



Innovations 2021

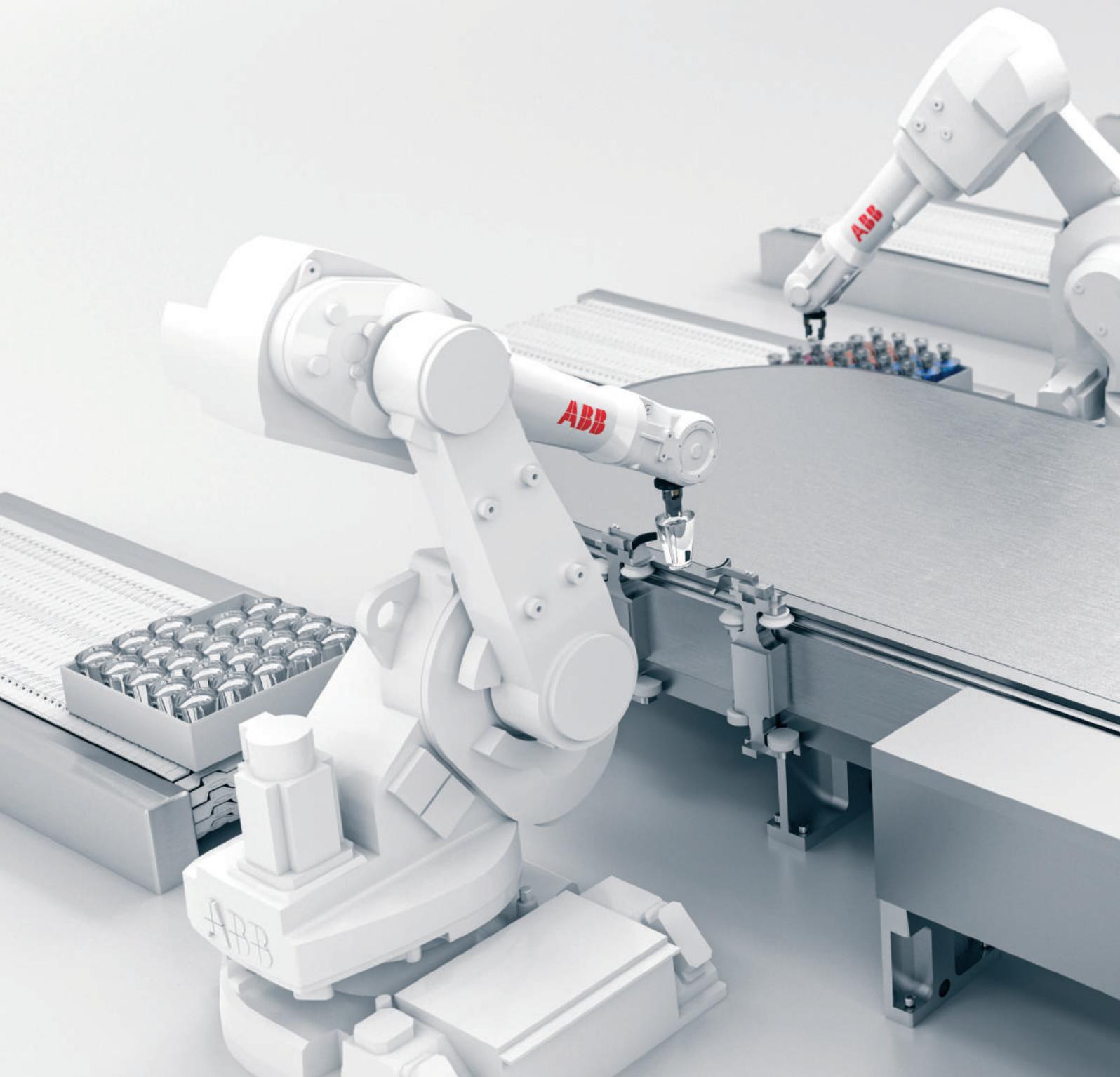
PERFECTION IN AUTOMATION
A MEMBER OF THE ABB GROUP

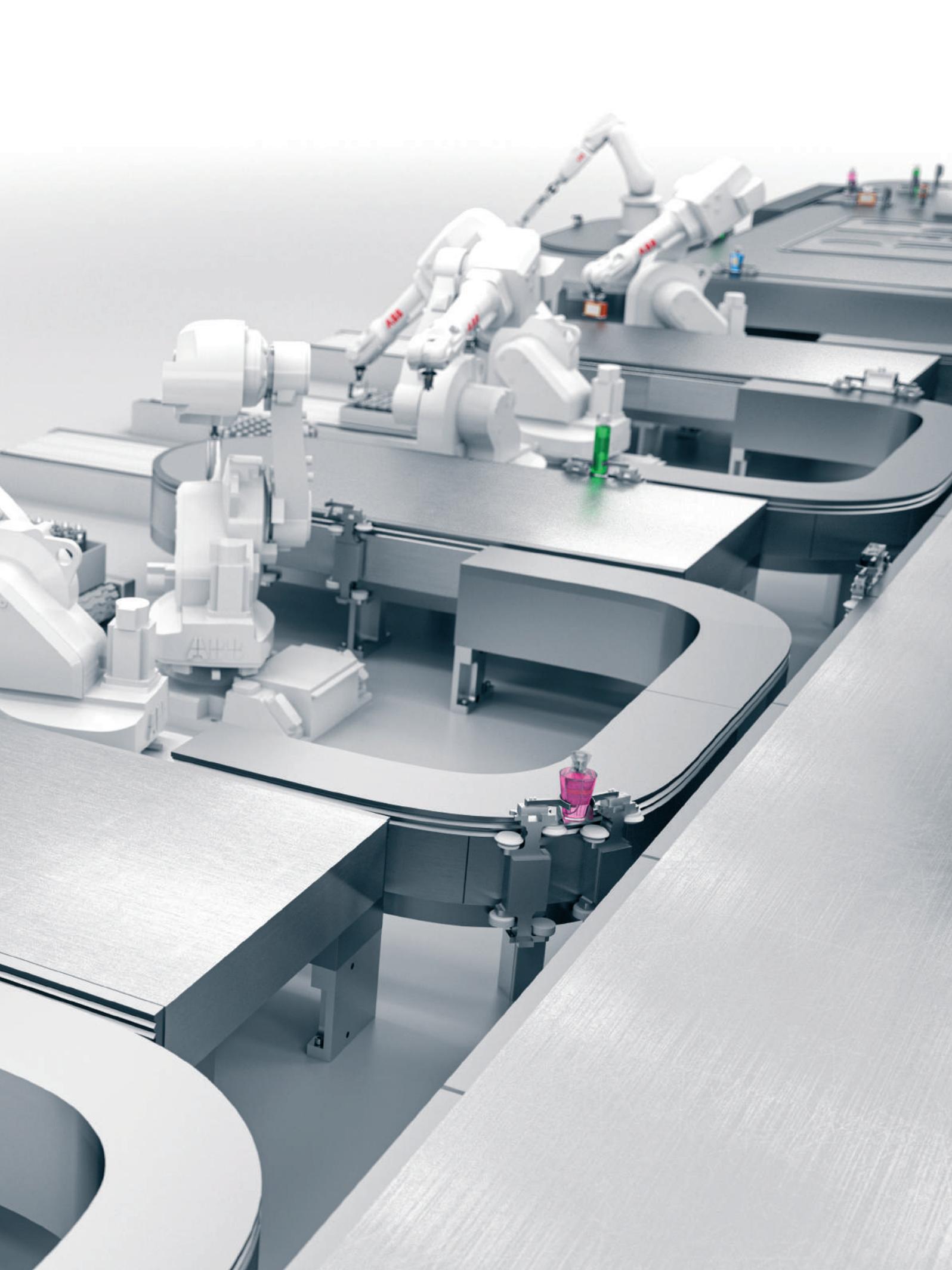


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Machine-Centric Robotics





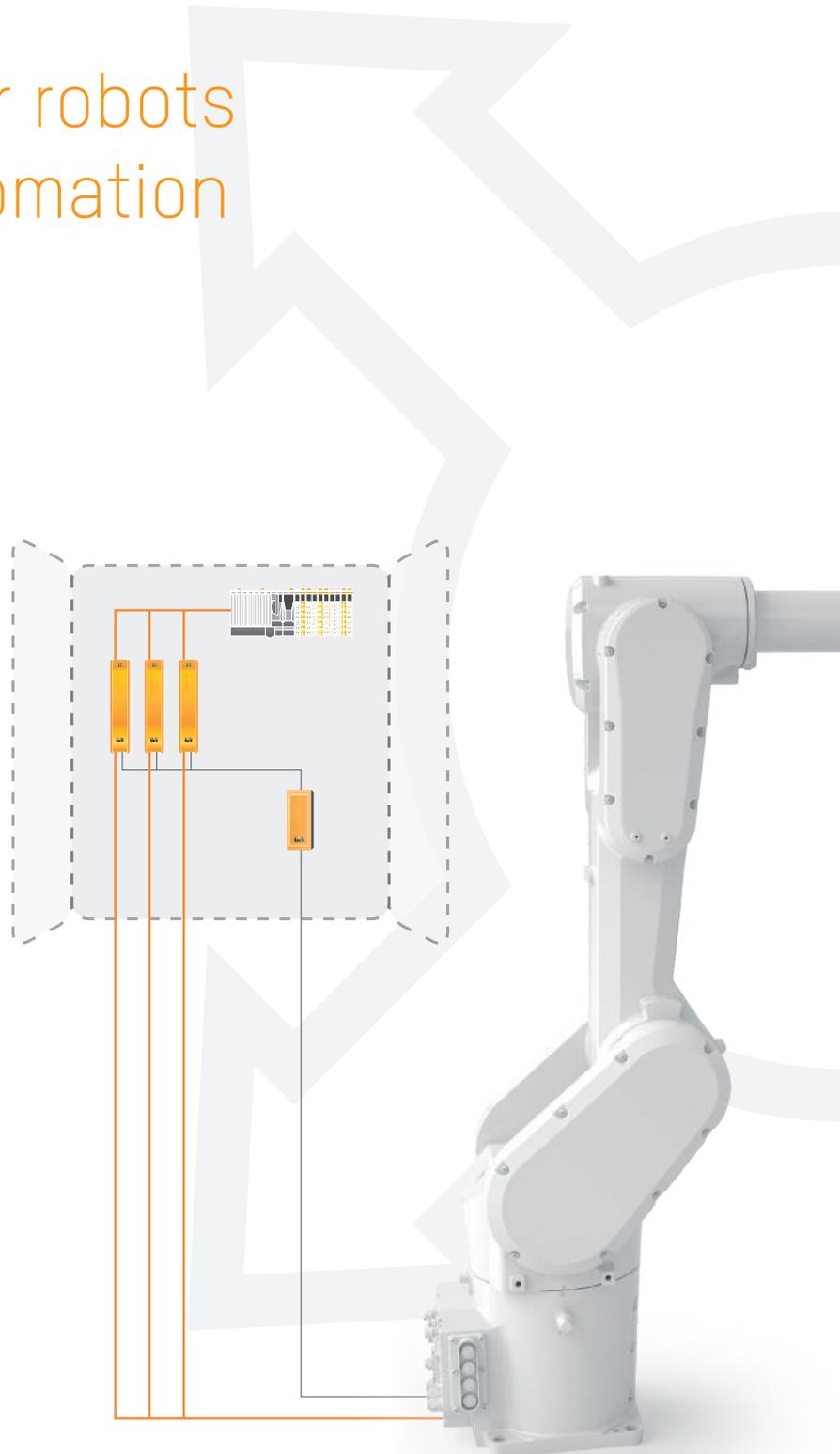
One-stop shop for robots and machine automation

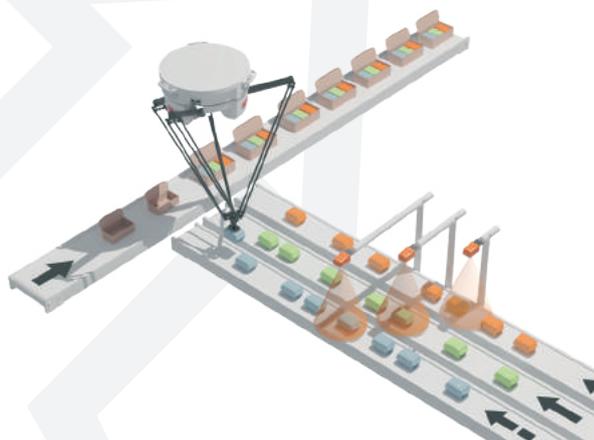
Machine builders now have a one-stop shop for robots and machine automation. B&R offers ABB robots as an integral part of its automation system. Unprecedented precision in synchronization between robotics and machine control helps OEMs build more productive machinery.

Seamlessly integrated

The ABB robots are programmed in B&R's universal engineering environment just like all other automation components. The robotics controller is an integral part of the machine control application.

- One point of contact
- One uniform system
- One software solution





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ROBOTICS

A robotics application in just a few clicks

Applications can be created without any knowledge of specific robotics languages. The user has access to all the familiar machine programming languages like Ladder Diagram, Structured Text and C/C++.

In addition, Automation Studio includes a pre-configured model for each available robot type. The developer simply selects the desired type in a wizard and all the necessary data and parameters for servo drives, payloads and maximum torque are copied into their project. The robot is ready for use without any further configuration.

- Familiar development environment
- Ready-made software components
- Full access to machine functions

Getting in form for global competition

Machine-Centric Robotics comprises all components necessary to implement a robotics application within the framework of machine automation project. The individual elements are seamlessly coordinated and allow immediate commissioning with any B&R controller. B&R supplies all the necessary components:

- Robotics hardware with servo motors
- ACOPOS P3 servo drive
- Cable in desired length
- Extensive robotics software



Six axes for any application

B&R customers can choose from a broad selection of 6-axis articulated arm robots. B&R will soon add the new IRB 1300 series to its portfolio. This series is characterized by higher performance with a significantly smaller footprint and less weight.

The robots can carry maximum payloads of four to 60 kg and have a reach of up to 2.5 m. To support sensors, actuators and grippers, the robots come with integrated compressed air lines, signal cables and in some cases Ethernet cables. The vast array of types and options offers a solution for virtually any application.

Robot type	IRB 1100 – 4/0.58	IRB 1300 – 11/0.9	IRB 1300 – 10/1.15	IRB 1300 – 7
Payload [kg]	4	11	10	7
Reach [m]	0.58	0.90	1.15	1.40
Protection	IP40	IP40		
Mounting type	Any	Any		
Positioning repeatability [mm]	0.01	0.02	0.02	0.03
Integrated user interfaces	8x signal (30 V; 0.5 A) 1x Ethernet (1000BASE-T) to upper arm	12x signal (30 V; 1.5 A) 4x signal (60 VDC; 4 A) 1x Ethernet (1000BASE-T) to upper arm		
Integrated compressed air lines	4x with max. 6 bar to upper arm	4x with max. 6 bar to upper arm		
Robot base area [mm x mm]	160 x 160	220 x 220		



/1.4	IRB 1600 – 6/1.15	IRB 1600 – 10/1.15	IRB 4600 – 20/1.15	IRB 4600 – 45/1.15	IRB 4600 – 60/1.15
	6	10	20	45	60
	1.45	1.45	2.50	2.05	2.05
	IP54		IP67		
	Floor, wall, ceiling, incline		Floor, ceiling, incline		
	0.02	0.05	0.05	0.05	0.06
	23x signal (50 V; 0.25 A) 10x power (250 V; 2 A) to upper arm		23x signal (50 V; 0.5 A) 4x power (300 V; 2 A) to upper arm		
	1x with max. 8 bar to upper arm		1x with max. 8 bar to upper arm		
	484 x 648		512 x 676		

Maximum performance with delta robots



The B&R portfolio includes delta robots from ABB and Codian. The versatile selection of robots make it possible to sort, group and order products at high speeds – even in food and beverage, pharmaceutical and cleanroom applications.

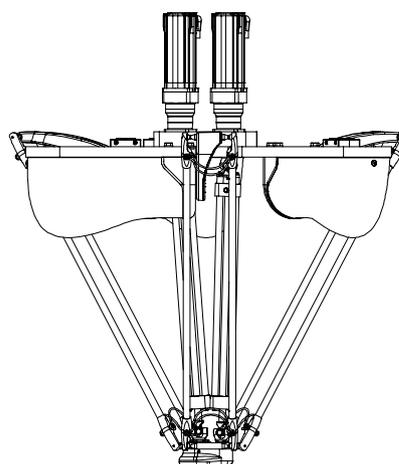
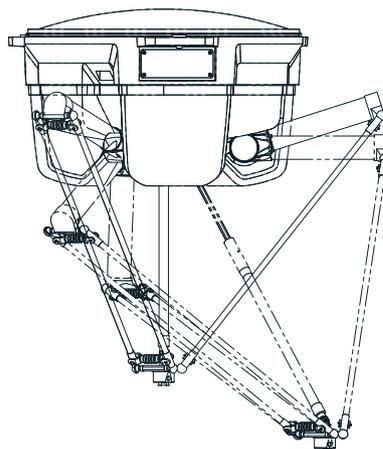
Delta robots from B&R are fast, reliable and exceptionally versatile. The product spectrum begins with very small kinematic systems able to perform in tight spaces. At the other end are large models for pick-and-place applications with payloads up to 35 kg.

