process level. These dialog boxes can occur, for example, if virus scanners are updated, network connections fail or the

Windows Security Center shows warnings. Dialog boxes can be hidden if so desired.

Available in many languages

Like its predecessors Windows 7 Ultimate and Windows 8.1 Industry - Windows 10 IoT Enterprise is multilingual and covers all major languages, including those with Arabic and Chinese character sets.

Arabic	Finnish	Korean	Romanian	Thai
Bulgarian	French	Croatian	Russian	Czech
Chinese	Greek	Latvian	Swedish	Turkish
Danish	Hebrew	Lithuanian	Serbian	Ukrainian
German	Dutch	Norwegian	Slovak	Hungarian
English	Italian	Polish	Slovenian	
Estonian	Japanese	Portuguese	Spanish	

HMI Service Center – Comprehensive system diagnostics



Industrial PCs from B&R have always offered extensive system diagnostics that go above and beyond those of a standard PC. Not only is it possible to read information like serial numbers and part numbers, but also statistical data like power-on cycles and temperature sensor values. This data is managed by the specially developed Maintenance Controller. The goal is maximum system transparency for the user.

To offer optimum support whenever service is required, all informational and diagnostics features will be provided via the newly developed HMI Service Center. It could hardly be easier to use: Simply start the Automation PC or Panel PC with the USB flash drive inserted. Doing so will cause it to boot with the embedded operating system on the flash drive. The clearly structured user interface that appears provides access to all the necessary information and additional diagnostics features.

	Function
Battery	Feedback regarding battery status
BIOS	Read/write the BIOS version
Buzzer	Test the PC buzzer
COM	Test the serial interfaces on the PC and interface options
Device information	Factory settings Model number Serial number PCs and connected Automation Panels
Fan	Speed Status Log entries for all available fans Fan test
Firmware	Firmware versions of the PC and connected Automation Panels
Key	Test the PC buttons and optional buttons on panel
LED	Test the LEDs on the PC and panel
Network	Configure and test the Ethernet interfaces
RAM	Read the size and factory settings Test memory with test patterns
SRAM	Read Device ID and firmware version Inspection
Statistics	Power-on cycles Hours of operation
Storage	Material number and serial number Firmware version Location of installation SMART values
Temperature	Status and log entries for all temperature sensors Alarm for limit value violation including time period of occurrence
Touch screen	Test touch screen
UPS	Read statistics Voltages and status of UPS UPS tests
USB	Test the USB interfaces on the PC and connected panels



The new Automation PC 910 – Exceptional performance in a modular design

The entire line of processors used in Automation PC 910 systems covers a broad spectrum of CPU performance based on the 6th generation of Intel Core i-series processors. This new range of processors, which fits seamlessly into the Automation PC 910 system, brings another leap in perfor-

mance while keeping the thermal design power low. The new 14 nm processors are based on a completely new microarchitecture. Graphics performance has also been improved with the addition of support for DirectX 12.



With its state-of-the-art PC architecture, the APC910 ensures availability for many years. The accessory components used (hard disk, SSD, CFast) are identical to those used in the first Automation PC 910 generation for optimized man-

agement of replacement parts. It is not necessary to make continuous adjustments to the PC hardware over time, which adds up to its own cost advantages.



1 PCI / PCI Express slot



2 PCI / PCI Express slots



5 PCI / PCI Express slots

Future proof

The fully modular construction of the Automation PC 910 allows the system platform to be adapted to various applications. With data storage options ranging from SSD to CFast, slots for both PCI and PCI Express and an integrated UPS, there are virtually no limits to what you can do.

Modular panels

The Automation PC 910 is designed to operate remote panels. Automation Panels offer a uniform system platform. One and the same panel can be operated on an Automation PC with the corresponding receiver (SDL/DVI and Smart Display Link 3). The front of the Automation Panel is a premium quality projected capacitive touch screen, available in sizes up to 24" with Full HD resolution.

The edge-to-edge, anti-glare glass surface and brilliant, high-resolution display represent the ultimate in sophisticated operating panel technology. This new series is available with mounting options for a control cabinet cutout or swing arm.

Displays are equipped with a long-lasting, power-saving LED backlight. Classic 4:3 displays have also been enhanced by this advanced system design. Automation Panels featuring an analog resistive touch screen and display sizes up to 19".

Fanless operation that meets the highest demands

Many variants of the Automation PC 910 provide the option of operation without the use of fans. When this feature is combined with CFast cards and SSDs, the PC system is completely free of rotating parts – a huge advantage when it comes to maintenance-free operation. The Automation PC 910 cooling system has been designed to transfer heat out of the housing with optimal efficiency. To maximize convection for fanless operation, the Automation PC 910 heat sink design was optimized through an extensive evaluation process using simulated models. As processors shrink in size, heat is generated on a smaller and smaller surface area. To deal with this, heat pipes are the best way to provide maximum heat dissipation.

Optimized air circulation

The new honeycomb openings on the housing panels provide the perfect combination of air circulation and structural rigidity. Selected processors are able to operate without fans. Yet even without fans, the Automation PC 910 is able to achieve performance results that previous PC generations required fans to achieve. In the high-end range, quad-core processors can be used with fan cooling to achieve performance values that not too long ago would have been inconceivable for such a compact form factor. Air is precisely circulated through the integrated cooling fins.

2 modular interfaces
ETHERNET
POWERLINK
RS232/RS422/RS485
CAN/UPS/Audio/SRAM

SDL/DVI/Monitor

DisplayPort

RS232

2x Ethernet
10/100/1000

Up to 5 PCI /
PCI Express slots

4x USB 3.0

Smart Display Link 3
Single cable to easily connect operator panels, compatible with all Automation Panels in the field

Fanless
Same base device can be operated with or without a fan – maximum flexibility for all users

HDD & SSD
More than enough storage space with hard disk and solid-state drives

CFast
Combines the shape and dimensions of CompactFlash cards with the faster SATA interface

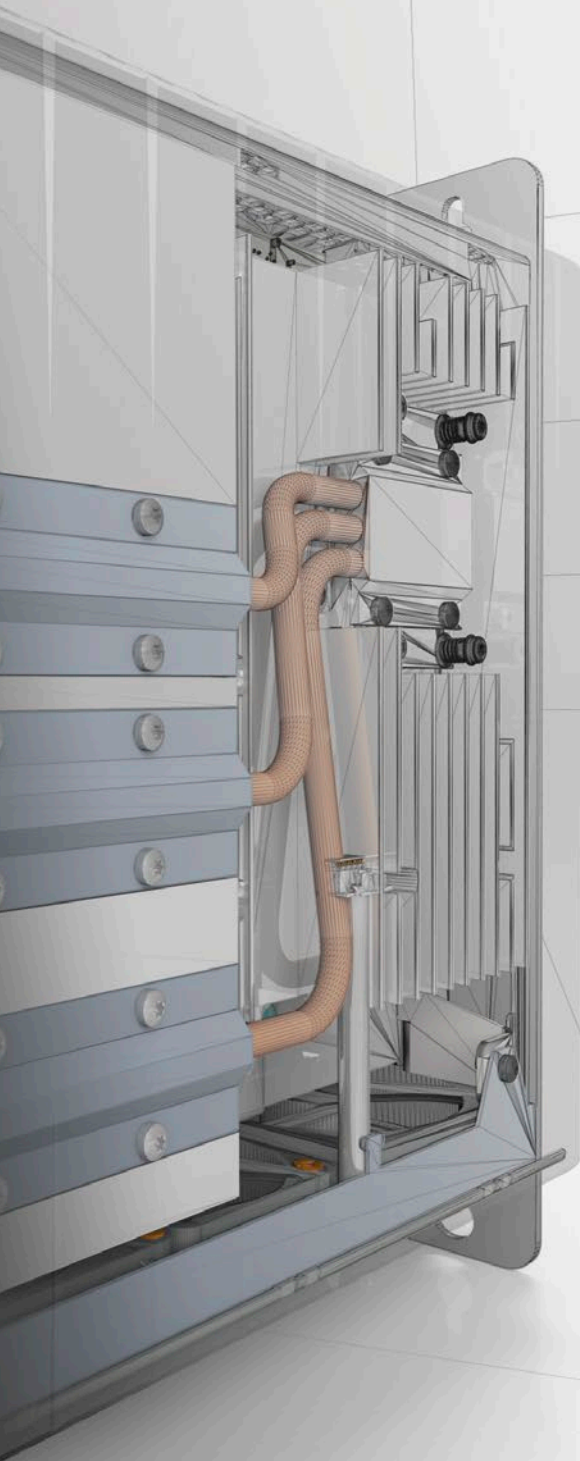


Automation PCs are designed and built for continuous operation in harsh industrial environments over a period of many years. They are encased in a robust welded housing that shields the electronics from the external environment and easily endures the harshest environments.

Highlights

- Intel Core i3/i5/i7 processors
- Intel Celeron processors
- Manufactured using state-of-the-art 14 nm process
- Maximum CPU performance
- Minimum power consumption
- Up to 4 cores
- Maximum graphics performance
- DirectX 12, OpenGL 3.1, OpenCL 1.1
- Intel Turbo Boost Technology
- Intel Hyper-Threading Technology
- Highly efficient energy management
- Multi-touch panels (projected capacitive)
- Single-touch panels (analog resistive)





Hygienic stainless steel operator panels with IP69K protection from a single source

The pharmaceutical, biomedical engineering and food industries place particularly high demands on machines. HMI systems must be free of wear and have no open grooves in order to meet stringent hygiene requirements. B&R's stainless steel panels provide IP69K protection and are perfectly suited for use in these conditions.

Cabinet-mounted panels

Hygiene is becoming more and more important in the processing industry. In the food processing and packaging industry, it is necessary to keep the materials being processed free of impurities. This issue is of course no less important in the pharmaceutical and biomedical engineering industries. Here it is also necessary to protect employees against infections and diseases.

Smooth stainless steel

B&R stainless steel panels feature a hygienic design and use especially resistant materials such as smooth stainless steel, a high-quality polyester overlay and special sealing materials. The range of available panels extends from simple touch screen visualization terminals to operator panels with integrated control and drive technology. Fully-fledged Panel PCs are also available.

Robust and suitable for hygienic applications

This stainless steel series, proven in harsh industrial environments, has been further optimized with regard to its hygienic properties and robustness. With its special design, the stainless steel Automation Panel 1000 is extremely well-suited

for use in the foodstuffs industry, where frequent cleaning takes place. The seamless touch screen design also makes this device optimal for the beverage and pharmaceutical industries. The entire series is certified in accordance with DIN 40050 for IP69K protection and was developed to meet the requirements of DIN EN 1672-2 – foodstuffs machines, general design principles, part 2: Hygienic requirements.

Devices in the energy-efficient Automation Panel 1000 series range from 7" to 15" display sizes and are available with or without an RFID unit.

Touch screen swing arm panels – Reliable and intuitive

The dimensions of the operator panel were designed to make it especially sleek. This means that additional handles are not necessary. In addition to an IP65-rated USB interface on the back of the panel, it is also possible to mount these systems on any conventional swing arm system.

Highlights

- Unique sealing system eliminates gaps
- IP69K
- 7" to 24"
- Shatter protection
- DVI, SDL, SDL3, Panel PC





Swing arm panels →

	5AP99D.156B-B62	5AP93D.185B-B62	5AP99D.185B-B62	5AP99D.215C-B62	5AP93D.240C-B62
Display size [inches]	15.6	18.5	18.5	21.5	24
Resolution [pixels]	1366 x 768	1366 x 768	1366 x 768	1920 x 1080	1920 x 1080
Touch	PCT	PCT	PCT	PCT	PCT
Orientation	Landscape	Landscape	Landscape	Landscape	Landscape
SDL/SDL3	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
Panel PC 2100	✓	✓	✓	✓	✓
E-stop, RFID reader, illuminated ring keys	✓	-	✓	✓	-

All swing arm panels are equipped with multi-touch screens that can be operated easily and intuitively. Since touch screen technology is firmly anchored in everyday life, time-consuming training can be kept to a minimum. Operational security is increased by ensuring that only sensible options are displayed on the screen. As a result, the possibility of error is kept to a minimum. The application determines which operating conditions can be selected. Users are also reliably guided step by step through complex processes. The touch screens themselves have a smooth surface so that their integration in the operator panel allows them to continue meeting strict hygienic requirements. The special structure of the screens increases robustness and also provides shatter protection. Touch screens can also be used with gloves or a suitable stylus pen.

Swing arm devices in new design

The new design allows B&R's swing arm panels for hygienic applications to be mounted with the flange on the top or the bottom. Each device can

be converted on-site for either pendant or pedestal mounting. If there is a risk of condensation accumulating in the swing arm system, pedestal mounting should be used.

The integrated B&R illuminated ring keys can be easily customized with symbols, numbers or text using slide-in labels – which don't affect the protection rating or create hygiene issues the way external tags do.

The keys are easy to configure from the PC. Each key can be illuminated in 4 different colors. If the keys and illuminated rings are to be evaluated via a direct connection to a PLC, the panel features convenient connectors for direct wiring. The PLC also offers 4 different colors, for example: green for run, red for stop, blue for reset and white as a neutral color for confirmation.

Individual solutions

These standard stainless steel panels can be adapted to meet special requirements at any

Cabinet-mounted panels →

	5AP1120.0702-I00	5AP1125.1043-I00	5AP1125.1044-I00	5AP1125.1505-I00
Display size [inches]	7	10.4	10.4	15
Resolution [pixels]	800 x 480	640 x 480	800 x 600	1024 x 768
Touch	Resistive	Resistive	Resistive	Resistive
Orientation	Landscape	Landscape	Landscape	Landscape
SDL/SDL3	✓/✓	✓/✓	✓/✓	✓/✓
Panel PC 2100	✓	✓	✓	✓
Panel PC 900	-	✓	✓	✓
RFID	-	✓	✓	✓



RFID

time. Manufacturing candy has different requirements and environmental conditions than processing meat, while filling highly salty or sugary liquids has different requirements than pressing and packaging pharmaceutical products. Changes in lifestyle and the resulting booming market for ready-made meals is another challenge. Aseptic processing of products provides many additional benefits to consumers, including reducing or doing away with the use of preservatives and increasing product shelf life. B&R operator panels can be specifically and individually adapted to meet all of these challenges. Their external appearance can also be designed according to customer wishes.

Advantages

- Approved for food production
- Can be operated with gloves
- Flexible swing arm installation
- Easy to clean

Individual design options

- Illuminated ring keys
- E-stop switch
- RFID reader
- Custom design
- Industrial PC integration

Illuminated ring keys and RFID readers

The RFID reader on the panel makes it possible to securely regulate access without direct contact without having to deal with passwords or key-operated switches. Not all operating elements can be implemented using a touch screen. Sometimes an illuminated pushbutton with a clear signal or tactile feedback is required. As a result, illuminated ring keys can be integrated on request. They are a perfect alternative to conventional electro-mechanical pushbuttons because they provide tactile feedback. And because they are integrated directly in the panel overlay, there are no edges or grooves, making cleaning extremely easy. Grooves and edges caused by add-on control elements are not just minimized, they are completely eliminated.

Customizing quick and easy – In under 2 weeks

Panel Designer allows all B&R panels and the front doors of Automation PCs to be designed individually. This web-based application makes it possible to create professional designs within a few minutes without any previous experience.

B&R customers receive their customized device in series quality in less than 2 weeks. To create a design, all that needs to be done is to select a hardware product. The appearance is then adapted using Panel Designer – B&R's free, easy-to-use software tool for creating custom panel designs. Colors, shapes and text can be added as desired. External graphics can also be easily loaded into the program and added to the design. The Panel Designer provides a real-time preview of the final result. This makes it easy for companies to ensure that their HMI devices perfectly match their corporate design. The design file that is created is sent straight to B&R's production. With

a revolutionary minimum order quantity of 1, it's never been easier or more cost-effective to create custom layouts tailored to specific machines or end users.



Link to Panel Designer

<http://paneldesigner.br-automation.com>



Panel Designer video

<http://www.youtube.com/watch?v=MxVXzrUtW30>

Advantages

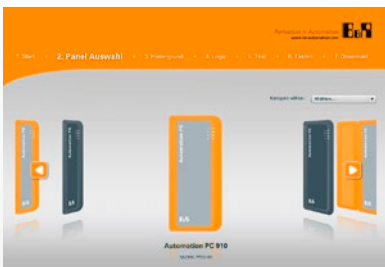
- Custom HMI in batch size 1 with Panel Designer
- Ready in less than 2 weeks
- Subsequent orders at series prices with added cost
- Custom adaptations are supported worldwide

Highlights

- Unique design: any time, anywhere
- Creativity with no compromises
- Online and free
- Intuitive user guidance
- Corporate design only clicks away
- Possible to upload graphics and company logo
- Support from B&R design team on request



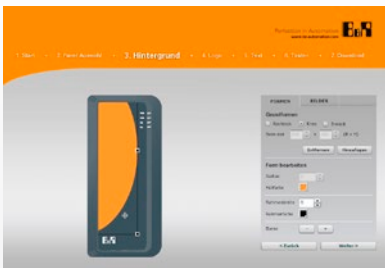
The new Panel Designer tool is now available online on the B&R website at no extra charge.



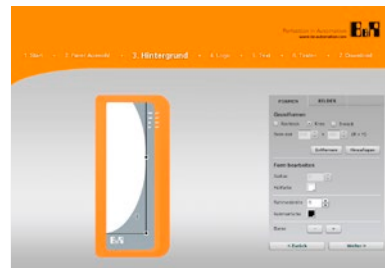
Panel Designer gives HMI devices your personal touch.



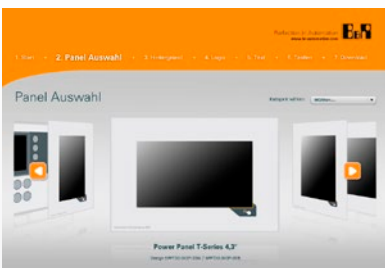
Create professional designs in minutes with the web-based Panel Designer.



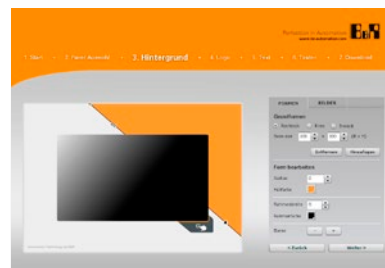
The front cover of an Automation PC can be personalized.



Colors, shapes, graphics and text – Panel Designer gives you extensive design freedom.



The Panel Designer can be launched in any web browser.



Once finished, your design is saved and passed on to B&R's production team.



Utilize braking energy effectively

The new 2-axis modules from B&R's ACOPOS P3 series feed braking energy back into the mains. This function significantly improves the overall effectiveness of a machine. With just 500 watts of regenerative braking power, the function pays for itself in only a year.

A prime candidate for this function are machine tools, whose headstock spindle drives generate large amounts of braking energy that would otherwise go unused. The function is also well suited for conveyor systems that move heavy loads vertically. Without power regeneration, not only would the braking energy go to waste, but the resulting heat would require additional cooling and consume even more power.

Regenerative braking is implemented particularly efficiently in the new 2-axis modules from the ACOPOS P3 series. One of the axes is configured as the feedback path to return excess power to the mains.

Save even more energy with ACOPOSmulti

Like the new ACOPOS P3, the active power supply modules from the ACOPOSmulti series also support regenerative braking. They also offer other helpful functions such as stabilization of the DC bus voltage independently of the mains voltage. Without any additional upstream transformers, this ensures consistent machine behavior – anywhere in the world.

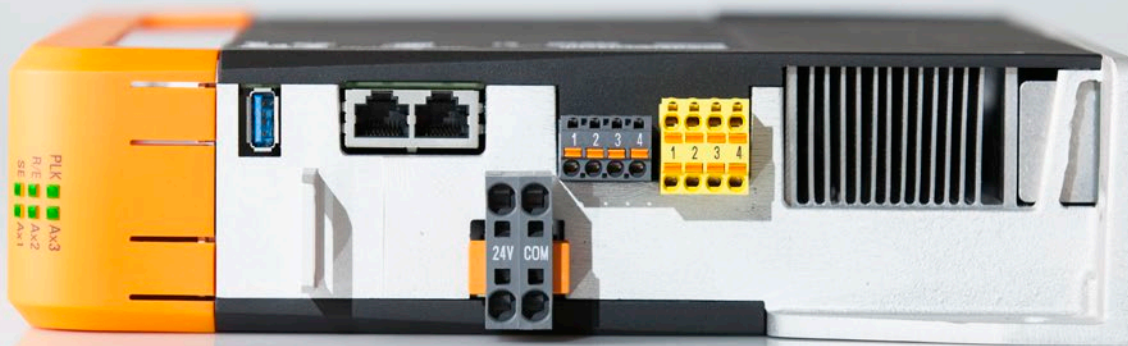
The ACOPOSmulti active power supply modules also feature power factor correction. By ensuring that the modules only draw effective power from the mains, this function considerably reduces a machine's overall power consumption.

Highlights

- Efficient power regeneration
- Compact 2-axis module
- Increased overall machine effectiveness



The new 2-axis modules from B&R's ACOPOS P3 series feature an extended power range up to 22 kW.



ACOPOS P3: 1 safety module monitors 3 axes

B&R presents the latest safety innovation for the ACOPOS P3 servo drive: For the first time ever, up to three axes can be monitored with a single SafeMOTION module. Users benefit from comprehensive safety functions while at the same time keeping the cost of the safety application down.

B&R presented the new ACOPOS P3 at the 2015 SPS IPC Drives trade show. With a power density of 6 amps per liter of space, this innovative system is the most efficient servo drive with integrated safety functions available on the market. It also offers unrivaled dynamics and precision, with a sampling time of just 50 μ s for the entire controller cascade.

Mix and match safety function packages

Users can optimize the cost of safety for their drive systems. With the ACOPOS P3, you only pay for the function packages you really need in your safety application. Get all the benefit of state-of-the-art safety technology while remaining competitive. B&R offers four different packages of safety functions:

Basic function set: ST0, ST01, SBC, SS1

- Speed function set: S0S, SS2, SLS, SMS, SLA
- Advanced function set: SDI, SLI, SBT, SLT
- Absolute position function set: Safe Homing, SLP, SMP, Remanent Safe Position

The "Basic" function set offers fundamental safety functions and serves as the basis for all the other packages. It provides basic control for the SafeMOTION module in the ACOPOS P3. The other packages provide complementary functions and can be used independently of one another. The "Speed" function set contains safety functions based on acceleration and deceleration such as safe stopping and safe speed limiting.

The "Advanced" function set provides more sophisticated safety functions. These can be used, for example, to monitor whether a defined direction of movement or a defined increment is violated. The "Absolute position" function set contains safety functions that establish and monitor a safe absolute position.

Combine drives from different vendors

The ACOPOS P3 with safety functions supports the "openSAFETY drive profile" specified by the EPSG in cooperation with Control Technique, Yaskawa, Danfoss and B&R. This means that the axis can be operated with safety functions on any safety controller that is openSAFETY compliant and supports the drive profile. Users benefit from a more flexible selection of drives and can combine products from different manufacturers.

Flexible selection of encoders

The encoder interface supports the digital EnDat 2.2 protocol from Heidenhain, which is certified for use in functional safety applications. In the future, encoders that support the Hiperface DSL protocol from Sick can also be used. Thanks to the multi-encoder interface on the ACOPOS P3, both digital encoder interfaces use the exact same hardware.

Highlights

- Compact servo drive for up to 3 axes
- Integrated safety functions
- Scalable price/performance model



100100PS.CO2X-01 A
Made in Austria

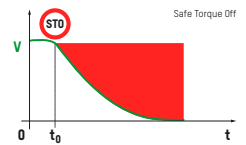


DANGER!
Risk of Electric Shock!
Before servicing, disconnect supply, wait 5 minutes and assure that the voltage at X1 has discharged below 42VDC



100
Stepper

Safety for compact stepper motors



The compact ACOPOSmicro Stepper drive is now available with Safe Torque Off (STO). Over time, this safety function will be added to all ACOPOSmicro drives.

B&R has integrated safe pulse disabling in ACOPOSmicro Stepper drives for shutting down safely and preventing unwanted startup. Safety ratings up to SIL2 / PLD / CAT 3 can be achieved depending on the wiring.