For every model, B&R provides performance parameters for accuracy and repeatability in

accordance with ISO 9283. Potentially achievable pick cycles are also specified in detail. This greatly simplifies development and eliminates the need for extensive testing to determine performance potential.

Highlights

- High performance
- Food-grade design
- Large selection



Robot type

Delta

Payload [kg]

1 - 35

Reach [m]

0.5 - 2.1

Protection

IP54 / IP65 / IP67 / IP69K

Mounting type

Hanging

Positioning repeatability [mm]

0.1

Integrated user interfaces

12x signal 50 V; 250 mA (IRB 360)

Get a grip

B&R's new robot operator panel makes teaching and controlling robots exceptionally intuitive. The panel has a 3D joystick, hardware buttons and an anti-glare multi-touch display. An easily accessible emergency shut-off ensures safety.

Fully integrated in the B&R system, the same HMI unit operates both the machine and robots, eliminating the need for two separate devices.

Highlights

- Intuitive teach-in
- Fast access
- Optimized operation



More productive with ready-made software components

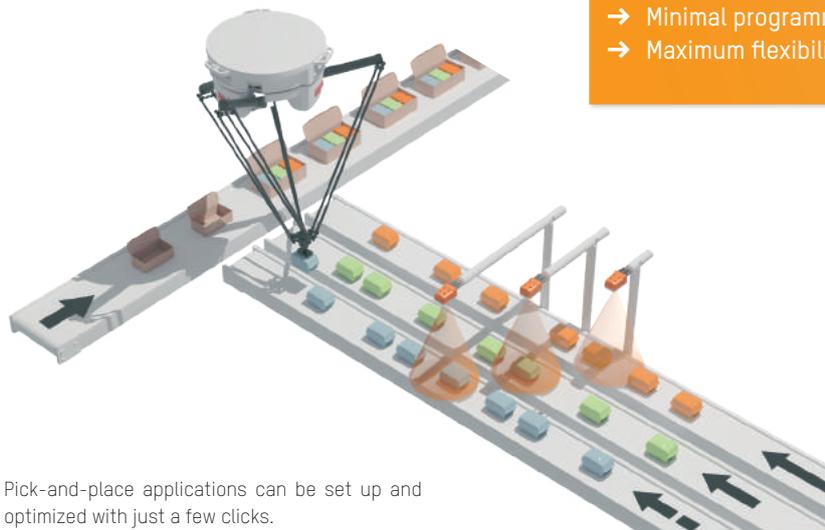
A ready-made software solution from B&R helps OEMs implement pick-and-place applications significantly faster. Not only does the system control the robot itself, it also handles coordination with other axes, conveyor belts or tracks.

mapp Pick&Place grants the user maximum freedom to solve the requirements of their process using any number of delta, articulated arm or SCARA robots. The software also allows developers to automatically optimize their process in different ways. They can choose whether the movement profiles should prioritize shortest pick duration, first in first out, or energy-optimized movement.

Configuring, not programming

As part of the mapp Technology software framework, mapp Pick&Place is automatically linked to all of the other mapp components. As a result, it takes only a few clicks to set up coordination with other motion axes, B&R machine vision components or web-based mapp View HMI applications. Much of the development time otherwise spent on manual programming has been eliminated.

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ROBOTICS



Pick-and-place applications can be set up and optimized with just a few clicks.

Highlights

- Increased productivity
- Minimal programming effort
- Maximum flexibility



Virtual commissioning with a digital twin

All of the comprehensive simulation options available in the B&R system are available for the robotics as well. All of a machine's software and hardware – robotics included – can be represented in the form of a full digital twin and simulated at whatever scope or depth is needed. Not only does that accelerate development and commissioning, it continues to provide benefits throughout maintenance and ongoing operation.

Before ever setting up an actual robot, developers can check their design's performance on key metrics like picks per minute. Since all the characteristics of the robots are stored in the system, the physical limits of motors and gear-boxes are taken into account. All the programmer needs to do is specify the payload and press the button to start the simulation.

Working with a digital twin of the machine and its robots is easy, thanks to B&R Scene Viewer. Isolated movements or simple processes are displayed in graphical form and can be viewed from any angle.

Dramatic acceleration

For in-depth simulation of more complex processes, B&R's open development environment offers numerous options – including a bi-directional interface for the industrialPhysics simulation software. There, users can operate an entire virtual production line in 3D – including the precise timing and positioning of interaction between robots and other machine components. Potential problems, such as collisions between robots and products, can be identified and avoided, and operators can make targeted adjustments to correct any faults or imprecisions. A digital twin dramatically accelerates the process of developing and optimizing a machine design.

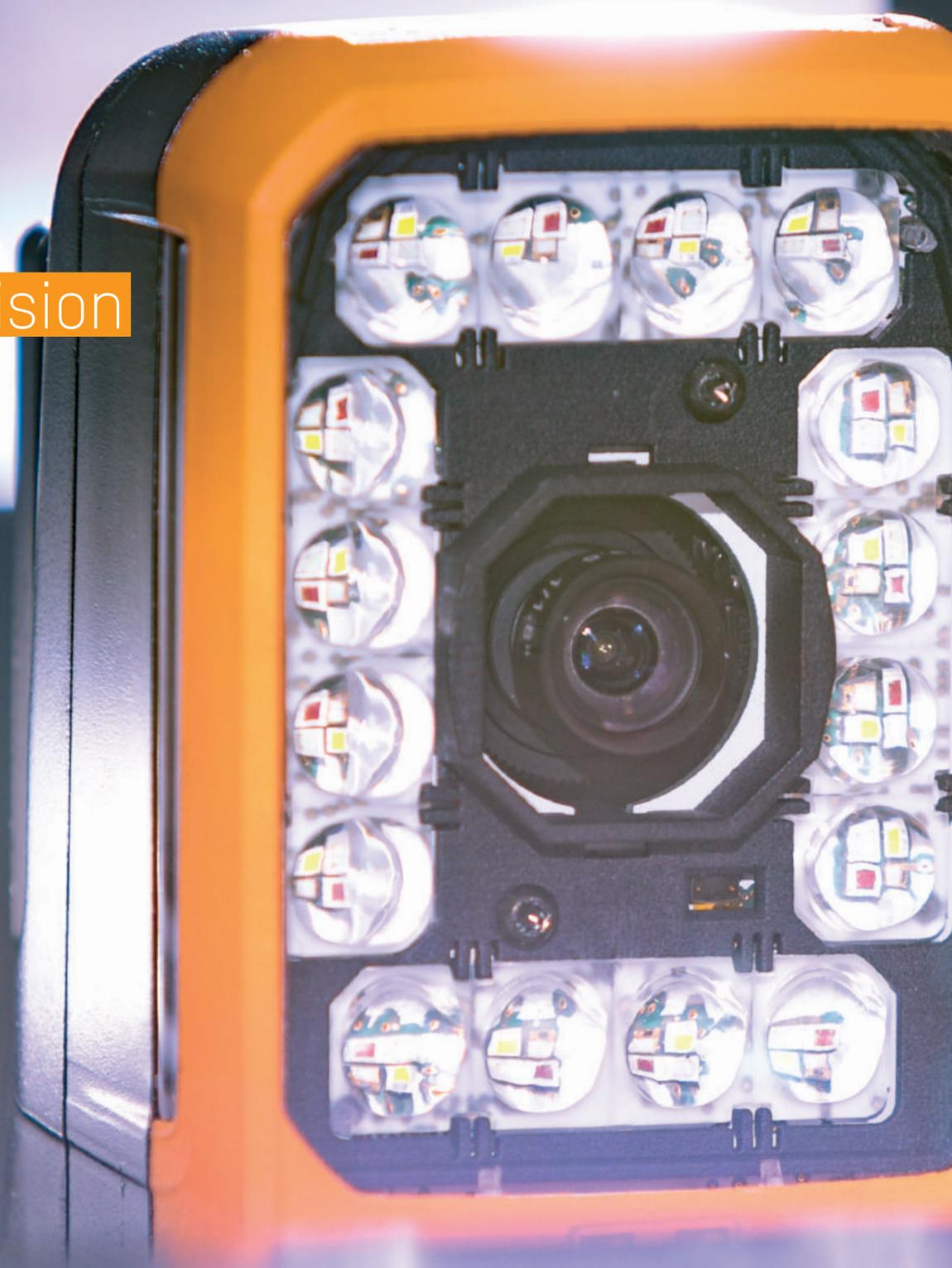
Highlights

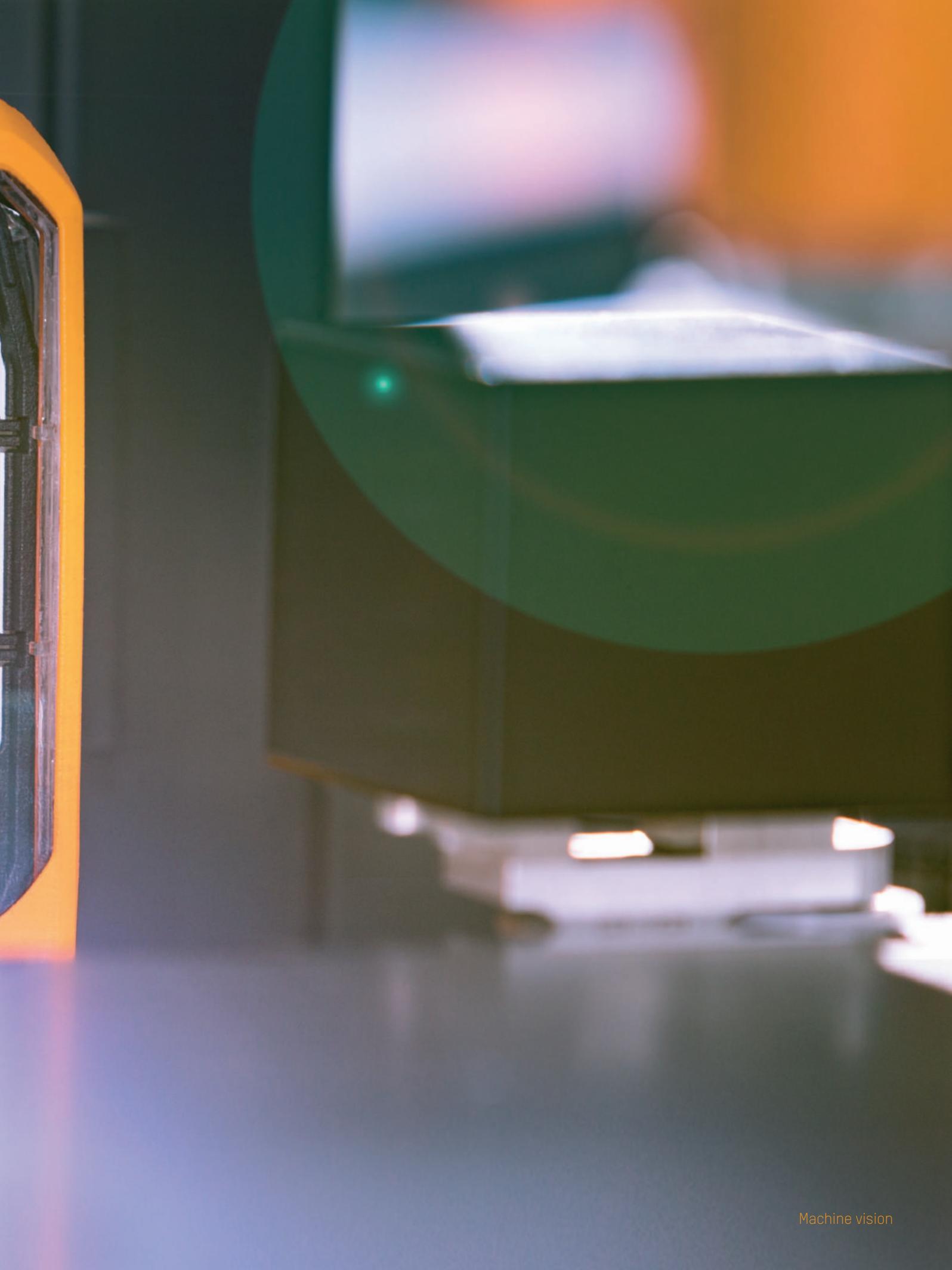
- Robots simulated along with rest of machine
- Accelerated development
- Tuning and optimization on a digital twin



The entire machine, including its robots, can be simulated and optimized as a digital twin.

Machine vision





Continually growing portfolio of cameras and lighting

Front
 Polarizing filter
 Diffusor filter
 Optical plastic

Variants
 Smart Sensor
 Smart Camera

CPUs
 Dual core
 Quad core

Lenses
 f = 4.6 mm
 f = 6 mm
 f = 8 mm
 f = 12 mm (macro)
 f = 16 mm
 f = 25 mm

Sensors
 1.3 megapixels
 3.1 megapixels
 5 megapixels

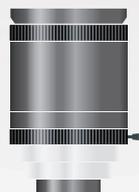
Lights
 IR, UV, red,
 green, yellow,
 blue, white



S-mount camera



C-mount camera



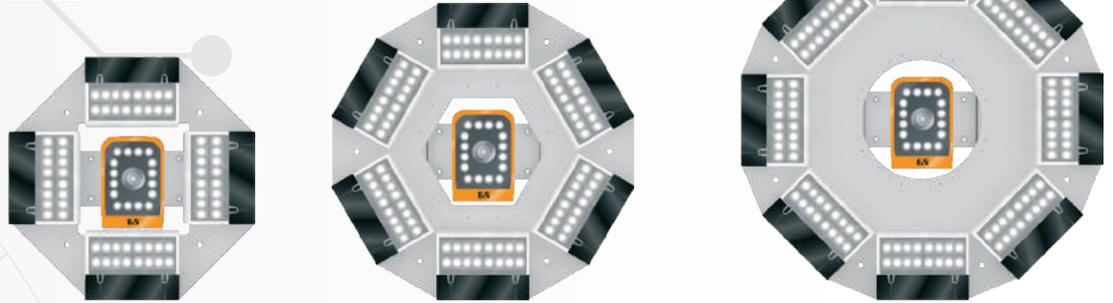
C-mount lenses



C-mount filters

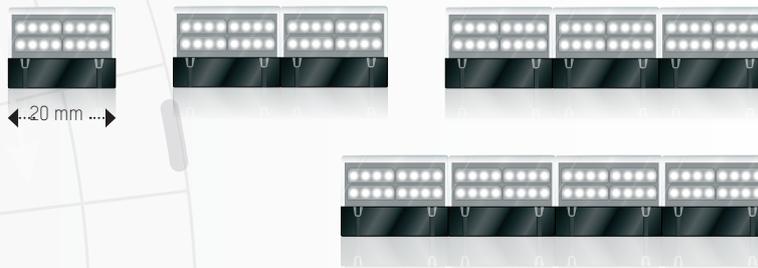
The Smart Camera and Smart Sensor are available in many different variants and can be adapted flexibly to the requirements of the application.

Ringlights



Ringlights are comprised of either four, six or eight light bars and provide exceptionally homogeneous illumination.

Light bars

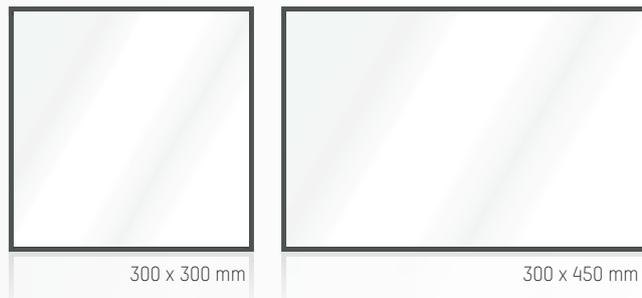


The light bars can be ordered individually or in assemblies of two, three or four. The motorized LEDs can swivel to adapt to product changes.

Light
 IR, UV, red, green, yellow, blue, white
 Motorized swivel

Front
 Transparent
 Diffusor filter
 Polarizing filter

Backlights



Light
 IR, UV, red, green, yellow, blue, white

Front
 Transparent
 Diffusor filter
 Collimating film

Six backlight variants are available to allow flexible adaptation to the task at hand.

Smart Sensor



The Smart Sensor is designed to implement single-function applications, such as reading QR codes, or detecting orientation or position. Unlike many other devices in its class, there is no need to install a different sensor for each function. Instead, the user simply configures the Smart Sensor in the Automation Studio engineering tool, where they can choose from a large selection of functions.

Fast modeling

Only a few clicks are needed to create a model. Suitable parameters for most applications are generated automatically. For more complex models, there is access to a complete parameter set. Up to 255 models can be stored and executed on a sensor. Additional models can easily be exchanged in the application via recipes.

Improved recipe handling

Recipe handling has become substantially more flexible. In addition to the ability to change existing recipes via the mapp Vision configuration interface, completely new recipes can be created directly on the machine.