Stop function for Category 0

Safe pulse disabling interrupts the power being sent to the drive. Electrical torque can then no longer be generated, so the drive coasts to a

stop. The requirements for preventing unexpected startup in accordance with EN 1037 as well as the requirements concerning Category 0 stop functions in accordance with EN 60204-1 are met. The requirements concerning the STO safety function in accordance with EN 61800-5-2 are also met.

Highlights

- Safe Torque Off (STO)
- SIL 2 / PLd / CAT 3
- STO Enable input

New encoders for ACOPOSmicro

B&R is further expanding the ACOPOSmicro servo drive series. In the future, SinCos and 5 V ABR encoders will also be supported.

Both 1-axis and 2-axis devices are available for SinCos encoders. The ABR interface has been integrated in a 2-axis ACOPOSmicro module. This device is equipped with two ABR 5 V differential inputs.

The technical data for the servo drives correspond to the data for existing ACOPOSmicro models. A

rated current of 8 A, a trigger input, a motor holding brake connection and an enable input are available for each axis.

Highlights

- Support for SinCos encoders
- Support for 5 V ABR encoders
- 8 A nominal current



Extensive safety functions for ACOPOSmotor

B&R has added a SafeMOTION module to its distributed ACOPOSmotor servo actuators. The compact unit now consists of a servo motor with encoder system and a servo drive with integrated safety technology.

The integrated safety technology makes it possible to implement today's most advanced safety systems. Yet, the distributed servo actuator requires no external wiring or external devices such as overspeed monitors.

The individual safety functions are selected on the SafeLOGIC safety controller and are executed directly on the axis. This is how B&R guarantees fast response times for maximum safety.

Intelligent encoder system

For the encoder system, B&R uses safety encoders with an EnDat 2.2 interface. The digital encoders are resistant to interference and highly precise. Since they are mounted securely and each

encoder is checked for adherence to installation guidelines, errors in the connection between encoder and motor shaft can be ruled out. Position data can therefore also be used for the safe absolute position. Safety functions such as Safely Limited Position (SLP) and Safe Maximum Position (SMP) are also possible.

Compact and robust

On the ACOPOSmotor, the inverter and motor form a unit, which saves a considerable amount of space in the control cabinet. The cabling brings further savings potential. Daisy chaining considerably reduces the number of cables required.

The units are also extremely compact, because the electronics are cooled directly via the motor. ACOPOSmotor is also rugged enough to handle harsh environments. Vibration amplitudes up to 4 g are permitted. It also offers IP65 protection thanks to its fanless design and oil seal.

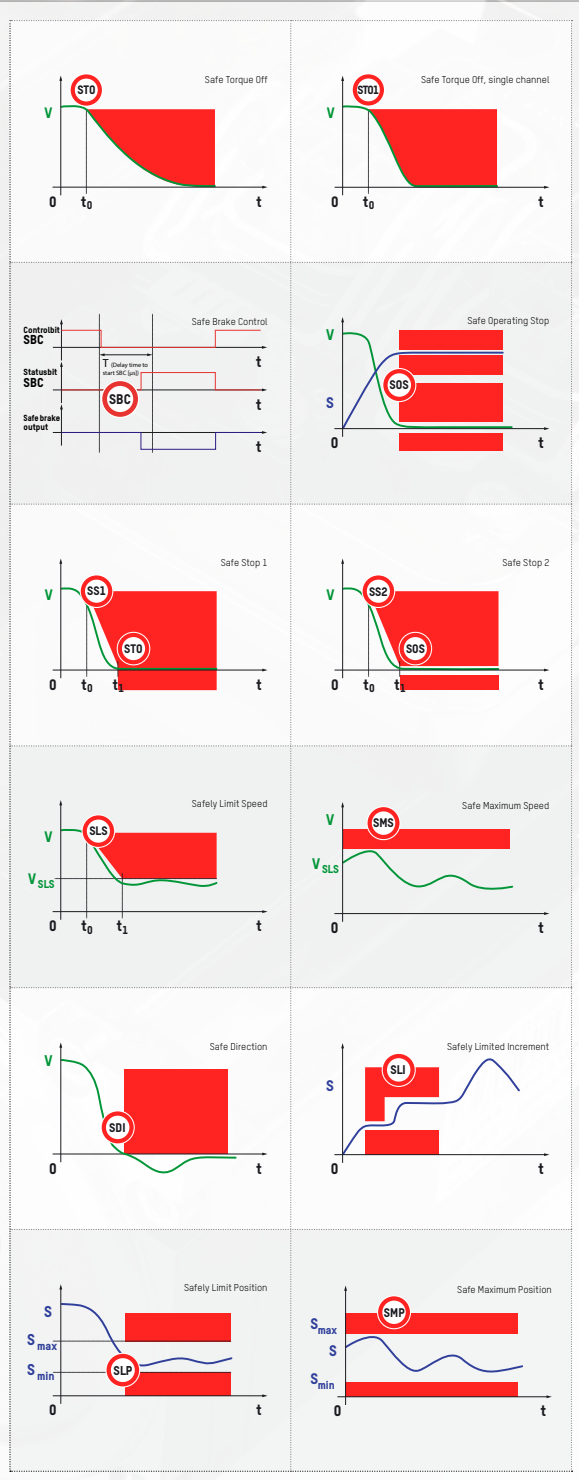
ETHERNET
POWERLINK

 open
SAFETY
Available safety functions

Safe Torque Off (STO)	SIL 3 / PL e / CAT 4
Safe Torque Off, one channel (STO1)	SIL 2 / PL d / CAT 3
Safe Brake Control (SBC)	SIL 2 / PL d / CAT 3
Safe Operation Stop (SOS)	SIL 2 / PL d / CAT 3
Safe Stop 1 (SS1)	Max. SIL 3 / PL e / CAT 4
Safe Stop 2 (SS2)	SIL 2 / PL d / CAT 3
Safely Limited Speed (SLS)	SIL 2 / PL d / CAT 3
Safe Maximum Speed (SMS)	SIL 2 / PL d / CAT 3
Safe Direction (SDI)	SIL 2 / PL d / CAT 3
Safely Limited Increment (SLI)	SIL 2 / PL d / CAT 3
Safely Limited Position (SLP)	SIL 2 / PL d / CAT 3
Safe Maximum Position (SMP)	SIL 2 / PL d / CAT 3
SafeSpeed	SIL 2 / PL d / CAT 3
Safe Homing, Safe Position	SIL 2 / PL d / CAT 3
Remanent Safe Position (RSP)	SIL 2 / PL d / CAT 3

Highlights

- Compact actuator with IP65 protection
- Saves control cabinet space
- Network-based safety functions

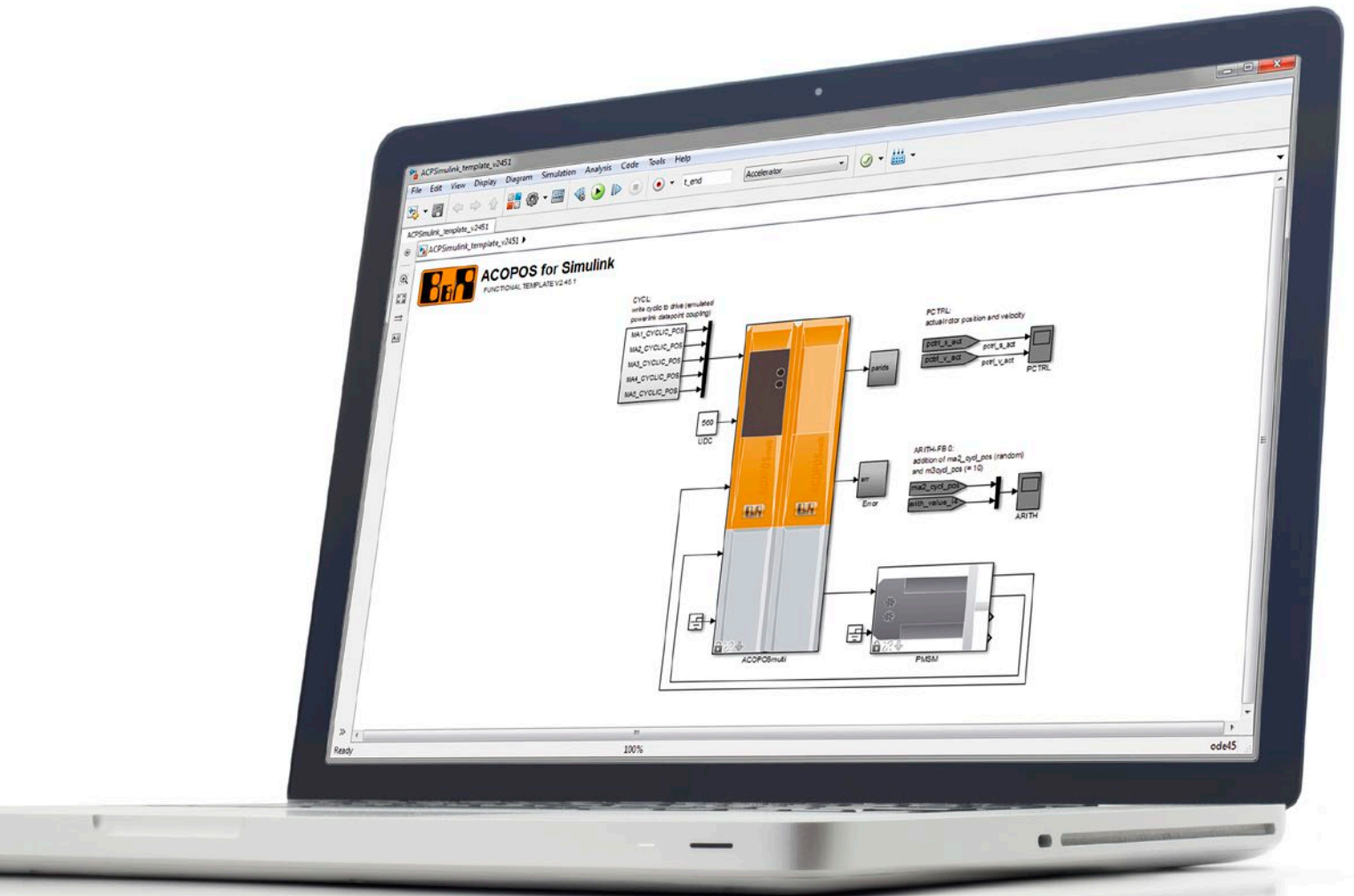




Virtual motion: New ACOPOS blockset for Simulink

A new blockset is available for integrating, configuring and simulating ACOPOS drives in Simulink. The blockset, called "ACOPOS for Simulink", is a helpful addition to the existing simulation options for motion and machine control that allow developers to analyze individual components or entire machines using nothing more than a PC.

The closer a simulation is able to approximate reality, the more valuable the results. The new "ACOPOS for Simulink" blockset is a highly accurate reflection of real-world drive behavior. It allows configuration and simulation of the drive motor and provides an interface for simulating power transmission systems. Up to 10 axes can



be displayed at a time, allowing the developer to simulate even complex machines with coupled axes.

Quickly identify effects of changes

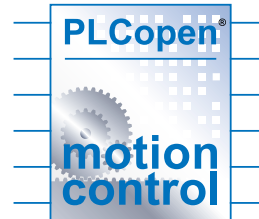
Simulink is the preferred tool for numeric simulation. It is well suited for complex drive systems, including those with feedback loops. Both controlled systems and control parameters can be easily modified to test the effects of various scenarios. It is also possible to simulate the behavior of a controlled system operating at the mechanical limits of the machine – without putting equipment and operators at risk.

More and more OEMs are discovering the time-to-market benefits of simulation. It allows the machine to be tested under various conditions, identifying weaknesses and optimizing machine design much earlier in development.

Highlights

- Simulate real behavior on PC
- Identify weaknesses early on
- Accelerate time-to-market

Easy integration of DS402 drives



Users can automatically incorporate DS402 drives into their Automation Studio projects. Programmed using the same PLCopen function blocks used for B&R's ACOPOS family of drives, from the developer's standpoint the drives behave identically.

B&R has long relied on PLCopen-compliant function blocks for programming axis movements. Developers value these function blocks because they make projects faster and easier to implement. The resulting applications are also easier to maintain and reuse.

Simple programming

These same advantages are now available to users with POWERLINK drives from any vendor. The

drives are integrated into the automation project just like any ACOPOS drive. For this to be possible, the DS402 drives must adhere to the applicable CAN in Automation standard as defined in IEC 61800-7-201.

Free selection of drives

Drives are imported into Automation Studio using simple XML description files. The import function ensures that the third-party drives fulfill the necessary functional criteria. Manufacturers of machinery and equipment can focus on product innovations rather than spending time implementing CANopen profiles.

With no arbitrary restrictions on the selection of drives, B&R's open drive solution is shaped only

Available PLCopen function blocks

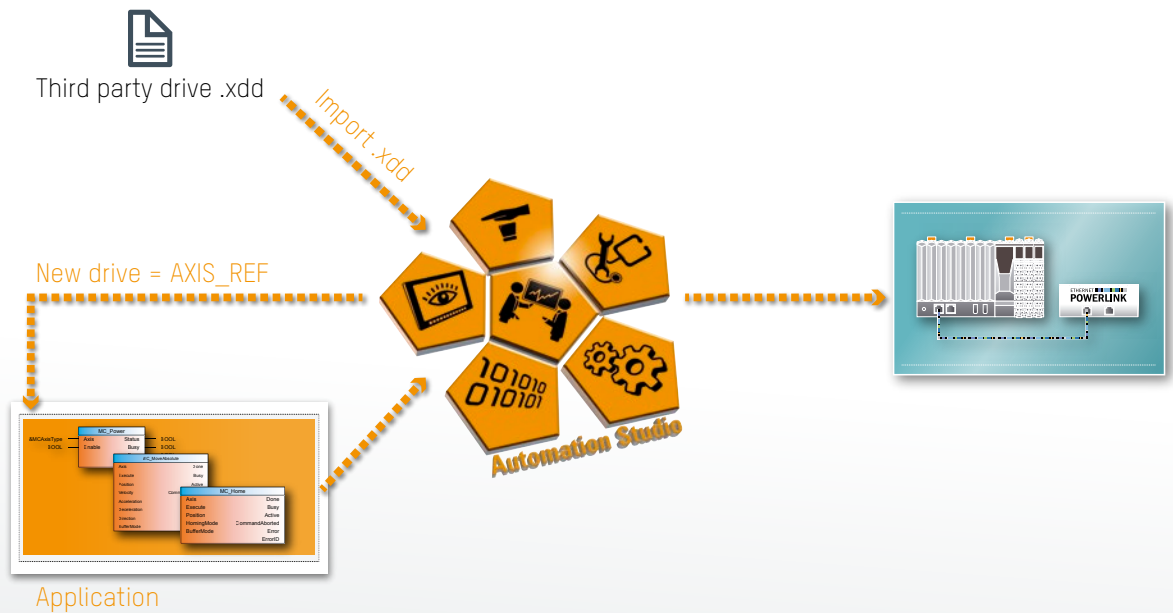
MC_Power	MC_ReadActualPosition	MC_Reset
MC_Home	MC_ReadActualVelocity	MC_ReadAxisError
MC_MoveAdditive	MC_BR_ReadCyclicPosition	MC_BR_MoveCyclicPosition
MC_MoveAbsolute	MC_Stop	MC_BR_VelocityControl
MC_MoveVelocity	MC_Halt	MC_ReadStatus

ACOPOS drives are programmed using PLCopen function blocks. POWERLINK drives from any other vendor can be integrated into the project in the same way. The only requirement is that they comply with the DS402 drive profile.

by the requirements of the application. Standardized programming allows hardware to be swapped out as needed without any adaptations to the software. Communication via the manufacturer-independent POWERLINK protocol further reinforces the openness of the entire system.

Highlights

- Free drive selection for every application
- All drives programmed with PLCopen
- Open and flexible



Position retained even without a battery

B&R compact servo motors are now available with an optional multi-turn encoder without battery backup. This allows the multi-turn position to be retained even if the connection between the drive and motor is interrupted. This option removes the need for a buffer battery in the servo drive. With this feature, these motors are perfectly suited for use with the ACOPOS P3 servo drive from B&R.

And with the new inductive digital EnDat 2.2 encoders (B8/B9), a wide variety of safety functions are also available. These encoders additionally guarantee a very high level of control accuracy and are resistant to disturbances. Motors in the

8LV series are available with a 40, 60 or 80 mm flange and cover a power range of 0.1 to 1.3 kW. Their compact dimensions make them the perfect choice for tight enclosures. These motors also have a direct gearbox mounting option.

The previous variants of the 8LV motor series are also still available. They are now even more compact and offer maximum performance with minimum space requirements. These variants also support the retention of the multi-turn position with a battery backup in the ACOPOSmicro servo drive.

- Inductive
- Optical
- Safe speed
- Safe position

8LSA2	8LSA3...7	8LSA2	8LVA2...3	8LSA3...7
S8, S9	SA, SB	D8, D9	B8, B9	DA, DB
S4, S5	S0, S1	D4, D5	—	DO, D1
ST0, SBC, SOS, SS1, SS2, SLS, SMS, SII, SDI, SLA				
SLP, SMP, RSP		—		
				

B&R servo motors – Safety functions



EnDat 2.2

BSR servo motors offer numerous safety functions.

Highlights

- No need for batteries
- Compact design
- Extensive area of use
- Safety included
- Digital encoder

Intelligent light curtains for safe machinery

In production environments where humans work in close proximity to machines, conventional sensors provide insufficient active protection against injury for operators. By integrating openSAFETY-based light curtains into its automation landscape, B&R is opening up completely new approaches to safety for today's manufacturing facilities.

Light curtains have been used for many years now to protect operators of machinery and equipment. But conventional light curtains are very inflexible. They are known to hinder the implementation of modern design concepts where human operators and machinery actually work together hand in hand.

It is for this reason that the EPSG developed an openSAFETY profile for intelligent light curtains. B&R is the first manufacturer to work on completely integrating this type of profile into its automation landscape. The automation specialist is accompanied on this journey by the Italy-based company Datalogic, who is busy developing a light curtain based on the new profile.

No hardwiring necessary

The intelligent light curtain is connected directly to the real-time POWERLINK network. The overlying openSAFETY protocol replaces the hardwiring that used to be necessary for the light curtain. Since

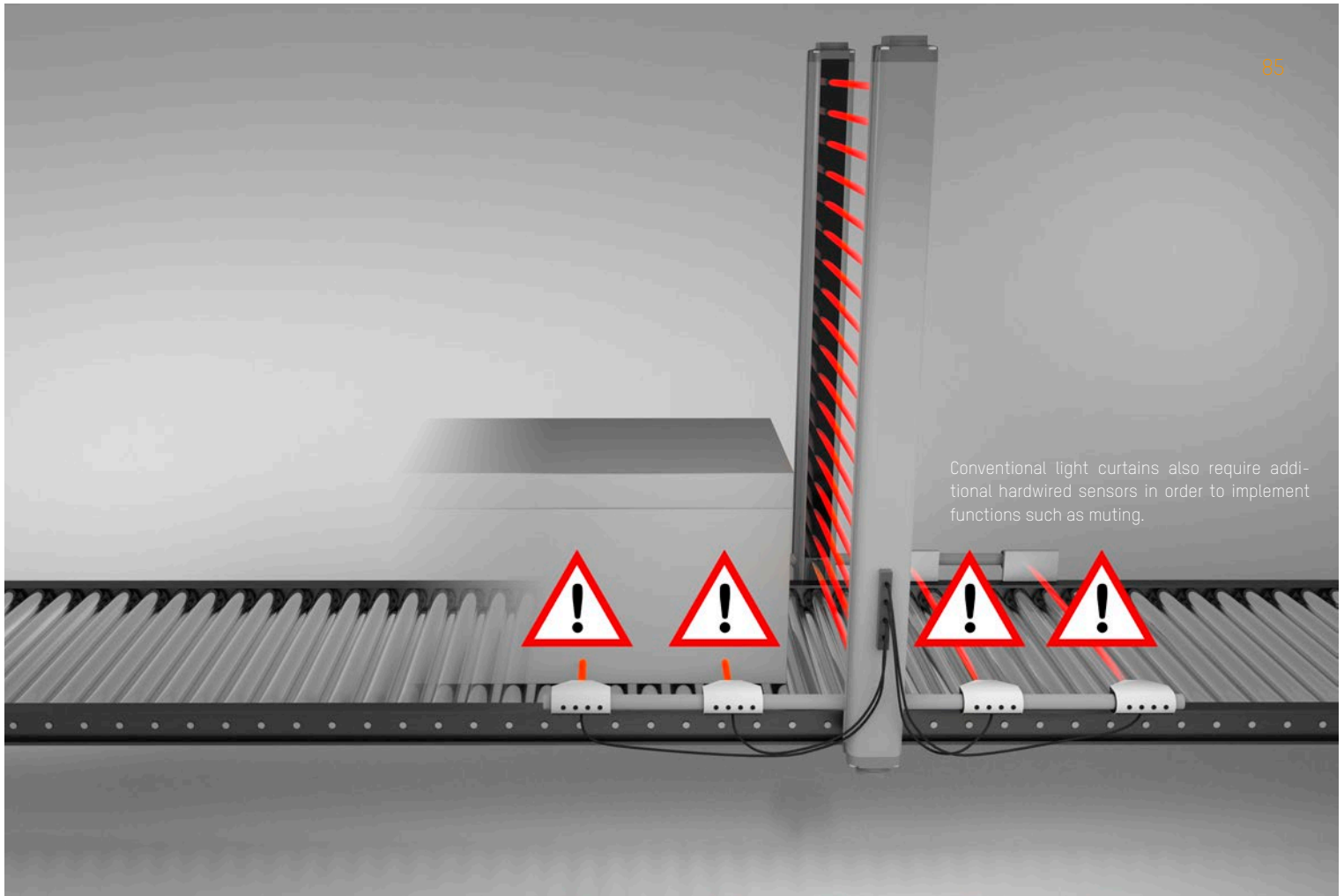
no safe I/O channels are necessary, an application with openSAFETY light curtains is less expensive than a hardwired solution.

Intelligent single-beam evaluation

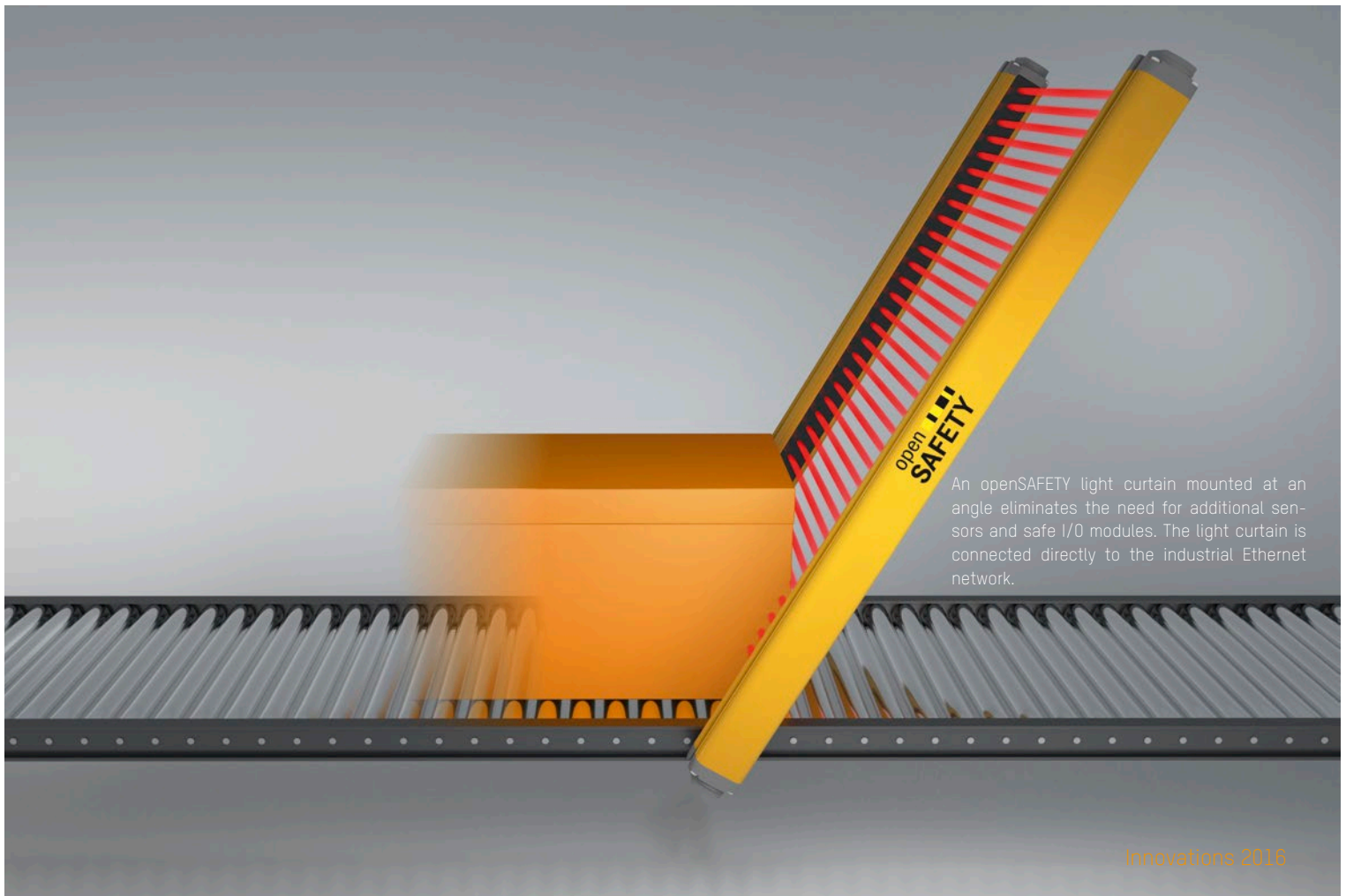
Light curtain with single-beam evaluation, as they are defined in the new EPSG profile, provide an easier way. When this type of light curtain is mounted at an angle, we are able to obtain all the data we need for intelligent muting. Based on which light beam is interrupted first, it is possible to determine the direction traveled by the product – without any additional hardware.