Highlights

- Quick model creation with just a few clicks
- Easily create complex ROIs
- New HALCON functions for even better code recognition

New HALCON functions

B&R is integrating HALCON into its vision software. Existing algorithms will be optimized and new features and functions will be added in all B&R vision products.



Subpixel barcode reading for the narrowest bars

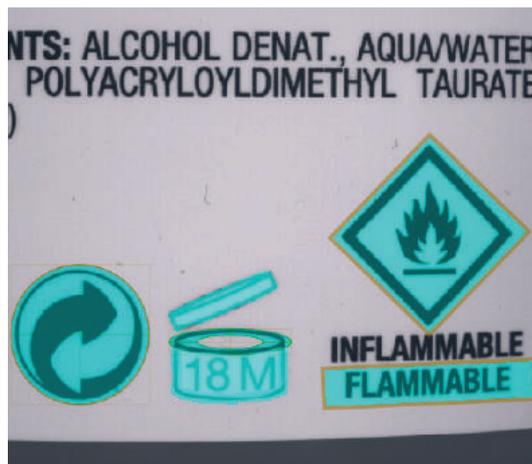
- Subpixel support: With new subpixel support, it is now also possible to read barcodes in cases where the bars are smaller than one pixel. This ensures reliable detection while at the same time reducing costs by permitting a lower resolution camera to be used.
- ECC 200 code reader: The ECC 200 code reader is faster, particularly for hard-to-read codes and when using multiple processor cores.
- DotCode: A new DotCode completes the extensive selection of code types already available.
- JIT compiler: A new just-in-time (JIT) compiler significantly improves execution speed. The performance increase ranges from 5% to 50%, depending on the selected image processing function and the number of models.

Easy ROI definition

In addition to rectangular regions of interest (ROIs), it is now possible to define circles and rings. These make it easy to create ellipses and other more complex ROI structures. The geometric shapes can then be adapted to the task at hand using the freehand brush. Each shape can be used to either add or subtract areas or individual points from the region. This makes it easy to define non-continuous ROIs and implement very small restrictions or exceptions.

Always up to date

The first fully integrated vision system combines the HALCON software library from MVTec and advanced control technology from B&R. Updates available on the controller are automatically transferred to each hardware device when the machine is started. These include new versions of the HALCON library used in the B&R vision system.



The different possibilities of ROIs (regions of interest).

New image processing component

The upcoming release of mapp Vision will include the pixel counter, a simple and efficient new image processing function. It can be used to evaluate the number and type of defects, contamination or residue on surfaces and brushes.

Smart Camera

The Smart Camera is a new addition to B&R's vision portfolio. Unlike the Smart Sensor, the Smart Camera can apply multiple vision functions nearly simultaneously. During image processing, the selected functions are executed in rapid succession in real time. The flexibility that comes from complete integration into the B&R system allows for process-controlled processing chains that would be costly and time-consuming to implement using conventional cameras.

Full scalability

Unlike conventional vision solutions, the Smart Camera is not a separate product family with its own programming environment and other limitations. The Smart Camera and Smart Sensor are fully interoperable. In cases where more than one functionality is required, it is no problem to scale up to the more powerful Smart Camera. The existing functionality, parameters and models can continue to be used. All the variables used on the PLC remain available. Implementation could hardly

be easier: Simply hook the camera up to the machine network, and it automatically obtains all the settings it needs from the controller.

Easy application development

A visual editor simplifies the wiring of the individual image processing components of the Smart Camera, providing a clear view of data used internally and externally. It makes machine vision projects as easy to work with as any function block.

Highlights

- Multifunctional for complex, real-time image processing
- Full scalability
- Easy project development with intuitive user interface
- Calibration with subpixel precision

The developer simply defines which of the output and input data should be made available to the controller. Inputs come from process variables or from the output data of preceding image processing components. Constant values are also possible if cyclical updates are not required.

Individual image processing components are either defined by a synchronous process variable or can be enabled/disabled by upstream components. This is important when the sequence of processing needs to vary dynamically.

If an image processing component outputs a position, the deviation of this position from an original position can be accounted for in other functions. This can help narrow down the ROI (region of interest) and significantly increase the processing speed.

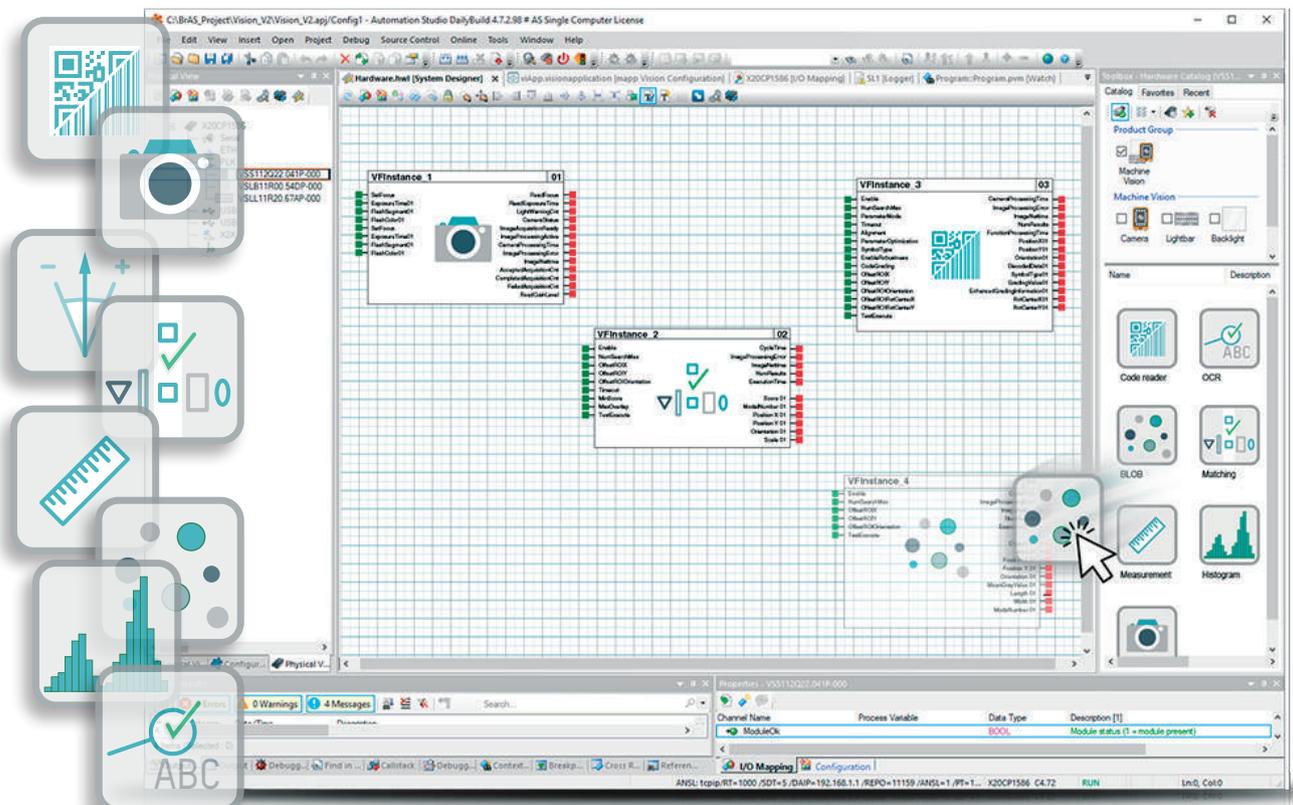
Higher resolution and larger image section

In addition to the existing 1.3 megapixel sensors, users now also have the option of quadrupling the resolution. The two new global shutter sensors with resolutions of 3.5 and 5.3 megapixels allow up to twice as large an image section with the same resolution.

Calibrate with subpixel precision

Certain image processing output, such as the center of gravity or the position of an edge, can be calculated with subpixel resolution. This makes it possible to achieve repeat precision that is significantly finer than the pixel grid of the sensor.

The Smart Camera provides a new image processing function for subpixel calibration, in which either the entire image or only the results are adjusted. If only the results are corrected, much faster processing times can be achieved.



Intuitive user guidance makes project development easy.

Optimal lighting conditions

Lighting plays an essential role in image quality. As an integral part of the automation system, B&R's machine vision lighting is easy to synchronize with other sensors, motor positions and events in the machine application. Lighting control with microsecond precision is even guaranteed when synchronizing multiple cameras and light sources.



Multicolor lighting for strong contrast

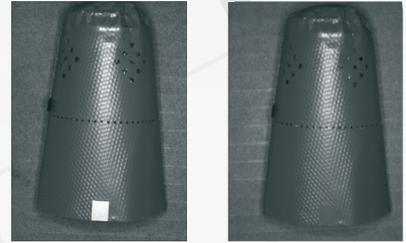
In order to achieve high resolution in image processing and to clearly recognize color contrasts, the Smart Camera uses monochromatic sensors in combination with monochromatic light and various filter options.

With a multicolor camera it would be virtually impossible to differentiate between the two orange tones RAL 2003 and RAL 2007 for example. If you use a monochrome camera to illuminate the objects with blue light, on the other hand, there is a clear contrast between them.



UV light unveils the invisible

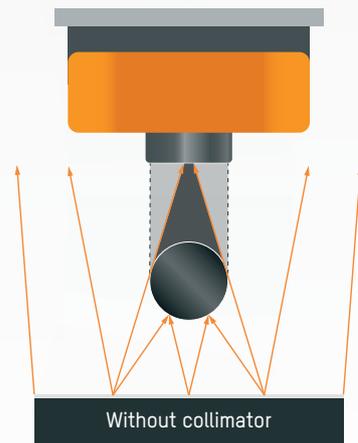
Very strong contrast values can be achieved by illuminating phosphorescent surfaces with ultraviolet light. Otherwise invisible security features in the foil of a champagne bottle can be seen clearly under ultraviolet light.



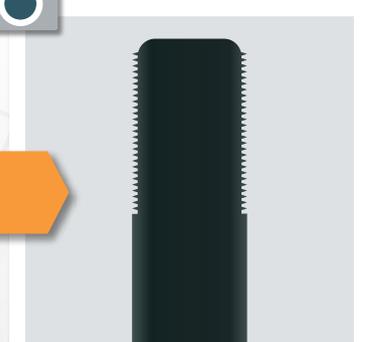
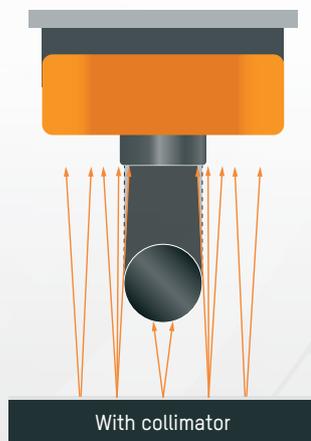
Backlight collimating film for precise measurements

A collimating film integrated in the backlight restricts the way light is propagated. Only rays of light traveling in a specific direction are permitted to pass through. This is particularly important in

applications where a round object is to be measured using its shadow image, but the precision requirements do not permit the use of telecentric illumination.



Gradient causes unclear edges



Sharp contrast on edges

Filters for improved image quality

The new filters are a simple and inexpensive way to improve the quality of captured images. They are available for both the Smart Camera and the Smart Sensor. Backlights have two new options in addition to the standard diffuser filter.

Polarizing filter

Reflections and glare can be eliminated by using a polarizing filter. Overexposure is suppressed to achieve perfect contrast.



Undesired overexposure



Polarized exposure

Diffusor filter

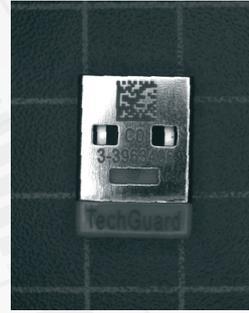
A polarizing filter may also eliminate desired reflections, such as laser markings on metallic surfaces. In these cases, a diffusor filter ensures optimum contrast.



Standard exposure



Polarized exposure

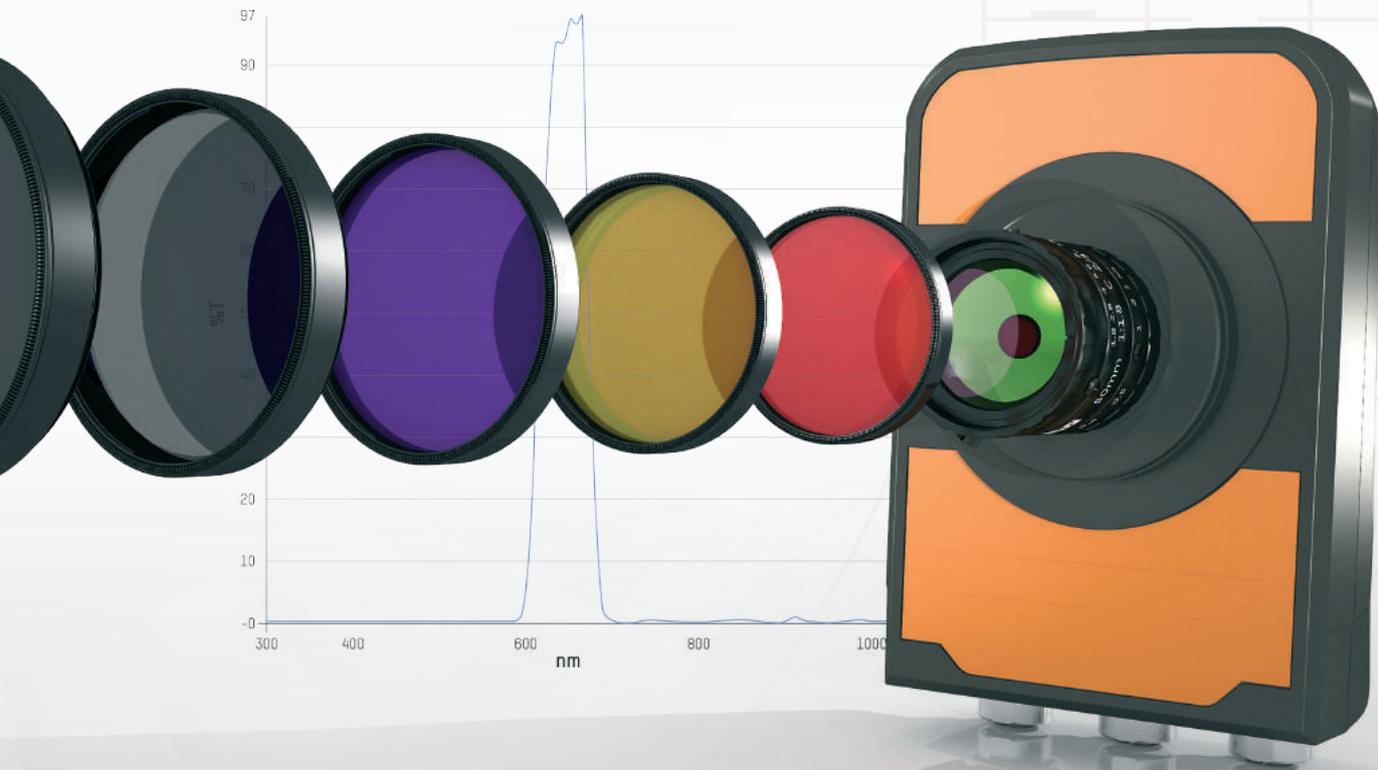


Diffuse exposure

Optical filters for M27 thread

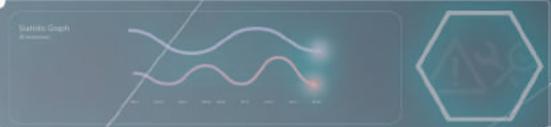
Filters available for C-mount lenses include polarizing filters and narrow bandpass filters for a variety of wavelength ranges. The spectrums are optimized for the available LED wavelengths.

Other variants are available specifically for fluorescent surfaces. They significantly improve contrast under difficult lighting conditions.