openSAFETY provides the SafeLOGIC controller with detailed information about which beam was interrupted and when. In addition to the product's direction of movement, it is also possible to determine its height – and, using the transport speed, its length as well.

Using this information, the safety controller is able to confirm that the product moving through the light curtain is exactly the one that was expected. If a person were to sit on a product in order to bypass the photoelectric sensor, for example, then the machine would enter its safe state. Solutions using conventional light curtains require a lot of technical effort in order to detect that type of tampering.



Conventional light curtains also require additional hardwired sensors in order to implement functions such as muting.



An openSAFETY light curtain mounted at an angle eliminates the need for additional sensors and safe I/O modules. The light curtain is connected directly to the industrial Ethernet network.

Programmed in the engineering software

With a B&R solution using openSAFETY light curtains, safety functions such as muting and blanking are easily programmed in Automation Studio. Once an openSAFETY light curtain has been installed and the node number set on the device, the rest of the configuration is handled in Automation Studio.

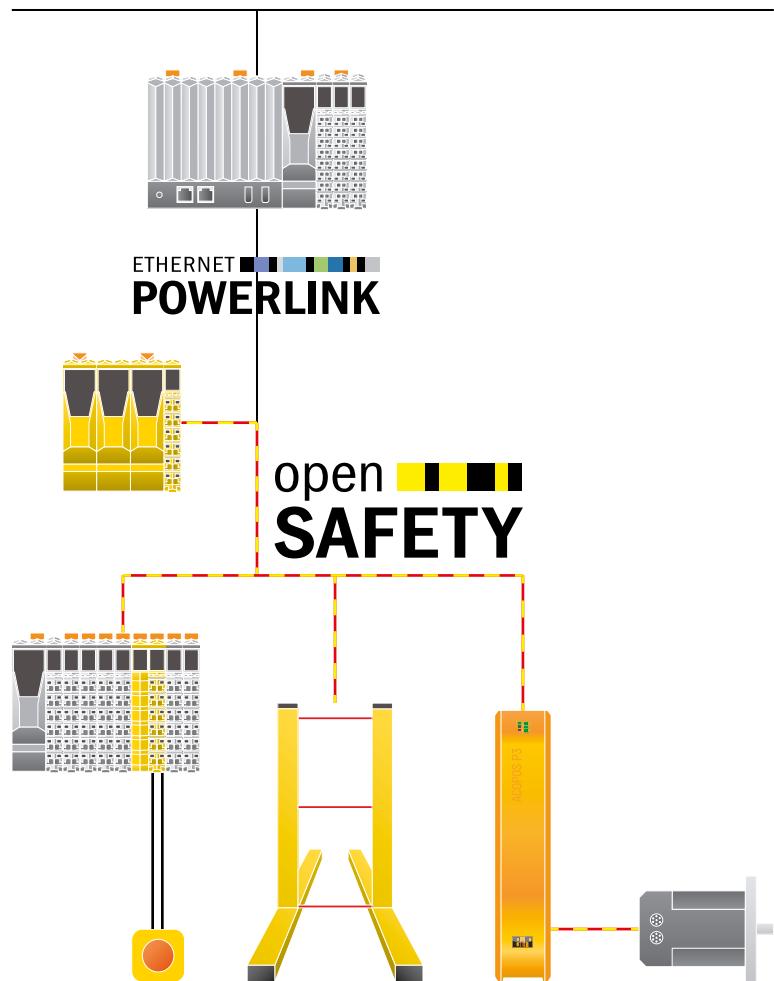
Conventional light curtains require tedious DIP switch configuration on the device or even the use of dedicated software. This becomes even more problematic once everything is installed, because the DIP switches are difficult to reach and represent a potential source of errors.

Fast commissioning

openSAFETY light curtains considerably reduce the amount of work needed for commissioning – especially for equipment produced in series. This is because, once written, the safety application can be reused on every machine. The light curtain simply has to be connected to the network. The safety controller automatically detects whether it is dealing with the correct light curtain model and transfers the configuration to the device. Errors that might otherwise result from manual configuration or on-site wiring are prevented.

The troubleshooting possibilities of the intelligent light curtain are a huge step forward as well. Error messages that used to require painstakingly reading and interpreting LED blink patterns can now be viewed in plain text. This allows for more detailed diagnostics and considerably shorter downtime.

As with safe drives and I/O, the openSAFETY light curtain is integrated directly into the safety network. Wiring is reduced to a minimum.



Highlights

- Less hardware necessary
- Shorter commissioning times
- Easy maintenance
- Wiring errors can be ruled out

open 
SAFETY

openSAFETY is a global IEC standard that ensures fast and absolutely reliable transfer of safety-related data regardless of the controller and fieldbus being used – providing a unified safety standard across entire machine lines.

The advantages are many. Combining faster response times with smaller safety clearances means increased productivity, which is enormously important for machine builders. System operators profit from faster commissioning and changeover times thanks to automated parameterization and configuration services. And with openSAFETY, you're always on the safe side – TÜV Rheinland and TÜV Süd have both awarded this technology SIL 3 certification for satisfying international IEC 61508 requirements.

Hydraulic system solutions with POWERLINK

High-performance hydraulic components from Bosch Rexroth, Moog and ATOS are now available with a POWERLINK interface and can be seamlessly integrated into the B&R automation system. Ultra-precise synchronization between B&R servo

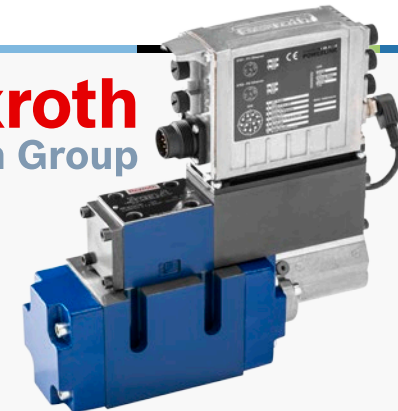
drives and these hydraulic components brings considerable advantages to processes such as injection molding – boosting both the quantity and quality of the output for ultimate productivity.

MOOG

Moog D636/D637:
Direct-operated
servo valves



Rexroth
Bosch Group



Bosch Rexroth IAC: Direct-operated
control valves with integrated axis
control

atos



ATOS proportional servo valve

ETHERNET
POWERLINK

open
SAFETY

One of the things that characterizes the POWERLINK communication protocol is its high performance in terms of cycle time and clock accuracy. Integrating hydraulic solutions into the B&R automation system allows hydraulics applications to take full advantage of the extremely fast response times.

POWERLINK: The key to success

POWERLINK supports cross-communication and allows B&R servo drives and hydraulic components to exchange data directly. This eases the load on the controller and helps balance the computational load optimally across the system. Machine sequences can be coordinated more precisely, opening up entirely new machine concepts.

Shorter commissioning times

Hydraulic components can easily be integrated in B&R's Automation Studio engineering environment using a device description file. Proven functionalities – graphical display, simple component configuration and a convenient online view – are

all available just as they are for other B&R products. Even highly complex system architectures are clearly organized and easy to manage. Commissioning is sped up considerably.

Proven diagnostics functions

Integration of the hydraulic products into the POWERLINK diagnostics solution helps reduce unplanned downtime to a minimum. Error data is read directly from the components and displayed for the user in a clear overview. The root cause of the fault can be identified quickly and resolved.

Highlights

- Seamless integration
- Increased productivity
- Fast response times

KUKA and Yaskawa speak POWERLINK

KUKA and Yaskawa MOTOMAN now also offer their robotics controllers with a POWERLINK interface. Robots from these manufacturers can now be integrated seamlessly into B&R automation systems. Machine manufacturers benefit from easier robot programming, increased productivity and greater flexibility.

Libraries are provided for programming the robot in the IEC 61131 environment used for the B&R controllers, ensuring that they are seamlessly integrated into the overall machine application. Specialist robotics knowledge is no longer required. Commissioning is accelerated and timing accuracy is increased.

No need for an extra operator terminal

Since the robotics controller is fully integrated in the general control system, the robot doesn't need its own operator terminal. All the data required for operation and diagnostics can be displayed and modified on the machine's main terminal.

KUKA KR C4

The KR C4 robotics controller from KUKA with integrated POWERLINK interface is now available. A corresponding device description file is available for integration into the B&R control system. KUKA also offers the mxAutomation library for programming the robotics controller in the familiar IEC 61131 environment of Automation Studio –





ensuring seamless integration of the robotics logic into the overall machine software.

Yaskawa DX200

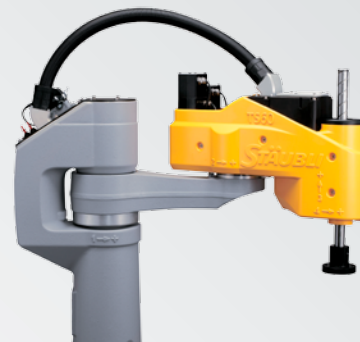
Yaskawa now offers an integrated POWERLINK interface in its DX200 robotics controller. The device description file and MotoLogix library provided by Yaskawa allow the controller to be integrated into the B&R control system. MotoLogix allows the machine manufacturer to program the robotics controller in IEC 61131 languages for direct integration into the application.

Comau and Stäubli

The C5G (Comau) and CS9 (Stäubli) robotics controllers have featured integrated POWERLINK interfaces for some time now. Together with the new solutions from KUKA and Yaskawa, users now have maximum freedom in the selection of a robotics platform.



Comau C5G



Stäubli CS9



Highlights

- IEC 61131-based robotics programming
- Robotics seamlessly integrated into automation solution
- Reduced hardware costs
- Large selection of robotics platforms

Yesterday, today and tomorrow: Integrated vision technology with B&R



More than 5 years ago, Cognex and B&R decided to work together to integrate vision in an automation system. Because of the high level of integration, previously unforeseen possibilities were opened up to machine manufacturers. Simple handling of the overall system revolutionized the market for machine manufacturers and initiated a new trend.

SICK, Baumer, Datalogic and Mekra Lang have announced the introduction of systems with POWERLINK integration

The trend of integrating POWERLINK interfaces in vision systems continues. Vision sensors from SICK, Baumer and Datalogic are equipped with a POWERLINK interface. In addition, the SICK CDF600 system opens up a wide range of code reading for integration in POWERLINK networks. The scanner data comes together centrally at the component, making it easier to track products along the entire value added chain. Mekra Lang equips the IP cameras it develops with an integrated POWERLINK interface, which makes it possible – with no additional wiring – to install camera systems on a ma-

ETHERNET
POWERLINK

open
SAFETY



chine to do things like monitor otherwise unsupervised areas from a central location.

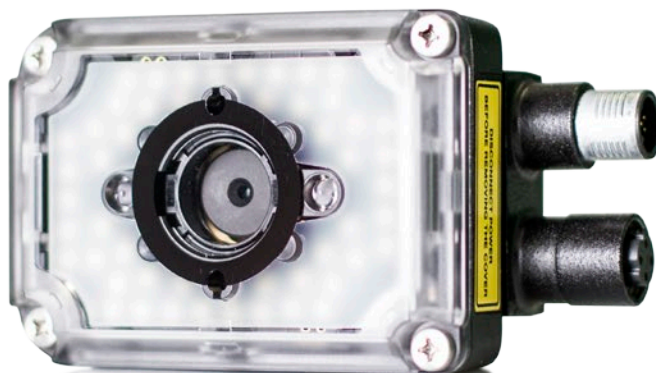
Digitalization accelerates implementation of vision systems

Inspired by digitalization and the innovative spirit of machine manufacturers, integrated vision technology is evolving rapidly. IT and automation have moved closer together. Highly synchronous real-time data from the sensors used to control the machine and also the image data used for quality assurance are thus transferred at the same time via a single cable. Through the integration of POWERLINK, unnecessary interfaces

previously used for horizontal and vertical communication in production have been eliminated. This increased system performance significantly. As leaders in innovation, SICK, Baumer, Datalogic and Mekra Lang identified this trend at an early stage.

Increased system performance

Synchronous interaction between vision solutions and control technology have diversified the use of vision systems in machines. Using POWERLINK as the Ethernet-based communication protocol allowed the vision system to be triggered directly by the position value from a drive, for example. It is also possible for drives in a network to receive sensor data directly. The customer benefits from faster machine processes and minimized hardware costs.



Highlights

- SICK, Baumer, Datalogic and Mekra Lang equip vision systems with POWERLINK
- POWERLINK for quality assurance and traceability

Evaluate control performance efficiently

APROL Control Performance Monitor (CPM) helps plant operators work more efficiently. Based on standard data found in every control loop, the CPM control module automatically calculates parameters that can be used to evaluate control performance.

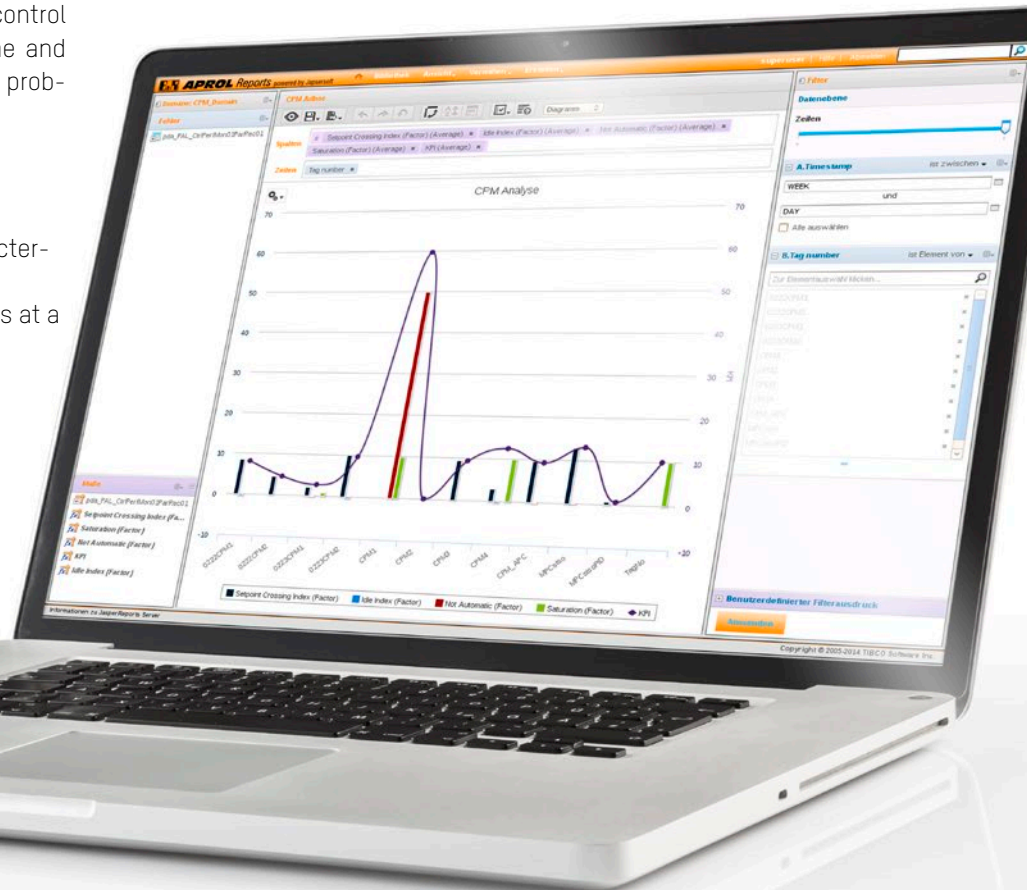
- More effective process control through continuous, non-invasive control loop monitoring
- Simplified condition-based actuator maintenance
- Real-time processing for highly dynamic analysis

These parameters are summarized in an analysis report that is tailored to the respective control loop. The graphics in the report make it easy to quickly identify typical fault scenarios (e.g. valve friction) that have a negative effect on control performance. APROL CPM works in real time and allows for highly dynamic analysis. Aliasing problems are prevented.

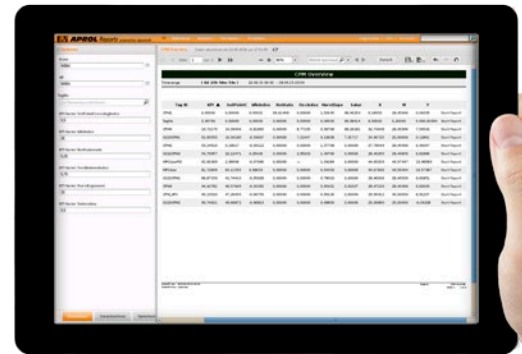
Features:

- Loop reporting: Detailed report of characteristic control loop parameters
- Plant reporting: Identify control problems at a glance
- Ad-hoc reporting: Create your own key performance indicators

Clear graphical visualizations help identify control performance issues immediately.



Informative KPIs can be displayed in overview tables, for example.



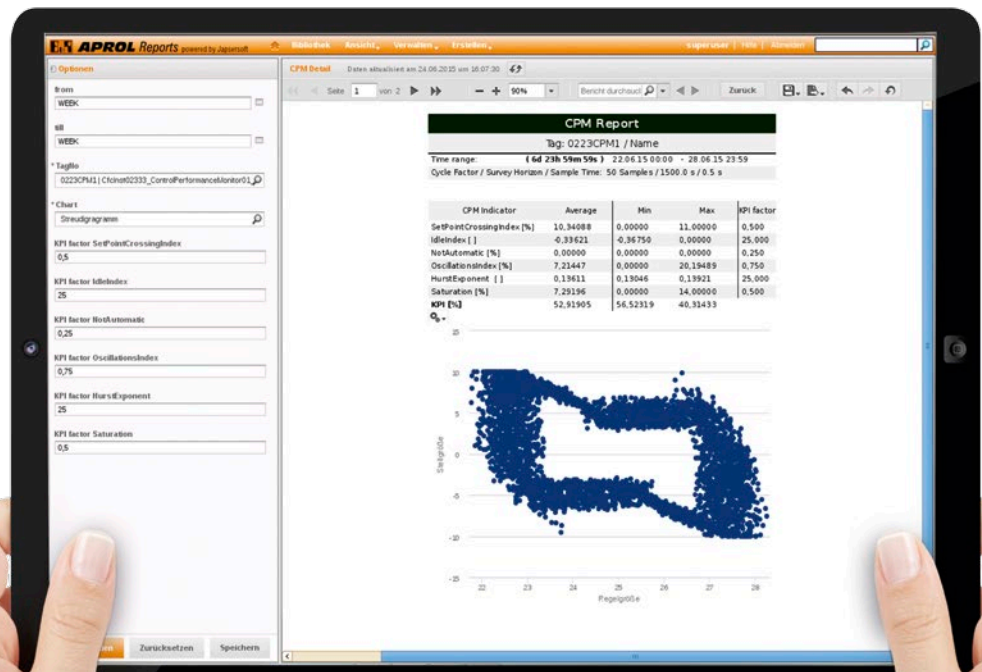
KPIs for control performance comparisons

It is possible to compare the performance of control loops for entire plant segments using dimensionless key performance indicators (KPIs). Each KPI consists of various parameters provided by the CPM control module. KPIs can range from 0% (poor) to 100% (very good). This makes it easy to check performance at a glance.

The reporting tool allows users to copy and edit KPI calculations. This is helpful if the KPIs of special control loops are to be compared with those of standard control loops. For example, it would be possible to filter out oscillations caused by the cyclic cleaning processes of a soot blower.

Highlights

- Significant KPIs
- Control performance always clearly indicated at all times
- Easily adaptable parameters



Correlations between variables can be seen at a glance in the Control Performance Monitor.



Process data always in view

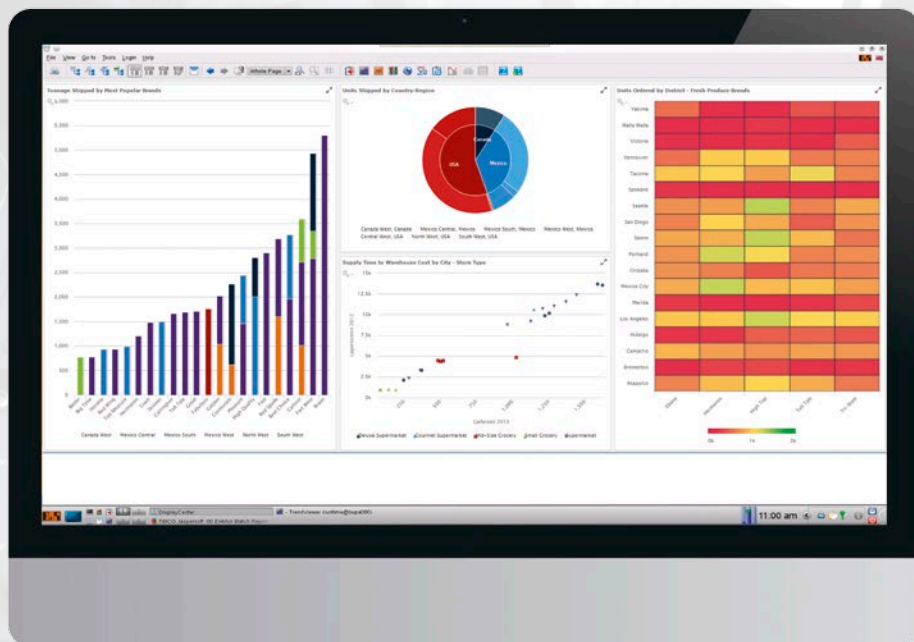
B&R has integrated a report server in the runtime environment of the APROL process control system. Countless possibilities for exploratory data analysis are now available for all APROL projects. With the corresponding app, dashboards and reports can also be viewed and edited on mobile devices.

of operating and process data for machinery and equipment. The report server provides reports and dashboards for optimizing production (OEE, downtime analysis, "Down Time Loss", etc.). Reports are generated in printable form and can be edited interactively.

Web-based design tool

Modern manufacturing processes demand extremely high levels of precision. It is impossible to maximize product quality without constantly monitoring and sufficiently analyzing production data. APROL supports real-time collection of raw production data and central, seamless archiving

Each user can create personalized dashboards by dragging and dropping components in an easy-to-use, web-based design tool. The dashboards can then be modified interactively, giving users the flexibility to quickly optimize the way they view and analyze their data.