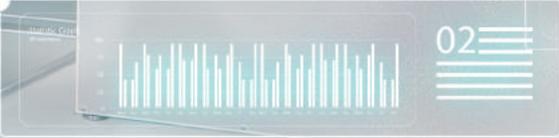
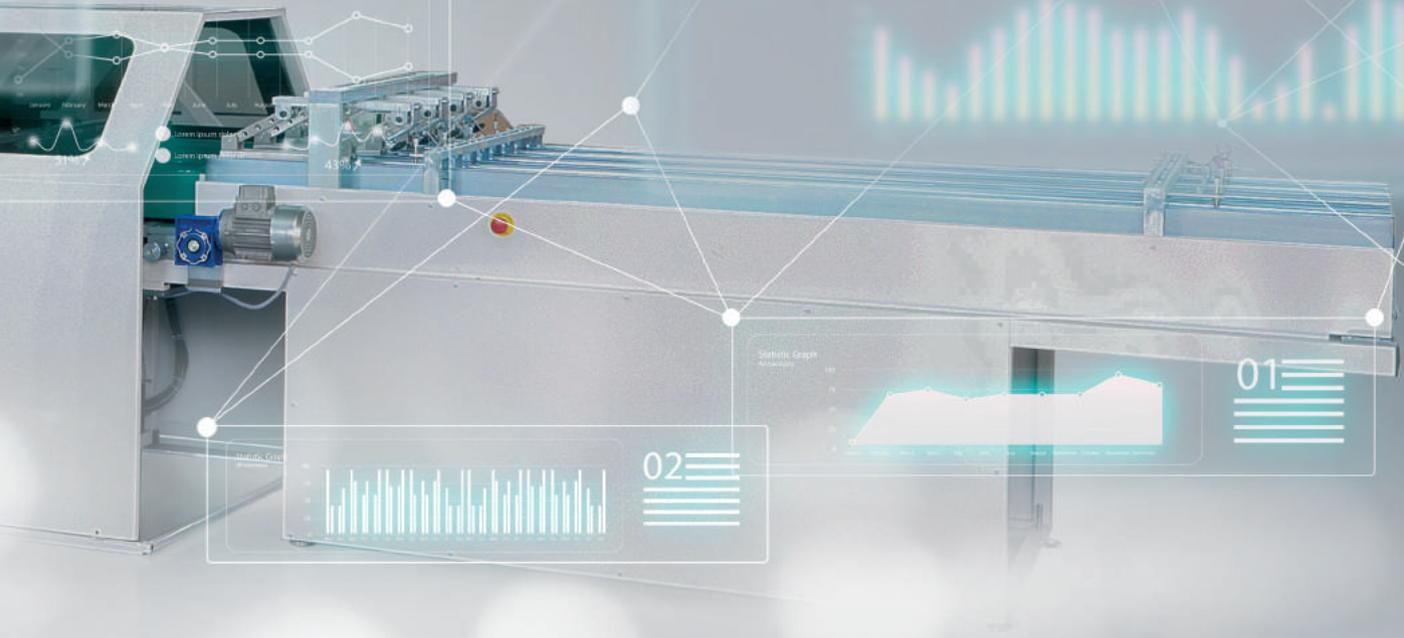
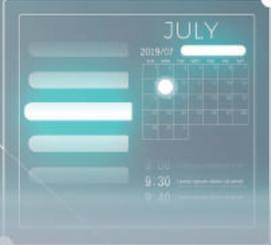
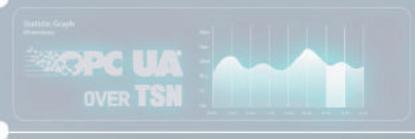


Industrial communication





Regin
Regin
Regin



Shaping the future of industry – OPC UA and TSN

OPC UA and TSN fulfill a long-held desire throughout the world of industrial manufacturing: standardized vendor-agnostic communication. Modular, flexible manufacturing solutions are easy to implement with OPC UA and TSN.

The communication solution enables users to design machines and plants for batch-size-one production, optimize performance and implement predictive maintenance. All without interrupting ongoing operation. OPC UA and TSN also offer built-in security mechanisms, including user authentication and authorization, encryption and certificate handling.

Communicate 18 times faster

OPC UA and OPC UA over TSN enable plug-and-produce networks that are easy to administer and configure. Network stations with OPC UA over TSN can communicate up to 18 times faster than with any other protocol. This opens up new possibilities in areas such as tightly synchronized motion and control applications.

More efficient bandwidth utilization

OPC UA over TSN also meets the requirements of

future IoT applications. The technology supports networks comprising tens of thousands of nodes and benefits from bandwidth extensions to the Ethernet standard. Even large volumes of data – like streaming video – can be handled with ease.

The fusion of IT and OT

OPC UA enables seamless, transparent communication from the sensor to the cloud. The worlds of IT and OT merge to form a unified network, fulfilling a key requirement of all Industrial IoT applications. Since OPC UA and TSN are completely vendor-independent solutions, machine builders and operators are no longer dependent on proprietary communication solutions from individual providers.

Highlights

- Vendor-agnostic and interface-free
- Improved OEE
- Future proof

Pilot applications - OPC UA and TSN in action



Pilot application: 3D metal printing machine

Made possible by: Information modeling with OPC UA

Situation

A machine consists of a number of modules, each with its own controller and interface. A higher-level control system brings all the information together and makes it available to the machine operator.

Problem

- Defining and programming interfaces is complex and time consuming. Incompatibilities can arise.
- In order for machine modules to be reused for other machine variants, they must be described manually. This is costly and prone to errors.

Solution

The machine modules and the higher-level controller with the communication interface for

the machine operator are described in an OPC UA information model. The higher-level controller automatically merges the information models of the individual machine modules into a common OPC UA information model.

Advantages

- Full machine model generated automatically
- Time and money saved throughout design, commissioning and maintenance
- More robust against errors thanks to a standardized module description
- Reusable interfaces make it easier to scale machine variants



Pilot application: Rotor spinning machine

Made possible by: Field-level communication with OPC UA over TSN

Situation

A machine consists of a central controller for the drive technology with several subordinate cascaded CAN networks. Two CAN master plug-in cards and up to 30 CAN hubs are required to control the total of 1,000 CAN drives.

Problem

- Network size and complexity: Long downtimes in the event of fault, changeover or maintenance
- Low bandwidth (10 Mbit/s): Tedious updating all devices in the network
- Alarm and diagnostics systems must be maintained separately
- No historical record of selected data points

Solution

Switch to an OPC UA over TSN network. End-to-end use of an Ethernet-based physical layer, together with OPC UA over TSN, allows flatter, simpler network topologies. An alarm system is available with OPC UA alarms and conditions.



Pilot application: Bottling line

Made possible by: Controller-to-controller communication, PackML / OPC UA companion specification

Situation

Three separately manufactured machine modules are combined to form a complete system. This requires definition and implementation of the communication interfaces between the machine modules. The machine modules are each equipped with two POWERLINK and two Ethernet interfaces.

Problem

- Time-consuming: Describing and defining communication interfaces
- Complex: Building, maintaining and troubleshooting separate networks
- Cost-intensive

Solution

Step-by-step integration of OPC UA into the machine modules. Modules described using PackML / OPC UA companion specification. Communication between the modules is made possible by controller-to-controller communication based on the OPC UA publish/subscribe mechanism.

Advantages

- Reduced cabling
- Easily scalable for new machine variants
- Cost savings
- Faster changeover and maintenance
- Easy alarm management
- Fast troubleshooting and root cause analysis with OPC UA historizing function

Advantages

- Uniform descriptions of interfaces and functions with PackML
- Cabling costs cut in half
- Simplified maintenance and diagnostics
- Reduced costs



Pilot application: Industrial uninterruptible power supply (UPS) system

Made possible by: OPC UA publish/subscribe mechanism, information modeling

Situation

A power supply plant consists of a variety of automation components from different vendors. These components communicate with each other over a CAN network. There are different communication interfaces for connecting to the plant operator. To achieve higher power, multiple plants can be joined together in a network.

Problem

- Low response speed and bandwidth (10 Mbit/s) of the CAN network: problem balancing mains fluctuations
- Commissioning multiple networked plants time consuming
- Resource-intensive

Solution

Switch to OPC UA with publish/subscribe mechanism for internal and external communication. Rather than multiple communication interfaces for plant operators, there is a single, uniform OPC UA interface. For plants connected in a network, information models can be aggregated.

Advantages

- Fast communication with publish/subscribe mechanism
- Fast transmission of device and machine updates
- Fast commissioning
- Reduced cabling



Pilot application: Electric vehicle charging infrastructure

Made possible by: Field-level communication with OPC UA over TSN, OPC UA security

Situation

A machine builder is developing a charging station for electric cars. To do this, they need a future-proof, vendor-independent communication solution.

Problem

- Power fluctuations: The e-charging station is subject to power fluctuations, which must be compensated for in a time-critical manner.
- Remote connection: The charging station must permit remote access for maintenance, monitoring and cost accounting purposes.
- Network communication: Communication within the e-charging station must be vendor-independent and secure.

Solution

Switch to an OPC UA over TSN network. The OPC UA publish/subscribe mechanism enables the power fluctuations to be compensated for promptly. OPC UA security mechanisms enable secure IT communication and data retrieval from the cloud.

Advantages

- Interface defined only once
- Easy user management: Clear display of access authorizations through OPC UA role and rights management
- Vendor-independent communication

Publish/Subscribe mechanism for efficient data exchange

B&R has integrated the OPC UA publish/subscribe mechanism into its automation system. This can considerably reduce the load on automation components and networks. The mechanism enables fast, efficient cyclical data transmission. The use of PTP for high-precision time synchronization also establishes consistent timing throughout the network, a prerequisite for efficient production processes.

The publish/subscribe model enables one-to-many and many-to-many communication. A publisher sends its data to the network (publish), and any client can receive and process this data (subscribe). This reduces the amount of communication overhead utilizing network bandwidth and lowers the performance requirements for network nodes.

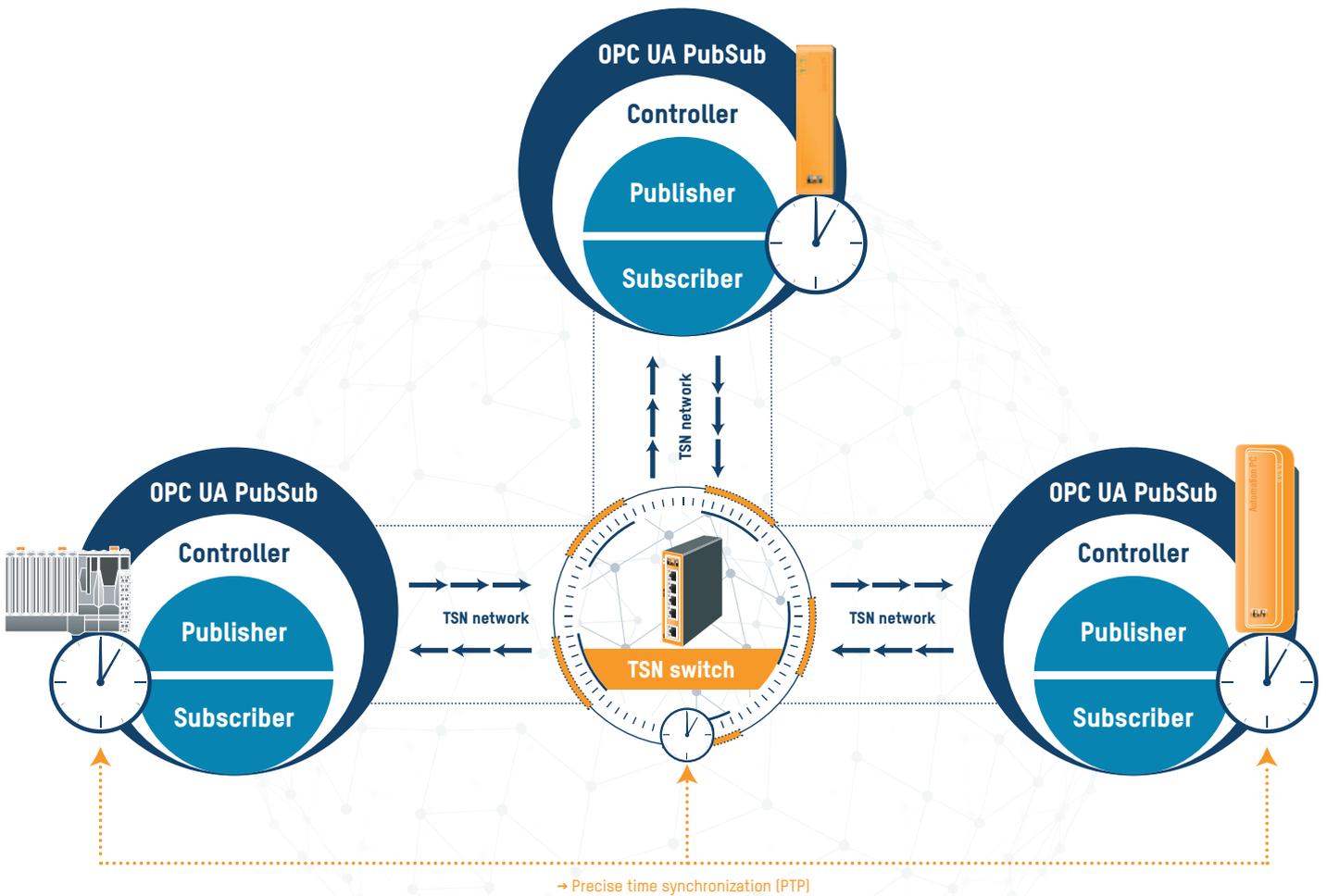
For small OPC UA networks with few nodes and low bandwidth or cycle time requirements, the client/server mechanism is also available. With this approach, a client requests information from a server, which processes the request and sends a response back to the client.

Synchronized communication between controllers

With the OPC UA publish/subscribe mechanism, machine controllers exchange data at very high speeds. When used in conjunction with the time synchronization protocol PTP (Precision Time Protocol), it enables synchronized communication between machine controllers in hard real-time, also known as controller-to-controller communication. This establishes consistent timing throughout the machine network, which is an essential requirement for efficient manufacturing processes.

Highlights

- Simplified data transmission in large networks
- Relief for server and network
- Fast, vendor-agnostic data exchange
- Efficient manufacturing processes



Easy OPC UA implementation



With BSR's Automation Studio engineering environment, configuration of OPC UA is virtually effortless. Integrating OPC UA into a machine design is very easy. The setup and configuration settings are simple and straightforward. New functions make creating applications with OPC UA easier and faster than ever.

Highlights

- Consistent alarms across different machines
- Simplified file transfer
- Streamlined programming
- Easy system integration
- Vendor-agnostic communication



Alarms & Conditions – Uniform alarm handling

B&R has added the OPC UA Alarms&Conditions function to its mapp AlarmX alarm management solution. Alarms can now be generated and sent in a standardized, uniform manner, regardless of who built the machines. The user configures the desired alarm directly in the application using

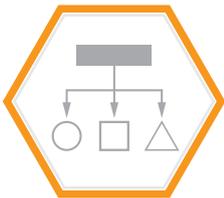
mapp AlarmX. The alarms are defined on the OPC UA server and can be read and processed by any OPC UA client. This makes it much easier to send and collect alarms on the network.



File transfer – Transfer files in a standardized way

Until now, different protocols were needed to transfer files like recipes, PDF reports or configurations. With OPC UA file transfer, B&R now offers a way to transfer files in a standardized manner. In the OPC UA information model, all files are avail-

able in a uniform way. There is therefore no need for separate protocols to transfer and open different file types.



Method handling – Easy representation of machine functions

With OPC UA method handling, B&R makes it possible to represent and call machine functions using OPC UA methods. The methods enable direct interaction between different machines or machine components. Machines can query each other to find out what kind of services, interfaces and

capabilities they provide – which enables them to interact more efficiently and autonomously. Standardized methods like those found in OPC UA companion specifications can be easily integrated into the program code as function blocks.



Information models – Uniform machine descriptions

In addition to modeling user-specific information models, B&R offers the option of integrating standardized information models based on OPC UA companion specifications. A large number of companion specifications are already supported, including PackML, EURMAP 77, 82, 84 and Umati. New companion specifications are being added

all the time. Machine builders can use it to describe their machine type and its data points and functions in a vendor-independent and uniform way. This facilitates communication within the machine network, integration into a production line and connection to cloud-based systems.

TSN switch for OPC UA over TSN communication

B&R's new real-time capable Ethernet switch can be used to set up networks using the vendor-agnostic communication solution OPC UA over TSN. Its design and form factor fit perfectly into the B&R portfolio for space-saving mounting in the control cabinet.

The TSN switch makes implementing modular machinery fast and easy. It enables cycle times of less than 50 μ s and offers four real-time capable TSN ports and one standard Ethernet port – to connect an HMI device, for example. The Ethernet switch also opens up the possibility of star, tree or ring topologies in addition to daisy-chaining. Multiple switches can be cascaded in order to reach remote cabinets or implement large, complex real-time networks. Non-TSN nodes can also be incorporated in the network via the switch.

Easy integration

The TSN switch is based on standardized, vendor-agnostic TSN mechanisms to ensure the

fastest possible cycle times and optimal bandwidth utilization. Mechanisms for fast data forwarding make it possible to exchange data quickly and directly between sensors and actuators located on different segments of the network. The Ethernet switch is completely integrated in B&R's Automation Studio engineering environment and configures itself automatically.

Highlights

- Vendor-independent real-time capability
- Faster implementation of modular machine designs
- For large converged machine networks
- Integration of non-TSN devices
- Automatic configuration
- Compact design



TSN switch →

Technical data

Product ID	0ACST052.1
TSN ports	4x
Standard Ethernet ports	1x
Cycle time	<50 μs
Time synchronization (jitter)	<±100 ns
Supported bandwidths	100 Mbit/s and 1 Gbit/s
TSN standards (IEEE)	802.1AS-2020 802.1Q 802.1Qbv 802.1Qav 802.1Qcc 802.1Qbu 802.1Qci
Security	Secure certificate store

Track technology





Hot performance through smart cooling

ACOPOStrak performance can be further increased using motor segments with integrated liquid cooling. This integrated solution requires no additional installation for cooling.

The new motor segments can be used to cool specific sections of track that need it most. In highly dynamic applications, large numbers of shuttles accelerate and brake on certain track segments. The resulting heat is absorbed by the liquid cooling system and transported away via a cooling medium that is pumped through the cooling circuit.

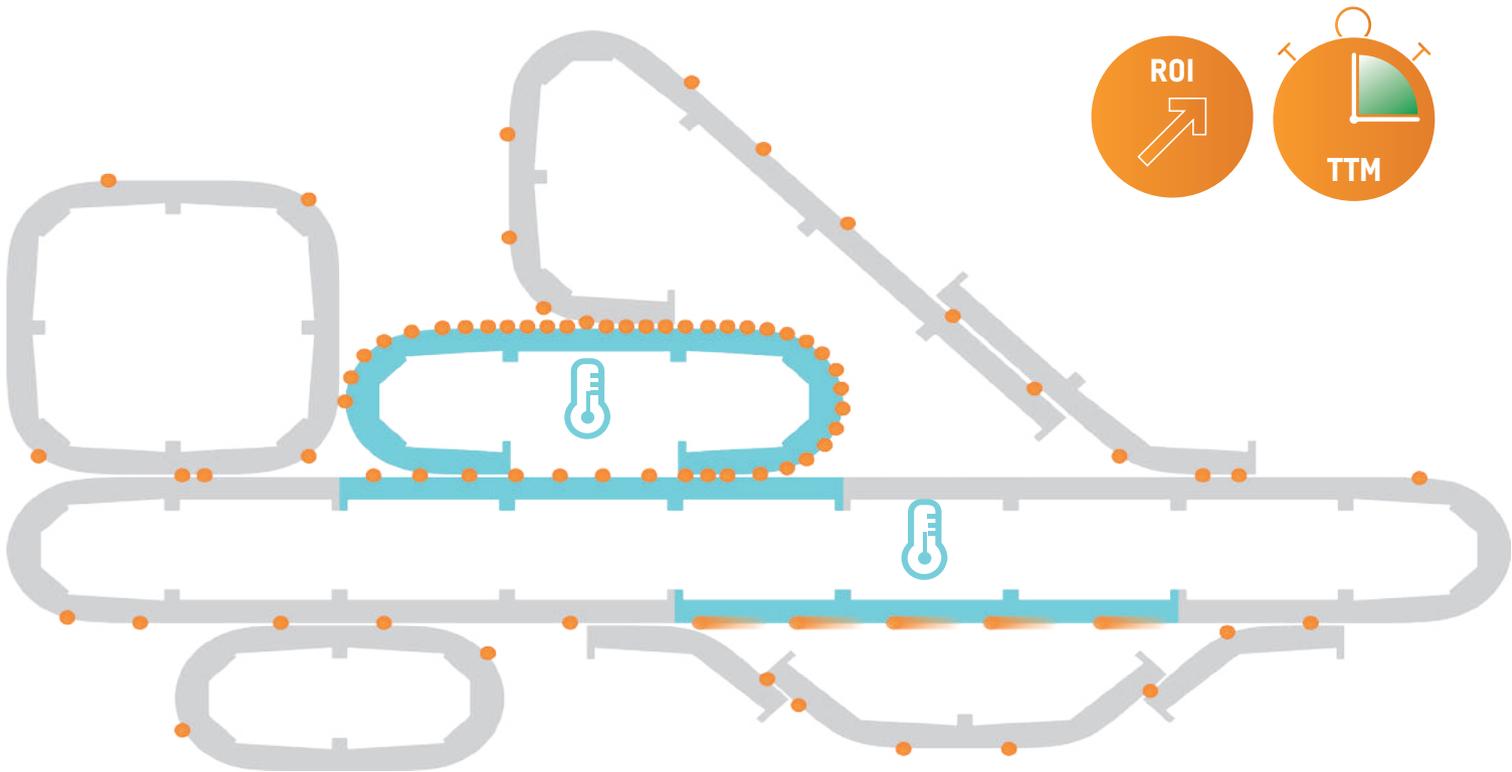
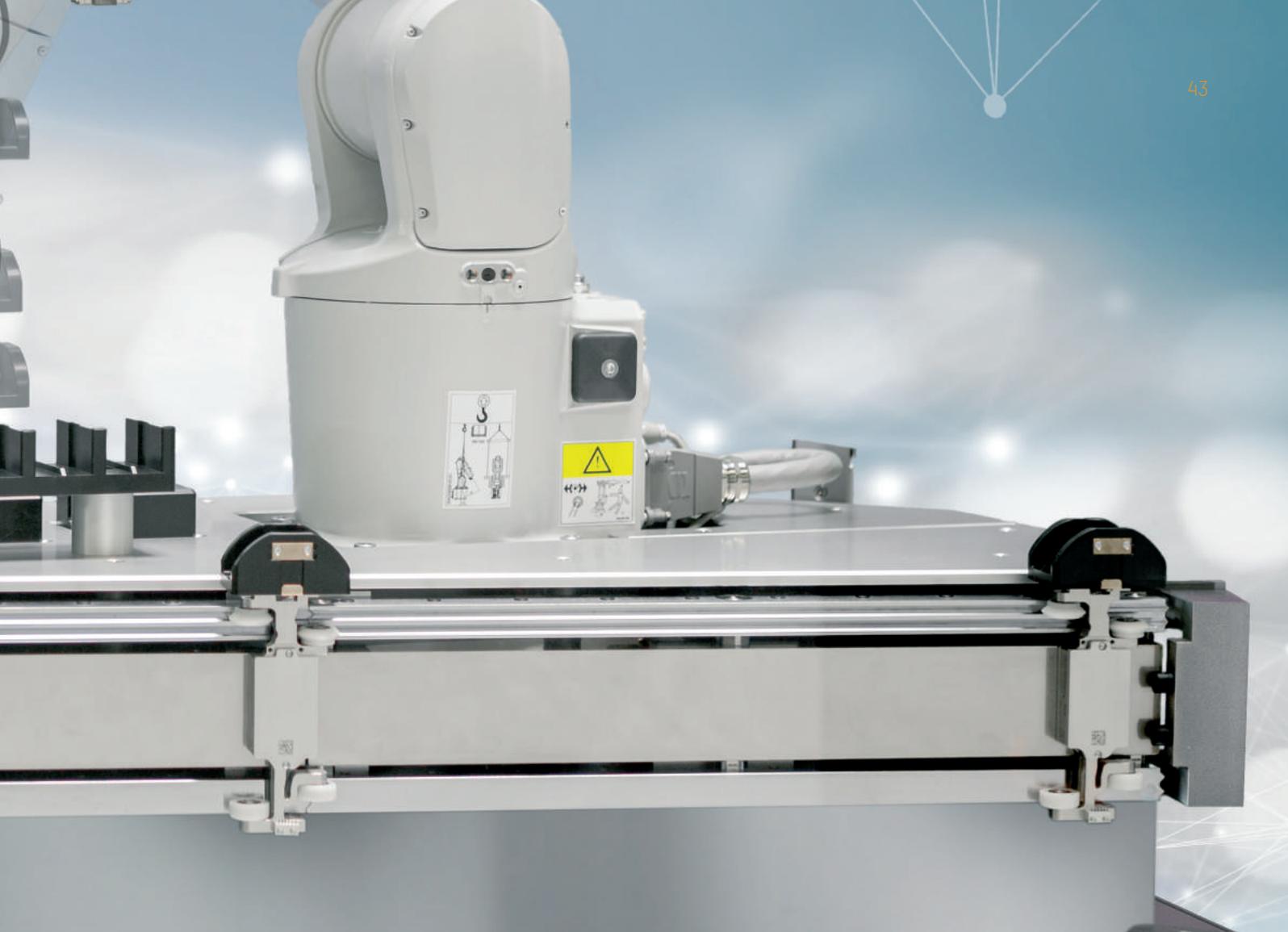
Thermal calculations made easy

The mapp Trak system software calculates exact-

ly where the track system's power requirements are the highest. From this information, it is able to determine how much heat will be generated in each track segment. The software simulation shows which parts of the track require cooled motor segments.

Highlights

- Increased performance
- No additional installation
- Cost savings



Limitless layout possibilities

The new Convoy function makes it possible to group shuttles together and control them as a unit. Movement processes can be programmed once for the whole group rather than individually. This speeds up implementation and simplifies shuttle handling throughout the ACOPOStrak system.

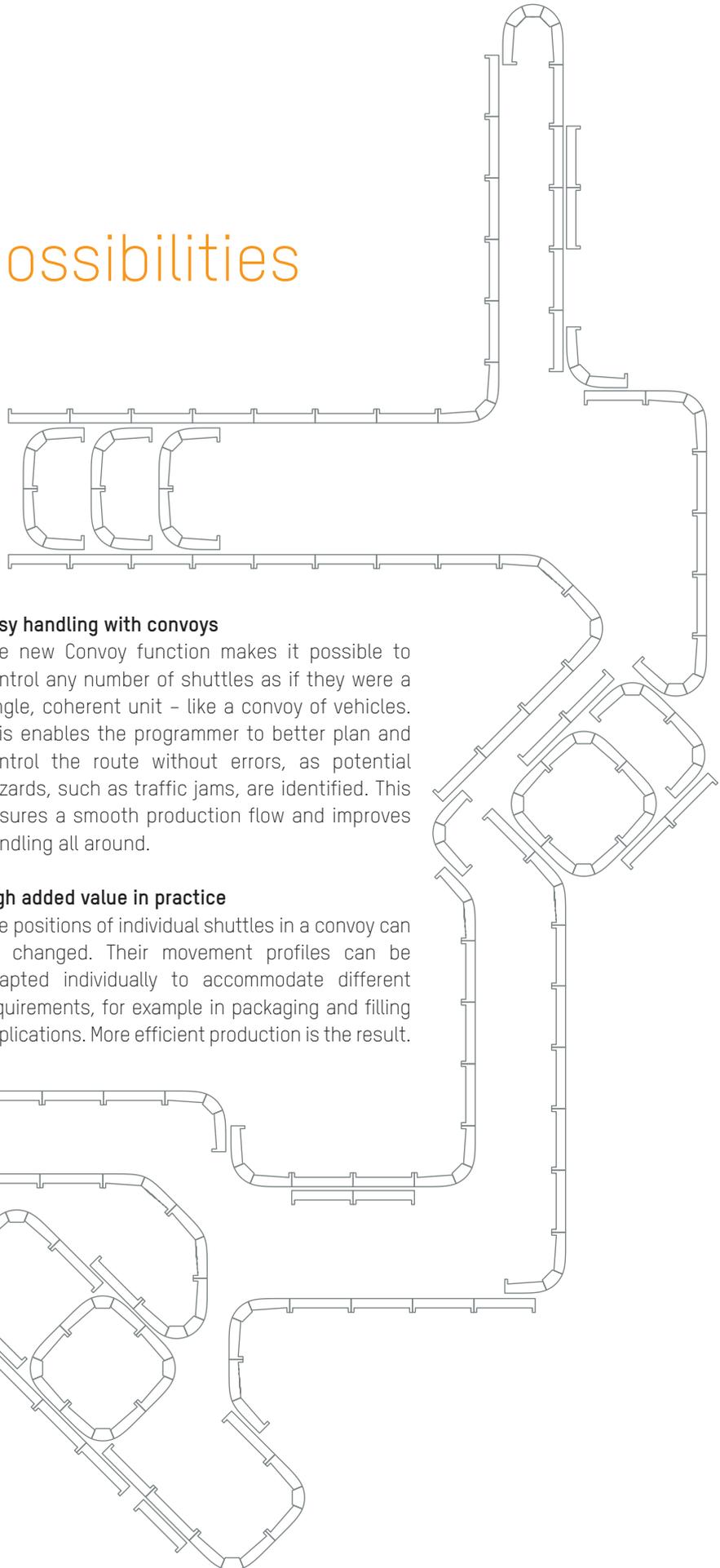
The ACOPOStrak software supports process-oriented programming. The programmer defines rules that control the flow of products on the track. This way, shuttle movements can be implemented with automatic collision avoidance around the entire track. With deadlock prevention, the firmware ensures that shuttles continue running smoothly without becoming jammed.

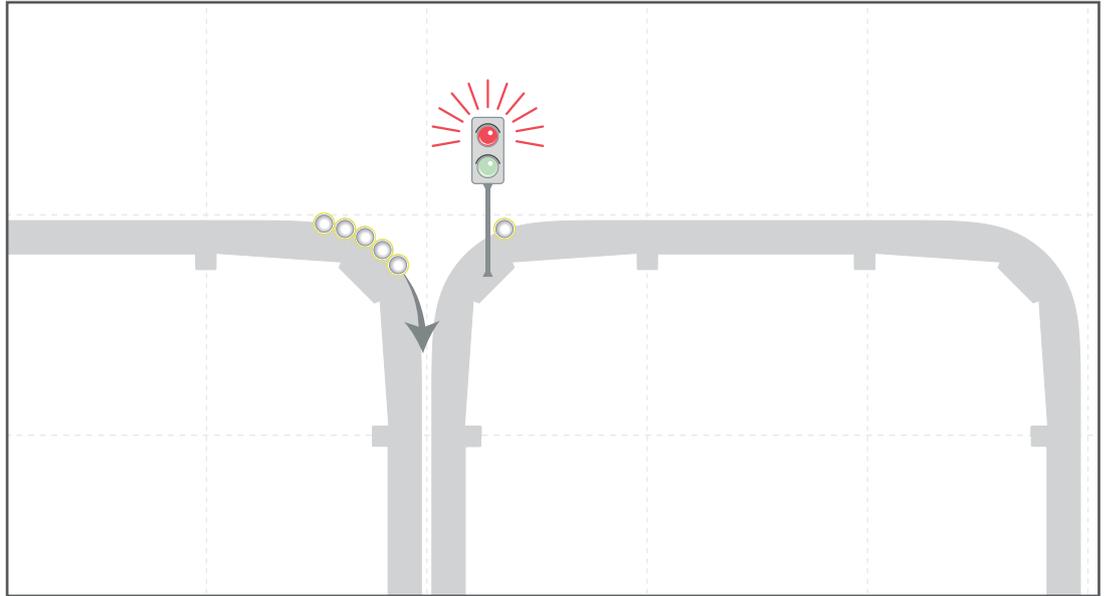
Easy handling with convoys

The new Convoy function makes it possible to control any number of shuttles as if they were a single, coherent unit – like a convoy of vehicles. This enables the programmer to better plan and control the route without errors, as potential hazards, such as traffic jams, are identified. This ensures a smooth production flow and improves handling all around.

High added value in practice

The positions of individual shuttles in a convoy can be changed. Their movement profiles can be adapted individually to accommodate different requirements, for example in packaging and filling applications. More efficient production is the result.





Convoys improve track planning by identifying potential hazards and bottlenecks in the layout.

The shuttles' ability to move backwards can be used to create a jogging movement. When moving forward, multiple shuttle movements can also be superimposed to achieve the same effect. This eliminates the need for a separate vibrating station for compacting bulk material, and the space can be used for other purposes. And since the vibration process no longer has to be completed within a certain timeframe, it can be implemented more gently and/or more effectively. Users can implement different movement profiles and custom vibration functions with different frequencies and amplitudes.