Like a cockpit

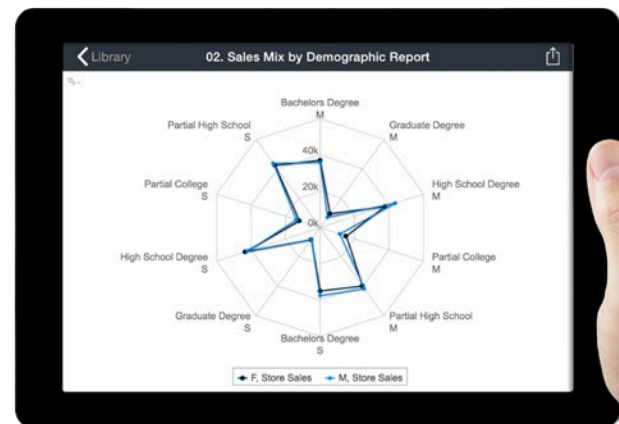
Like a pilot's cockpit, the APROL dashboard provides a quick and intuitive overview of key data in speedometers, diagrams, level indicators and more. Dashboard software makes it possible for users to combine data and graphic indicators and consolidate important information. Multi-report dashboards can be created using both internal and external data.

Anytime, anywhere

Having access to key data at all times is essential to making well-informed decisions. With a touch-capable browser, users can also design custom reports and dashboards to perform interactive analysis on tablet devices. Server-side authentication ensures that sensitive data is not stored locally on mobile devices.



Data and parameters can be presented clearly, even on small smartphone displays.



With a touch-capable browser, users can also design custom reports and dashboards to perform interactive analysis on tablet devices.

Highlights

- Online performance monitoring
- High-availability long-term archiving
- Optimization of production
- Identification of cause and effect

Asset performance monitoring for pumps and heat exchangers

B&R's APROL process control system makes it possible to monitor assets constantly. This helps reduce maintenance costs and downtime and optimize the availability and utilization of machinery and equipment.

Process control systems deal with a multitude of assets very often found in hard-to-reach locations. Failure of a single asset could bring an entire plant to a standstill. Continuous monitoring of plant equipment with APROL Asset Performance Monitoring (APM) allows operators to keep an eye on the asset's current operating data with targeted real-time parameters (e.g. performance).

In addition to providing operators with vital information about a plant's assets, it can easily prevent downtime by identifying the level of fouling on a heat exchanger or a cavitation-critical operating point for a centrifugal pump.

The software blocks of the APM functions utilize data that is already being collected via the process control system. Problems with assets are identified early by applying definable performance thresholds to measurement data.

Each asset has its own control module that calculates its benchmark values, which can be output in reports. The report system also allows you to directly compare all assets of a given type.

Control module for supply lines

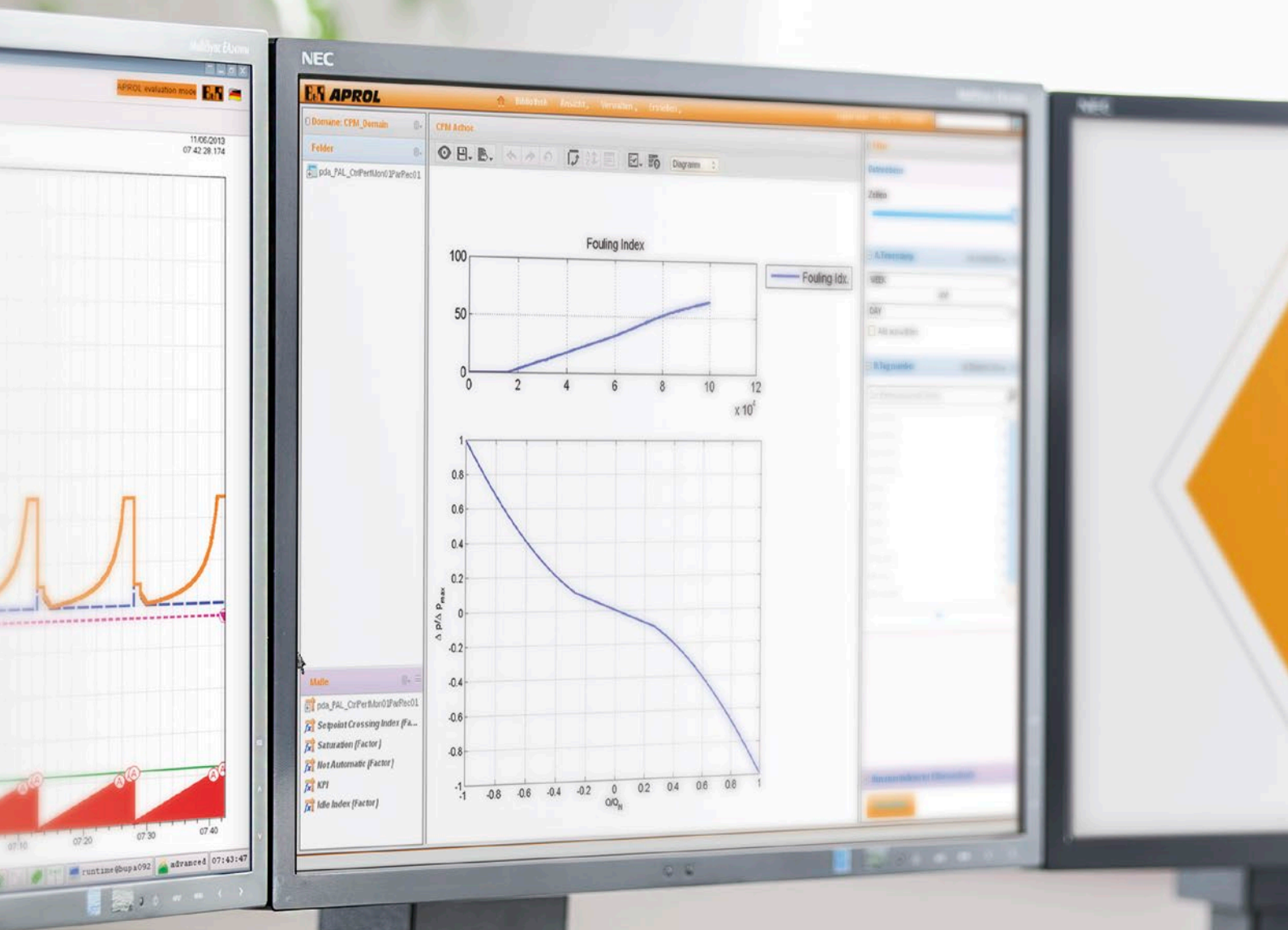
The software block for supply lines continuously calculates pressure drop in a pipe. The difference between the theoretically calculated pressure drop and the actual measurement is used to estimate the head loss, i.e. the level of fouling, in transport pipelines. As fouling increases, so do the required pump capacity and operating costs.

Control module for heat exchangers

Heat transfer processes account for a large portion of the energy utilized in industrial applications. Continuous detection of fouling in the heat exchanger makes it possible to constantly monitor the effectiveness of heat transfer. This allows problems to be detected and corrected early.

Centrifugal pumps

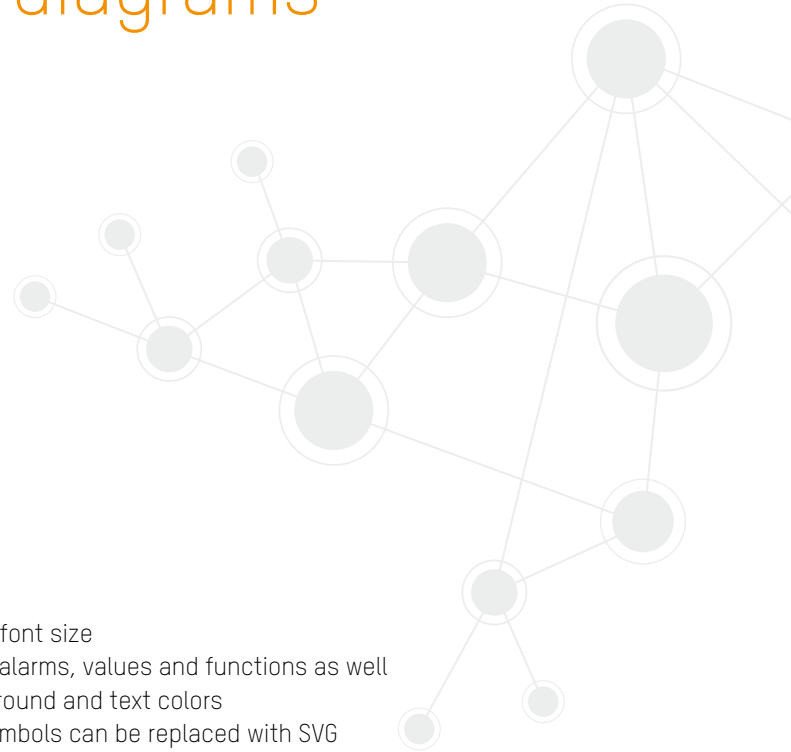
The control module is supplied with the existing measurements and data from the centrifugal pump. The module compares the available pump data with the actual measurements to assess the efficiency of the pump. Suction and discharge measurements, together with the flow rate, can be used to detect cavitation-critical operating points.



Highlights

- Longer life span
- Reduced operating costs
- Improved maintenance
- Less downtime
- Better asset utilization

Easily create control diagrams with graphic macros



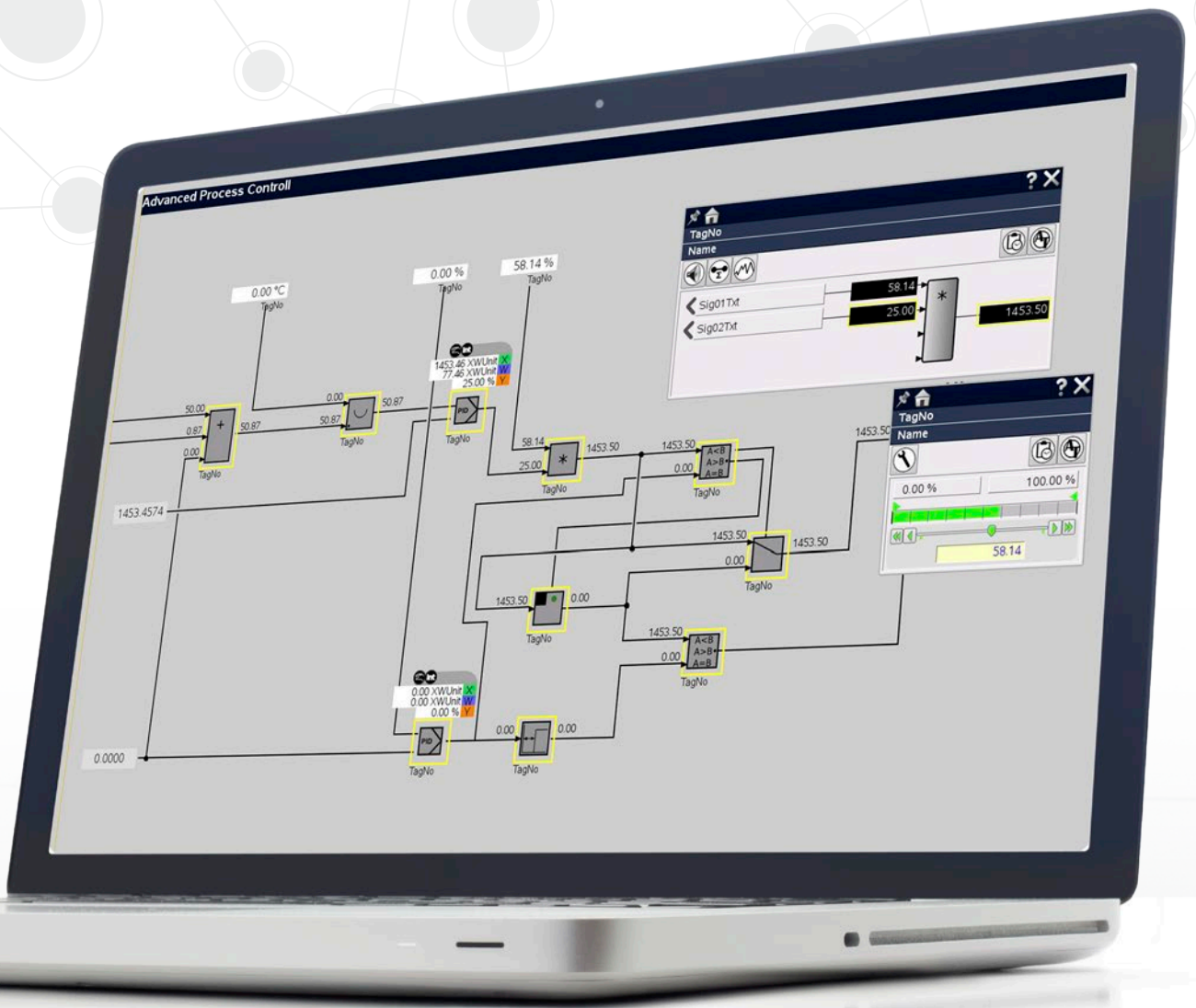
APROL includes a PAL library of standardized modular software functions for process engineering tasks. These extensively tested and documented control modules contain graphic macros for creating process graphics and faceplates for operation and monitoring. New graphic macros have now been added for creating control diagrams.