Ticketing system sets priorities

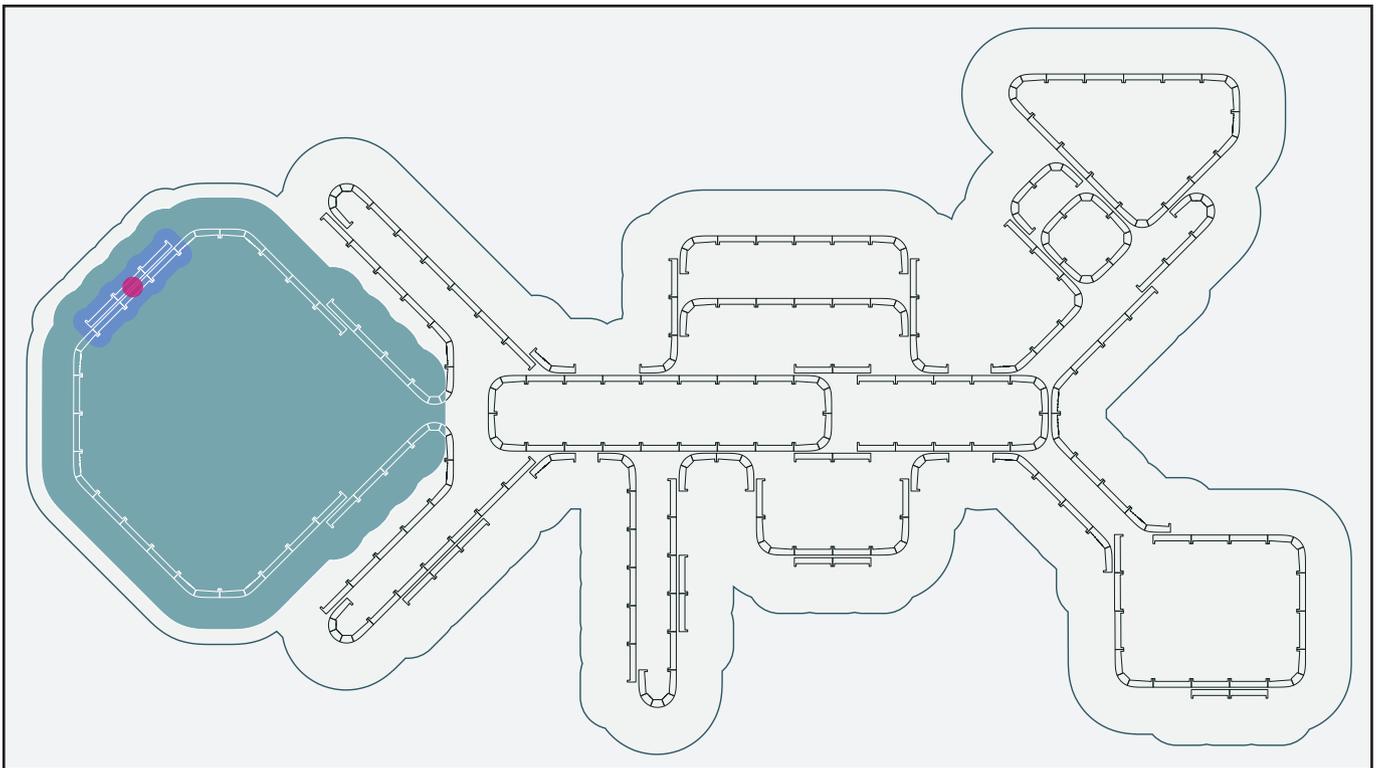
A new ticketing system provides the necessary traffic logic. This is key to ensuring shuttles are

able to follow their routes through the track system smoothly and efficiently. Within the software, each shuttle is prioritized with a ticket that defines the order and right of way for shuttles and convoys. This prevents collisions and conflicts and keeps production flowing unimpeded.

Highlights

- Faster implementation, simplified shuttle handling
- Customizable movement profiles
- Smooth and efficient traffic control with new ticketing system

User-specific diagnostics



Macro level

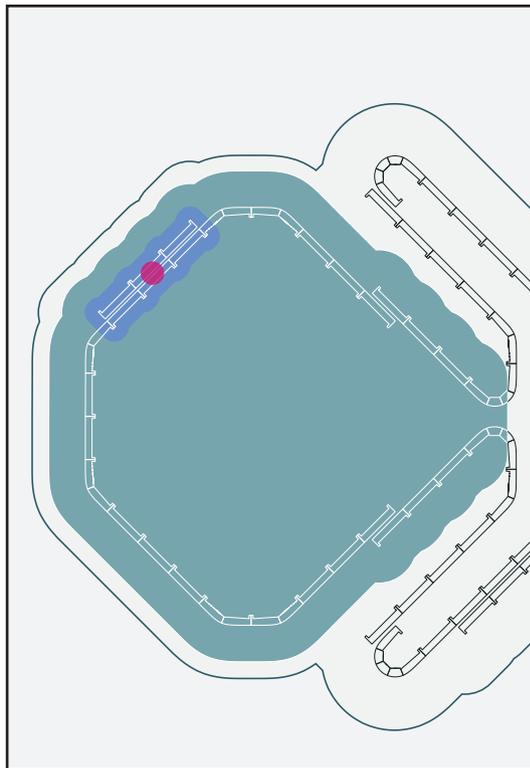
B&R's user management system allows custom configurations for each operator. The new Diagnostics function now allows the operator to choose via the HMI terminal how detailed the process flow diagnostics should be. This helps minimize downtimes and significantly increases plant availability.

Diagnostics can be used to analyze the process flow of an entire plant at a macro level. Throughput

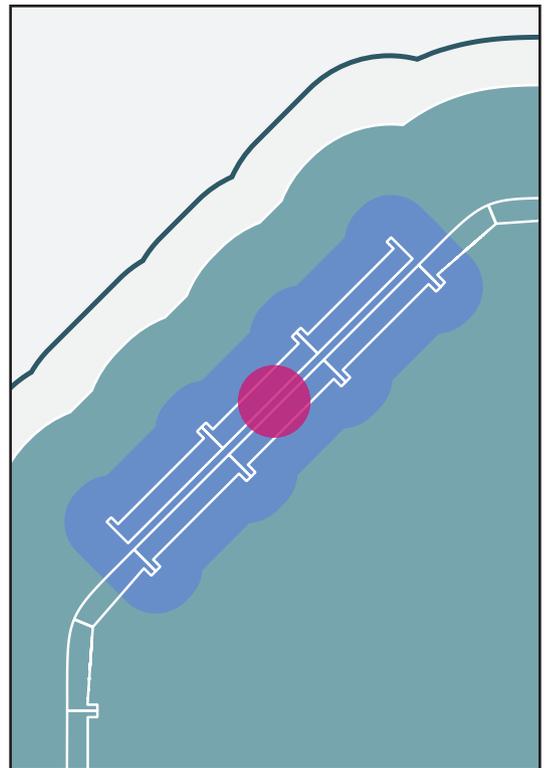
analyses can identify potential traffic jams or disruptions.

An intermediate level provides an additional degree of detail. Here, diagnostics are applied to individual modules or track segments to narrow down where delays are occurring.

The most fine-grained analysis occurs at the micro level, where the focus is on individual



Intermediate level

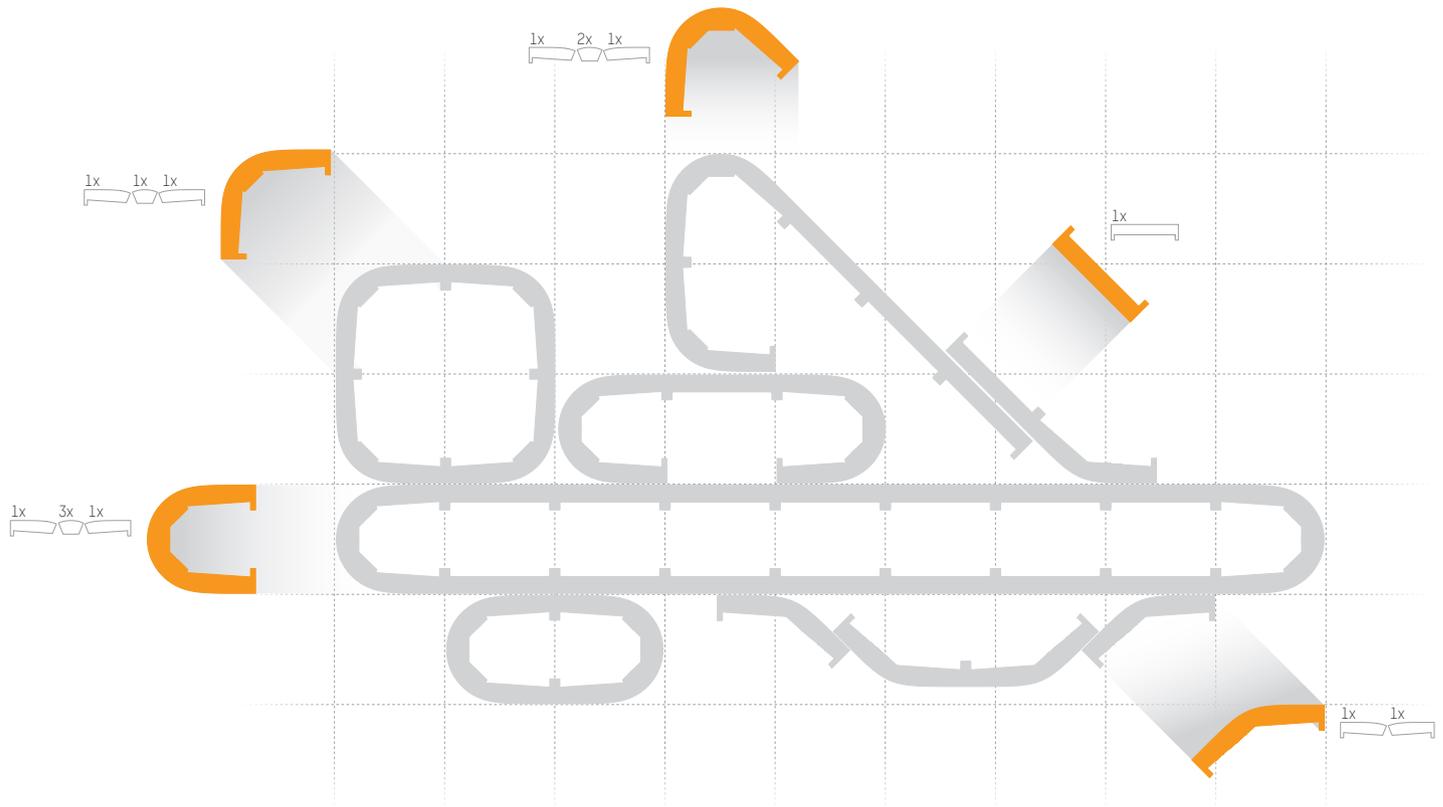


Micro level

shuttles. This helps to identify the exact cause of the problem, such as a laser that fires slowly. This extremely precise analysis is perfect for implementing predictive maintenance measures. If a fill valve is not achieving the throughput that it should be, this can be an early indication of an impending fault. By detecting and correcting issues before they become critical, you can prevent downtime and significantly increase plant availability.

Highlights

- Custom diagnostics for each operator
- Significantly higher plant availability
- Minimal downtime



Easy track system configuration

The new ACOPOStrak Designer software makes planning and testing an intelligent ACOPOStrak track system child's play. With a single software tool, designers can now configure the track layout in 3D and then test and evaluate individual shuttles and numerous other parameters. The simulation options provided in ACOPOStrak Designer help them minimize programming overhead, reduce energy consumption and boost throughput.

Despite the highly complex calculations that occur in the background, ACOPOStrak Designer is straightforward and intuitive to use. The simulation behaves exactly like a real ACOPOStrak system. It provides the user with important information, such as how fast shuttles will be able to accelerate or approach curves in the track. This makes it possible to determine how many shuttles to use and the speed at which they will deliver the highest productivity.

Simple and user-friendly simulation

ACOPOStrak Designer is a fast and easy way to perform sizing for an ACOPOStrak system. The entire conceptual design can be completed in a single user-friendly tool without any programming. Once the configuration is complete, it can easily be exported to Automation Studio for further development. Specific shuttle movements can be programmed using the ready-made components of mapp Trak.

Test every option

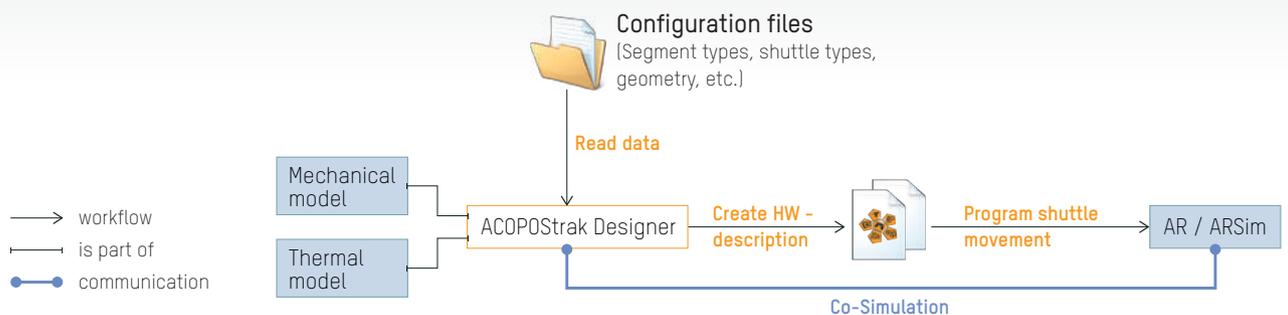
In order to calculate and visualize contact forces and shuttle movements, ACOPOStrak Designer provides mechanical design functionality. The analysis can be used to calculate maximum attainable speeds and payloads. This lets users check the fundamental feasibility of their ACOPOStrak system, forecast throughput and rule out potential hazards right from the start. The ability to accurately simulate the entire track system makes it possible to test and evaluate countless different layouts and scenarios and to identify which configuration is the most efficient.

Optimize energy consumption

ACOPOStrak Designer can also be used to evaluate the system's thermal behavior and cooling needs. It calculates the amount of heat generated by each track segment. To optimize energy consumption, the average energy requirements are calculated during constant shuttle movement to identify peak temperatures. This makes it clear where water-cooled track segments can help further increase throughput. The power supply can then be planned and designed accordingly. The result is a reduction in the machine's overall energy consumption.

Highlights

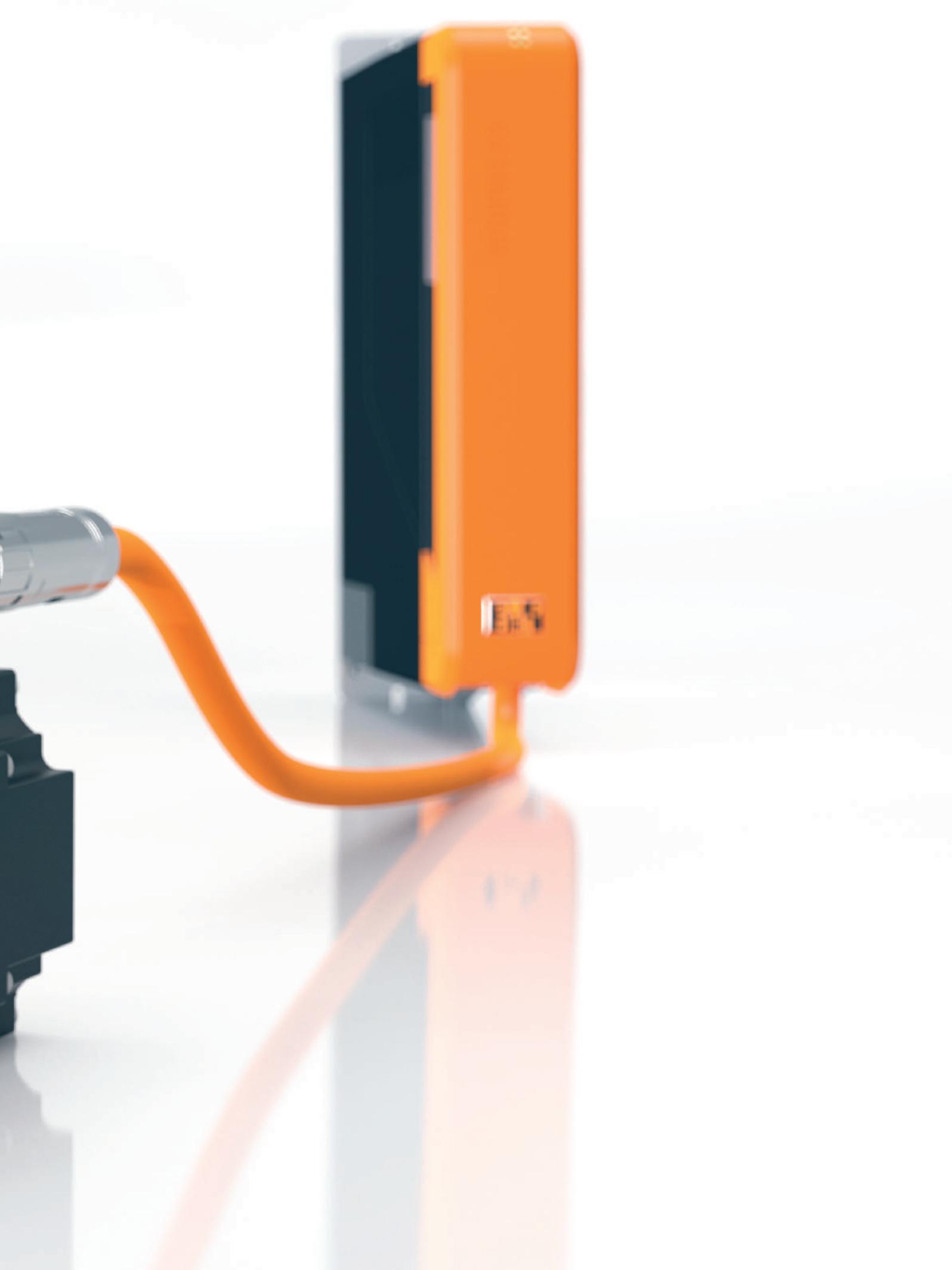
- Conceptual design with zero programming
- Accurate simulation and testing in 3D
- Optimized energy efficiency
- Maximized productivity
- Easy export to Automation Studio



ACOPOStrak Designer makes it easy to design the perfect track layout. Specific shuttle movements are programmed in Automation Studio. Together with ACOPOStrak Designer, they are then simulated and optimized.

Motion control





High power density for compact machine design



B&R is adding two new series of servo motors to its portfolio with high torque density. Their sophisticated design helps them achieve up to 75% higher nominal torque than comparable motors when used together with an ACOPOS servo drive.

The motors are suitable for a connection voltage of 325 or 750 VDC and can be installed at altitudes up to 4,000 meters. Machine builders can make their machines substantially more compact and economical.

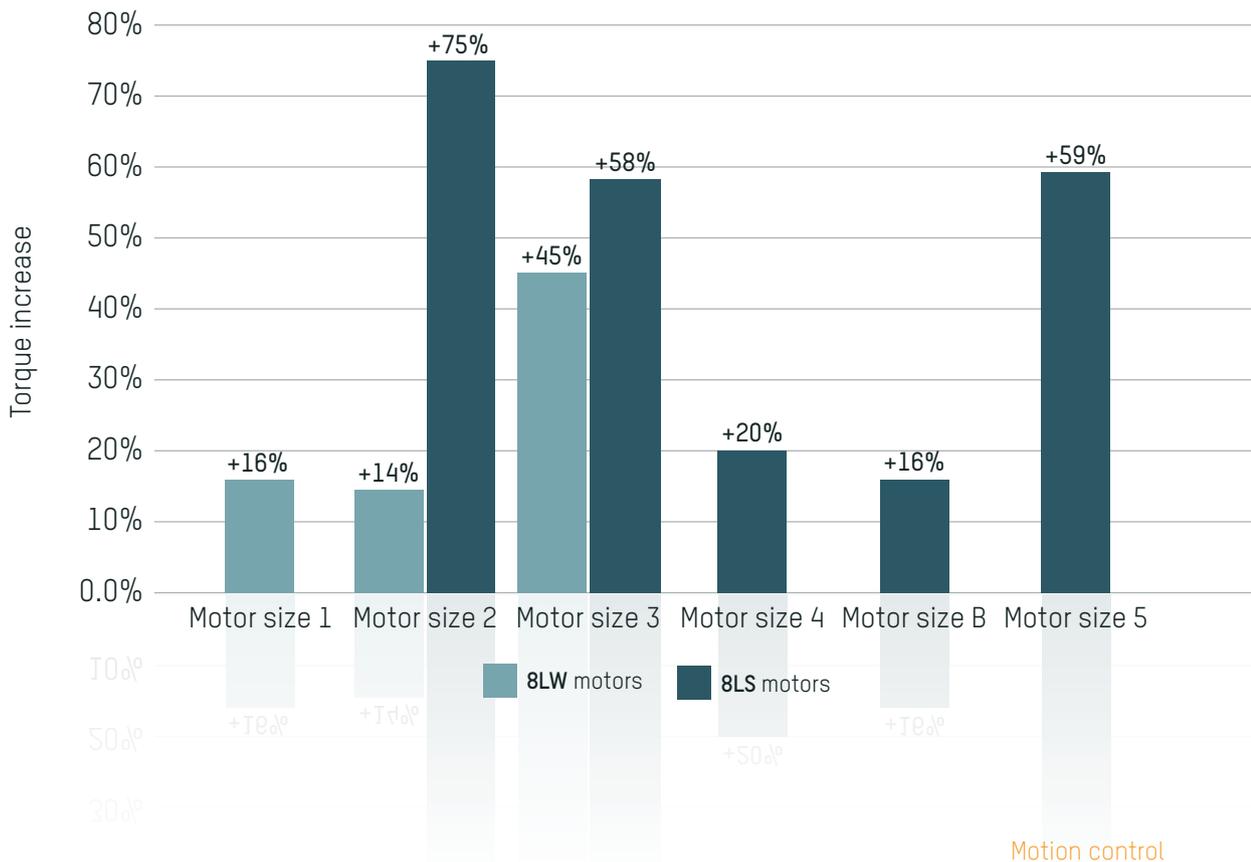
All the data at a glance

The embedded parameter chip contains all the mechanical and electronic data pertaining to the motor. This enables the user program to identify the entire power transmission system without time-consuming and error-prone manual config-

urations. Commissioning times are reduced considerably. Additionally, the ability to easily compare machine configurations during service helps to diagnose faulty arrangements immediately and minimizes costly downtime. Valuable additional information provides insight into the use or potential misuse of the motor.

Highlights

- Highly dynamic
- Excellent efficiency
- Economical system solution
- Ideal for high altitudes up to 4,000 m
- High power density for compact design



Scalable performance, versatile application

Motors in the new 8LW and 8LS series are compact and highly dynamic. They are fully scalable in terms of performance, precision and options to find the optimal solution for every application.

All sizes of all motors are optionally available as either a robust single-cable solution for EnDat 2.2 in conjunction with scalable safety functions, or as a dual-cable solution for resolvers and EnDat 2.2.

8LW servo motor series	Size 1 (1 length)	Size 2 (2 lengths)	Size 3 (1 length)
Connection voltage	325 VDC		
Nominal speed [rpm]	4,500	3,000 / 4,500	3,000 / 4,500
Nominal power [kW]	0.15	0.24 - 0.65	0.83 - 1.15
Stall torque M_0 [Nm]	0.36	0.78 - 1.50	2.30
Stall current I_0 [A]	0.66	0.92 - 2.73	3.51 - 5.36
Torque constant K_T [Nm/A]	0.55	0.55 - 0.84	0.55 - 0.84

8LS servo motor series	Size 2 (5 lengths)	Size 3 (4 lengths)	Size 4 (5 lengths)	Size B (4 lengths)	Size 5 (5 lengths)
Connection voltage	750 VDC				
Nominal speed [rpm]	(4,500) / 6,000 / 8,000	3,000 / 6,000	3,000 / 6,000	3,000 / 4,500	2,200 / 3,000 / 4,500
Nominal power [kW]	0.22 - 0.96	0.69 - 2.14	1.26 - 3.46	1.88 - 5.18	2.35 - 6.28
Stall torque M_0 [Nm]	0.40 - 1.50	2.40 - 5.40	4.70 - 12.00	7.00 - 20.00	12.00 - 29.00
Stall current I_0 [A]	0.55 - 2.89	1.60 - 7.40	2.90 - 14.80	4.30 - 18.30	5.40 - 17.80
Torque constant K_T [Nm/A]	0.52 - 0.97	0.73 - 1.45	0.81 - 1.63	1.09 - 1.63	1.09 - 2.22

Reduced cogging

Cogging causes speed droop. A 10-pole design reduces this effect and enables particularly good concentricity, which is especially beneficial in printing and grinding processes. The design also offers more precise positioning and repeatability.

Optimal heat dissipation

The new winding encapsulation significantly improves heat dissipation via the housing. Effective heat dissipation is the most important prerequisite for high power density in motors. The winding encapsulation changes the clearance and creepage distances and permits installation altitudes up to 4,000 meters.

Numerous options

Motors are available in an array of variations to meet the needs of any application:

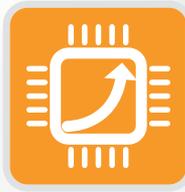
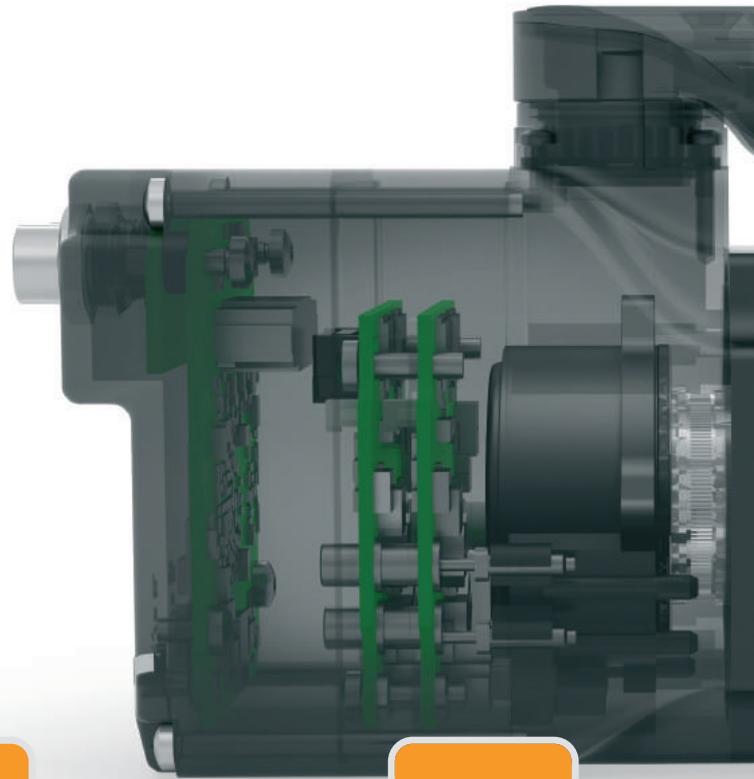
- External air cooling (multiple voltage options)
- IP54 protection
- Oil seal with IP65 protection
- Straight or angled connectors
- Smooth or keyed shaft
- Same encoder options for all sizes

Highlights

- Scalable for any application
- Easy connection
- Optimized heat dissipation
- Accelerated commissioning
- Overview of all motor data



Big performance in a small package



IP65

1be2

B&R is adding three new variants to its series of integrated motor-drive units. Equipped with powerful processors, the three new devices are perfect for applications where tight synchronization and positioning precision are paramount. ACOPOSmotor devices offer the same range of functions as the ACOPOS P3 and ACOPOSmulti series.

With their powerful processor, the ACOPOSmotor variants achieve a fast internal cycle time of 50 μ s for current, speed and position control. This makes them the right choice for highly dynamic processes where high-speed movements must

be synchronized with impeccable precision. That opens up potential new applications for these devices in areas like printing and packaging.

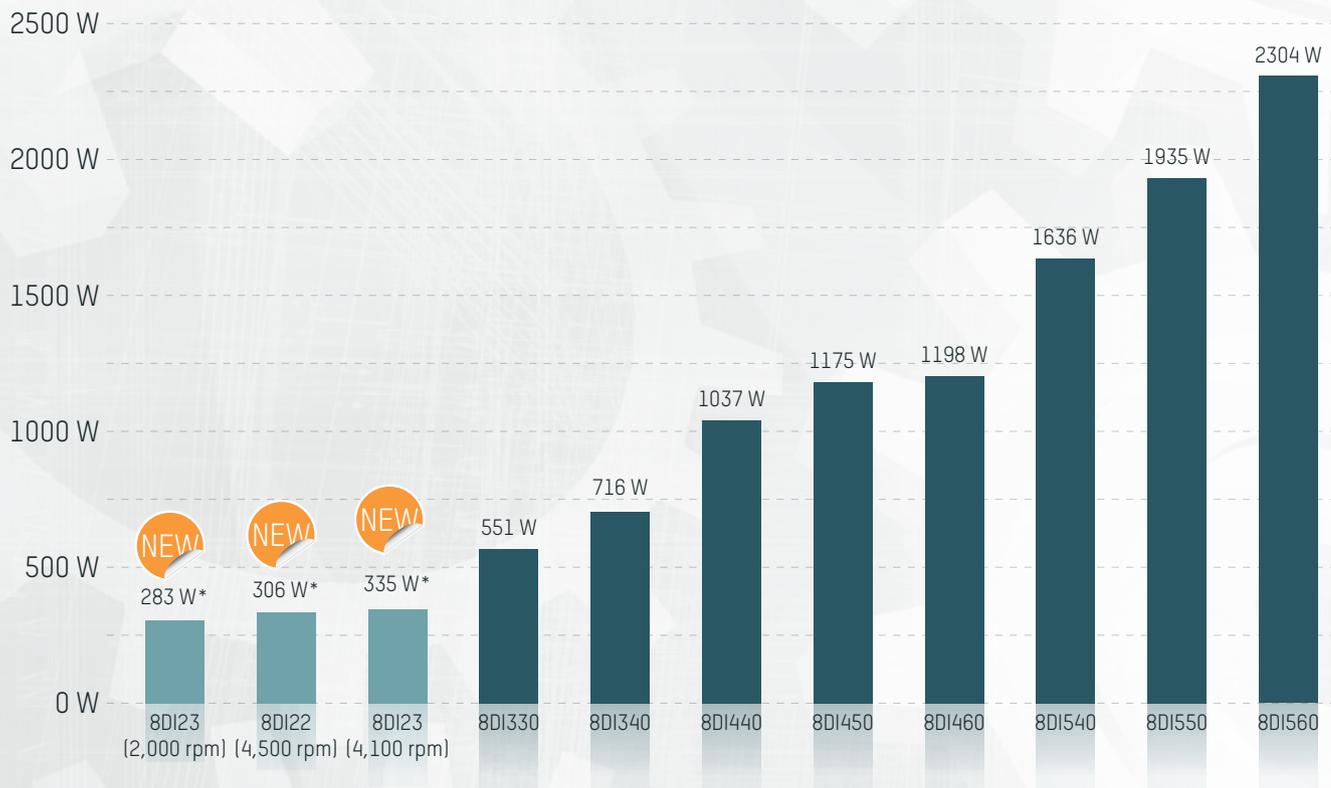
Highlights

- Perfect for modular machinery
- Reduced cabling
- Smaller machine footprint
- Many possible uses
- Simple installation

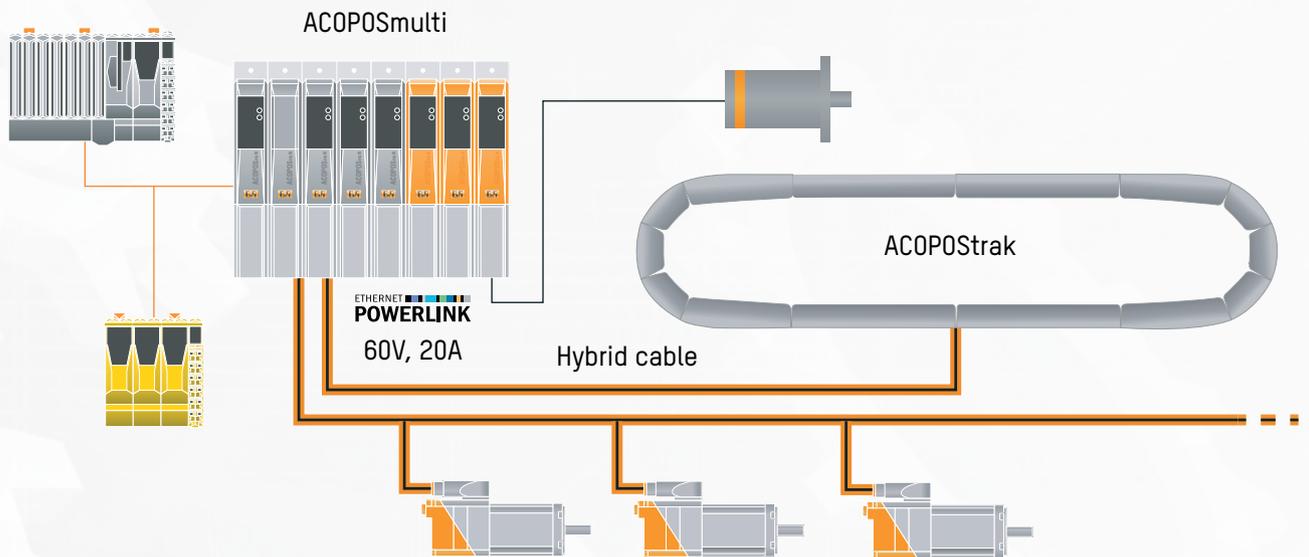


Three new ACOPoSMotor variants with powerful processors offer the same range of functions as the ACOPoS P3 and ACOPoS Multi servo drives.

ACOPoSMotor	Technical data
Nominal power	283 W to 2.3 kW
Power supply	7.2 A with peaks up to 20 A
Voltage	24 - 48 - 60 VDC
Single-cable solution	Power supply, POWERLINK, STO
Nominal speed	2,000 - 4,500 rpm
Nominal torque	0.65 - 1.32 Nm
Encoder	Absolute encoder, single or multiturn
Protection	IP65
Options	2 trigger inputs, motor brake, integrated gearbox



The ACOPoSmotor portfolio covers a power range from 283 W up to 2.3 kW. The smallest version has a 60 mm flange at a total length of only 128 mm.