- Font and font size
- Colors of alarms, values and functions as well as background and text colors
- All PAL symbols can be replaced with SVG vector graphics

The functions of the control modules in the standard library can only be modified by changing parameter settings. The faceplates and graphic macros can be customized more extensively, and the changes remain even after an update. The following properties can be customized:

Highlights

- More transparency
- Simple to create
- Easy to customize



Graphic macros are an easy way to create control diagrams.

Easy line control and monitoring

A convenient line monitoring system can be implemented in APROL with minimal engineering effort. The solution is based on OMAC's PackML standard, which can be applied to virtually any machine.

To remain competitive, owners of machinery and equipment must eliminate all sources of inefficiency. A line monitoring system provides the

information they need to identify and eliminate problems early on. The increased efficiency in turn boosts production output.

The standard PackML machine data interface in APROL contains control modules for machines and lines that provide convenient access to relevant details. Faceplates and sub-faceplates display key data and important details.



Highlights

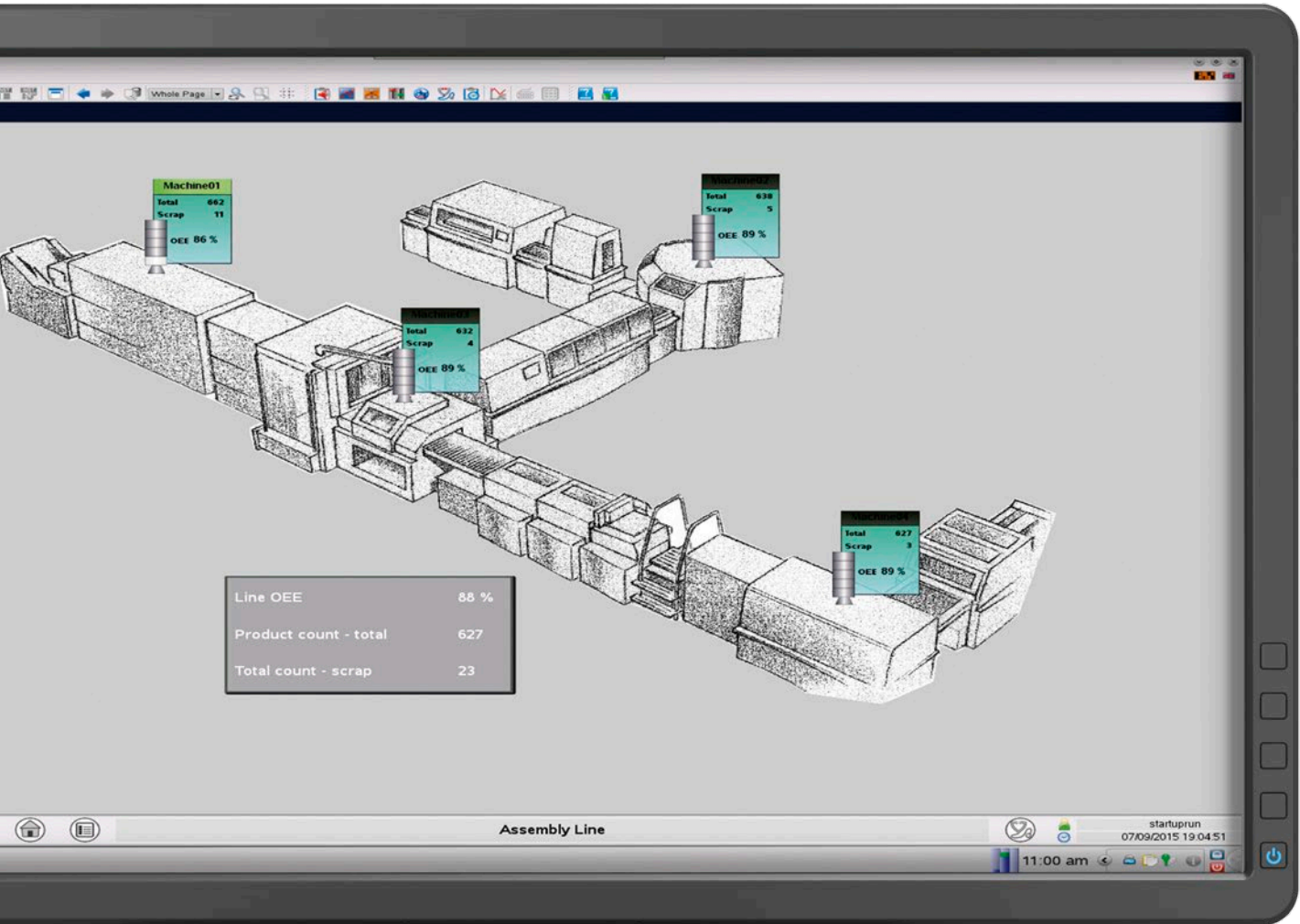
- Reduced downtime
- System-wide transparency
- Universal PackML standard for all machines



The faceplate gives an overview of key machine parameters at a glance.



From the line overview, details for each machine are just a click away.



Flexible integration of batch systems

B&R has added a new Phase Logic Interface (PLI) block to the standard library for the APROL process control system. It can be used to integrate a batch system for operating batch production lines.

The PLI block serves as an interface between the controller and the batch system. It receives commands and recipe parameters, passes them on to the control logic and then returns the current state as well as status information and report parameters. The state diagram is based on the widely used ANSI/ISA-88.01 standard for batch control.

A communication channel is also integrated for issuing requests from the control program to the batch system. Alternatively, the block can be used in manual mode, and presents the operator numerous options in a convenient faceplate. All the relevant actions and events are logged seamlessly in the system.

Multi-product lines

Lines on which a variety of products are produced (multi-product lines) place high demands on process control technology. Batch systems are a perfect solution for this, breaking the production process down into logical steps, or phases. These batch phases provide the basis for product reci-

pes.

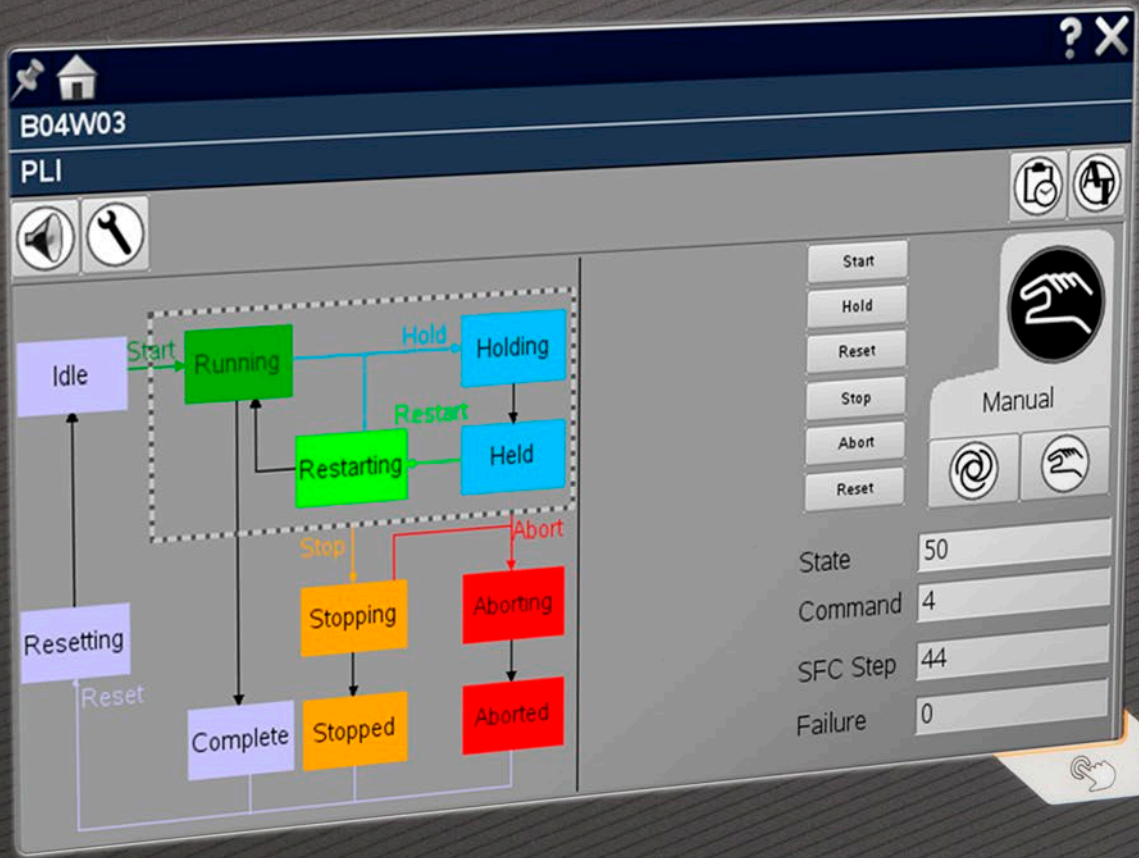
Each batch phase defines parameters for a given product, such as limit values for pressure, temperature and dwell time, and is assigned to the various production processes. The individual phases can be combined into recipes, which are stored in the batch system and can optionally be linked to other details such as stirring time or flow rate.

Modular control concepts

The PLI block offers an easy way to implement modular control concepts. The logic is broken down into manageable, reusable functions with uniform interfaces. The modules can be mixed and matched flexibly as the application demands. Any changes to the process can be implemented with minimal effort. That's the speed and simplicity of modular engineering.

Highlights

- Create recipes from batch systems
- Implement modular concepts
- Boost productivity



The operator sees at a glance what the status of a batch phase is.

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POWERLINK

The high-performance POWERLINK real-time communication solution is based on the IEEE 802.3 Ethernet standard and designed to ensure real-time data transfer in the microsecond range.

Flexibility

POWERLINK provides optimum flexibility for both centralized and decentralized architectures. Its hot plugging capability allows modules and components to be connected and disconnected as needed during operation. This has no impact on real-time behavior and does not require restarting the system, which saves time and money. Flexible cabling allows you to decide which topology best meets the needs of your system. Nothing stands in the way of upgrading your machine or system or continually expanding your machinery.

Performance

Highly efficient cross-communication and network topologies with distributed intelligent sensors and actuators help minimize jitter and ensure fast response times. The efficiency of POWERLINK makes it possible to implement high-speed control loops

centrally via the bus, greatly simplifying engineering. The advantages are clear: save time, simplify systems and relieve the load on control tasks.

Reliability

In safety-critical real-time applications, POWERLINK proves itself as an extremely robust system with a high level of immunity to electromagnetic disturbances. The most demanding field conditions require a system's mechatronic components to operate with utmost reliability, yet they also require the bus to ensure data transfer even if an error occurs.

Return on investment

Based on IEC standards and supported by the internationally active Ethernet POWERLINK Standardization Group, POWERLINK guarantees compatibility anywhere in the world. As an open solution, POWERLINK is unpatented, software-based technology that is completely independent of proprietary hardware. Its scalability and ability to integrate all types of systems make POWERLINK a perfect solution for any industry.



open 
SAFETY

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Integrated automation
Global presence
Solid partnership



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B&R Corporate Headquarters
Bernecker + Rainer
Industrie-Elektronik Ges.m.b.H.

B&R Strasse 1
5142 Eggelsberg, Austria

t +43 7748 6586-0
f +43 7748 6586-26

office@br-automation.com
www.br-automation.com

Your local contact
www.br-automation.com/contact