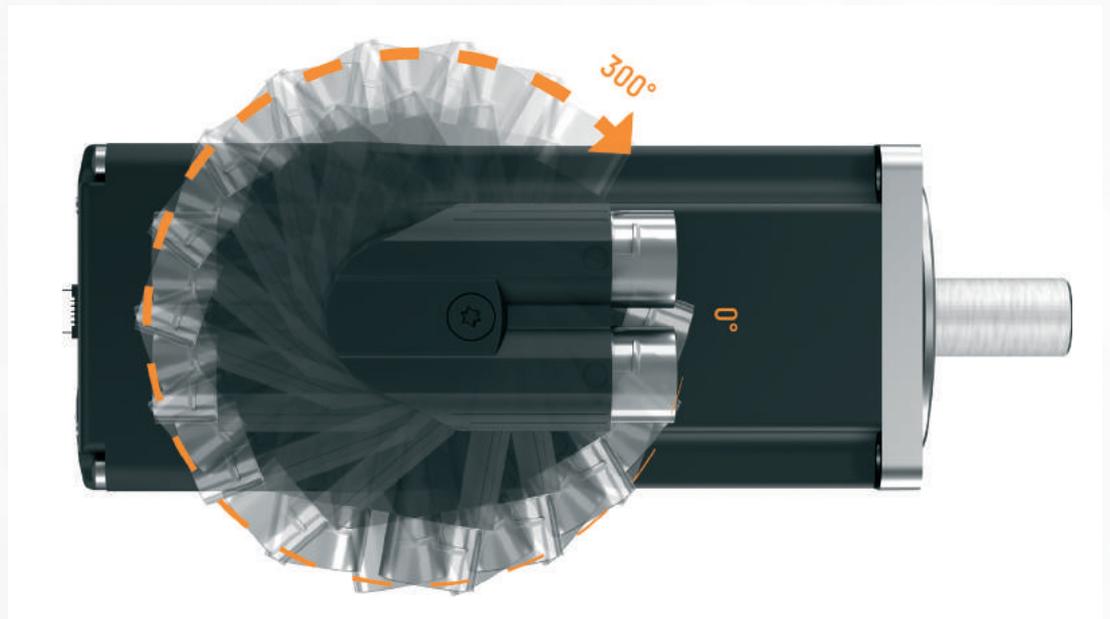


The compact ACOPOMotor variants can be connected directly to the ACOPOSTrak power supply. This greatly simplifies cabling for processing stations along the track. The ACOPOMotor doesn't need an extra power supply.

Reduced cabling

The ACOPOMotor variants are equipped with two 300° swivel connectors for hybrid cables. There's only one cable that needs to be run to the control cabinet. The hybrid cable transmits both the power supply and POWERLINK communication. Additional ACOPOMotor units are easily added on via

daisy-chain cabling. That saves up to 90% of cabling effort and makes testing and installation substantially easier. The integrated motor-drive units also come standard with the STO safety function. It is controlled via the hybrid cable, so no extra wiring is necessary.



The devices feature unique 300° swivel connectors that make installation considerably easier.



ACOPOSmotor devices have a smaller flange and offer increased power density, making it possible to build more compact machines that occupy less space on the plant floor.

Compact machines

The devices have new motors with particularly high torque density. This enables the use of a considerably smaller flange while at the same time increasing the power density by 12%. It becomes possible to build more compact machines that occupy less space on the plant floor. There is also a broad selection of gearboxes to use with the ACOPOSmotor.

The ACOPOSmotor portfolio covers a power range from 283 W up to 2.3 kW. The smallest version has a 60 mm flange at a total length of only 128 mm. ACOPOSmotor variants cover a wide voltage range of 24 to 60 VDC. Thanks to the low voltage, they are also suited for embedded applications like in automated guided vehicles (AGVs).

Fully integrated

ACOPOSmotor devices are fully integrated in the B&R system and don't require any special software, so developers don't need additional training.

Applications can be created using PLCopen function blocks or ready-made software components from the mapp Motion collection. The integrated motor-drive units can be synchronized with any other motor on the machine, or with the ACOPOStrak track system. It is also easy to implement robotics and G-code applications. Firmware updates are downloaded automatically when the machine is started up. Any other ACOPOS solution can easily be replaced with the integrated motor-drive units with no additional overhead.

Modular machinery

B&R's distributed drive technology opens up entirely new possibilities for designing modular machinery. Each machine module can be built and tested separately, reducing production costs and accelerating time to market. They also make on-site installation of the machine much easier and faster. All of a machine's options and variants can be managed effortlessly.



A wide variety of gearboxes are available for use with ACOPOSmotor devices.

Modular cooling concept for ACOPOS P3

The ACOPOS P3 servo drive is now also available with feed-through heat sink or cold plate cooling. The new cooling solutions dissipate up to 60% of generated heat outside of the control cabinet. This makes it possible to use much more compact cabinets, since fans and air conditioners can be reduced or eliminated entirely. Operation and maintenance costs are reduced.

This new ACOPOS P3 cooling solutions are suitable for a large number of axes in all power ranges. With the elimination of fans and air conditioners that bring outside air into the control cabinet, there is also substantially less dust that gets sucked in along with it. That means the machine needs to be stopped less frequently to perform maintenance tasks like replacing filters. Machine availability goes up.

Feed-through mounting

With feed-through cooling, push-through heat sinks conduct up to 60% of dissipated heat di-

rectly to the air outside of the control cabinet. Costly cooling of the control cabinet itself is not necessary. The heat sink offers IP64 protection and is compliant with standards EN 60529 and UL 50 Type 12. The fan installed in the push-through heat sink offers IP54 protection.

Cold plate mounting

This method utilizes a water-cooled cold plate. Virtually all heat loss from the devices is transferred to the coolant. It requires the machine to have its own cooling circuit.

Highlights

- Reduced cabling
- No additional fans in the control cabinet
- Increased machine availability



The ACOPOS P3 servo drive is now also available with feed-through heat sink or cold plate cooling. The new cooling solutions dissipate up to 60% of generated heat outside of the control cabinet.

Top speed for servo motors



A special variant of B&R's ACOPOS P3 servo drive now offers an output frequency of over 598 Hz. This new ACOPOS P3 is especially suited for machines with axes that rotate at very high speeds, like the spindles of CNC milling machines.

On the standard ACOPOS P3, the device's electrical output frequency is monitored. If it sustains a frequency above the limit value of 598 Hz for more than half a second, the movement is stopped and an error is triggered. With this new variant of the servo drive, the electrical output frequency of the device is not monitored and can

therefore exceed the limit value. The ACOPOS P3 in this power output class is subject to the dual use export regulations per (EC) No. 428/2009 of the European Community.

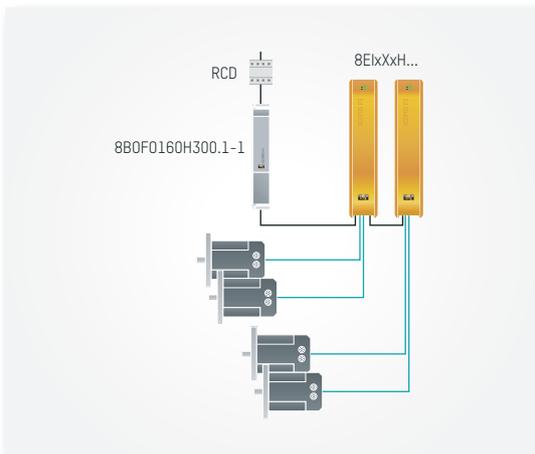
Highlights

- Faster movements
- Ideal for fast-rotating axes such as spindles
- An ACOPOS P3 variant for every application

ACOPOS P3 supports all common network types

B&R's ACOPOS P3 servo drive now supports both the TN-S, TN-C-S network types with grounded outer conductor and the TT and IT types with grounded outer conductor. This ensures the ACOPOS P3 can be deployed anywhere in the world. It also enables OEMs to reduce the number of machine variants, since no isolation transformers or additional filters are required.

- Supports all common network types
- Globally compatible
- Cost savings



Reduced leakage current saves operating costs

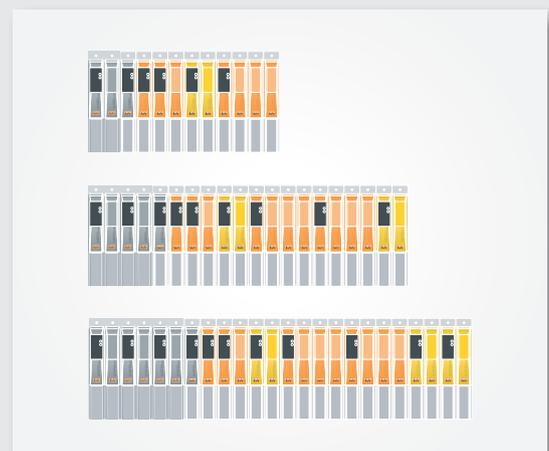
B&R has expanded its portfolio with a new EMC filter with low leakage current for the ACOPOS P3 servo drive. The filter is ideal for compact machines with few motors and short motor cables. With the new filter, machine builders can use standard 30 mA residual-current circuit breakers for their machines.

- Cost savings
- Use standard 30 mA circuit breaker
- Optimal for compact machines

More scalable machine performance

Passive power supply modules for the modular B&R ACOPOSmulti drive system can now be connected in parallel. This significantly boosts output while also making it more scalable to specific applications. The total output of an ACOPOSmulti rack increases to as much as 48 kW at 132 A, for example.

- More scalable performance
- Increased total output
- Fully customizable



Powerful and reliable



B&R is expanding its frequency inverter portfolio with a powerful new series: ACOPOSinverter P96. These overload-capable devices cover a range from 0.75 kW up to 110 kW and support virtually all motor types. Integrated in the frequency inverters, Direct Torque Control (DTC) enables high-precision speed and torque control. This allows the devices to start up reliably and react quickly to changes in load or power supply to keep the machine running smoothly.

Integrated DTC enables fast torque response and precise torque control down to zero speed, even without an encoder feedback system. This makes the ACOPOSinverter P96 a good match for ensuring

uniform quality and increased performance on packaging machines, paper machines, film extruders and more. DTC also ensures torque linearity, a critical factor particularly in winding applications.

Highlights

- Out-of-the-box solution
- Smooth, continuous machine performance
- Maximum reliability
- Fully integrated in B&R control system
- Globally compatible

Maximum reliability

The ACOPOSinverter P96 is equipped with coated circuit boards and a robust housing with IP20 protection. The integrated power electronics and each of the integrated protective measures are factory tested under full load. This ensures maximum reliability.

Easy installation

The frequency inverters have all the functions they need to operate, including harmonic filters, EMC filters and a POWERLINK interface. The connection for the braking resistor, or brake chopper, is also integrated into the devices for all output

classes. This greatly simplifies control cabinet design. In addition, valuable cabinet space can be through the ability to connect the devices in series without derating.

Fully integrated

Regardless of whether the control system uses the DS402 drive profile or I/O mapping, the P96 series is fully integrated into the B&R automation system, just like all of its other frequency inverters. The frequency inverters are also certified by CE, UL, cUL, EAC and TÜV, making them well suited for use anywhere in the world.

Fully integrated in Automation Studio

Integrated POWERLINK interface

Direct torque control

STO safety function

Numerous I/Os

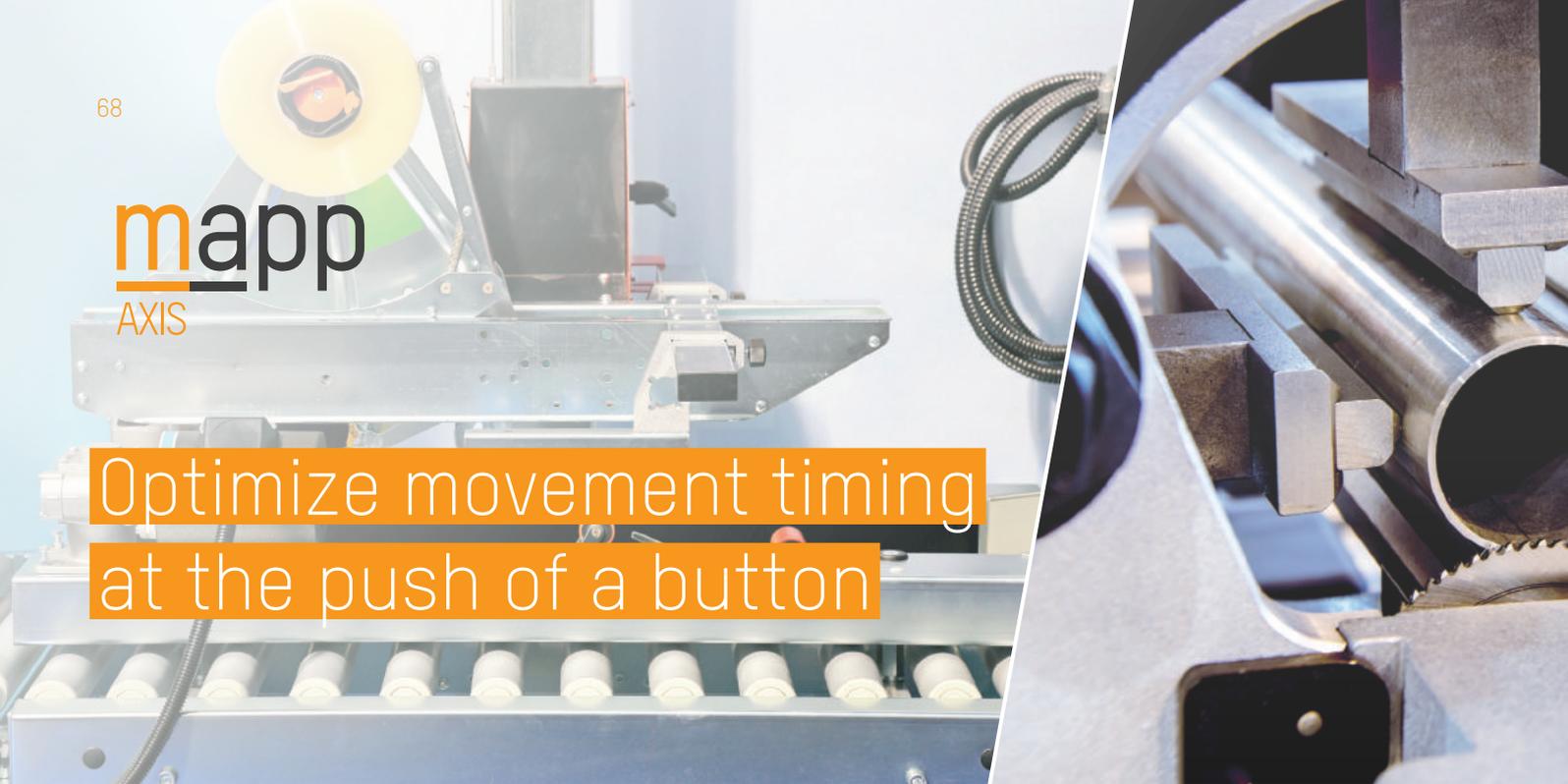
Mains choke

EMC filter C4

Brake chopper

Continuous
power range
0.75 - 110 kW



A background image of an industrial machine, likely a filleting machine, with a large yellow wheel and various metal components. The image is split into two parts: a larger left part showing the machine's rollers and a smaller right part showing a close-up of a metal component.

Optimize movement timing at the push of a button

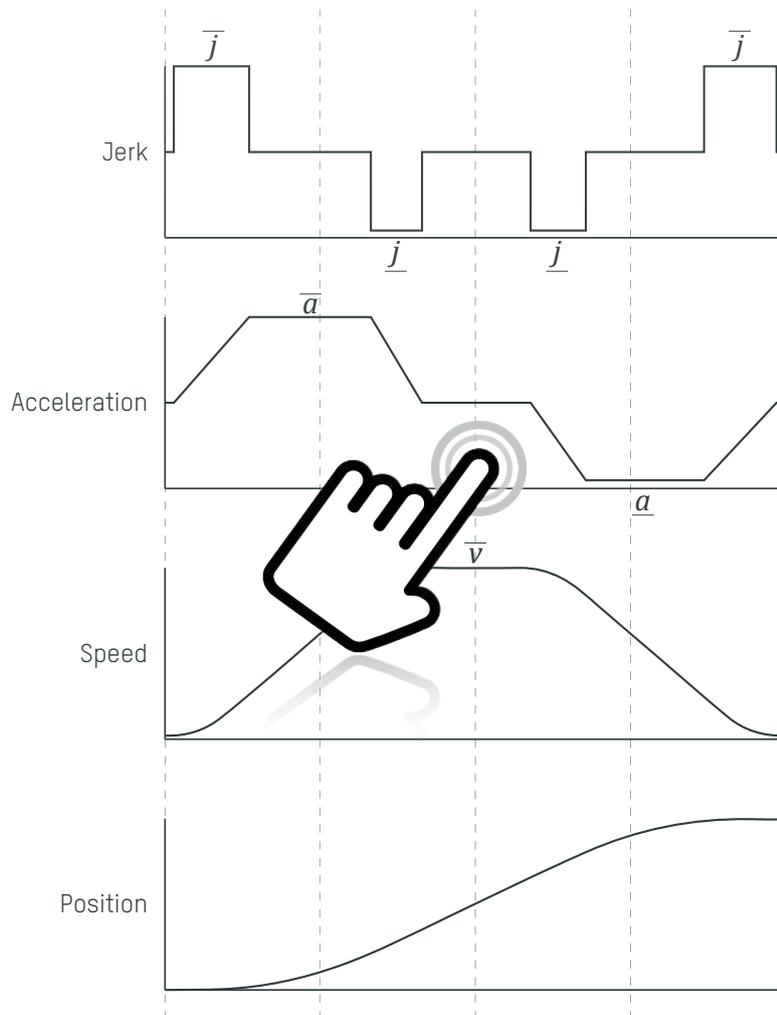
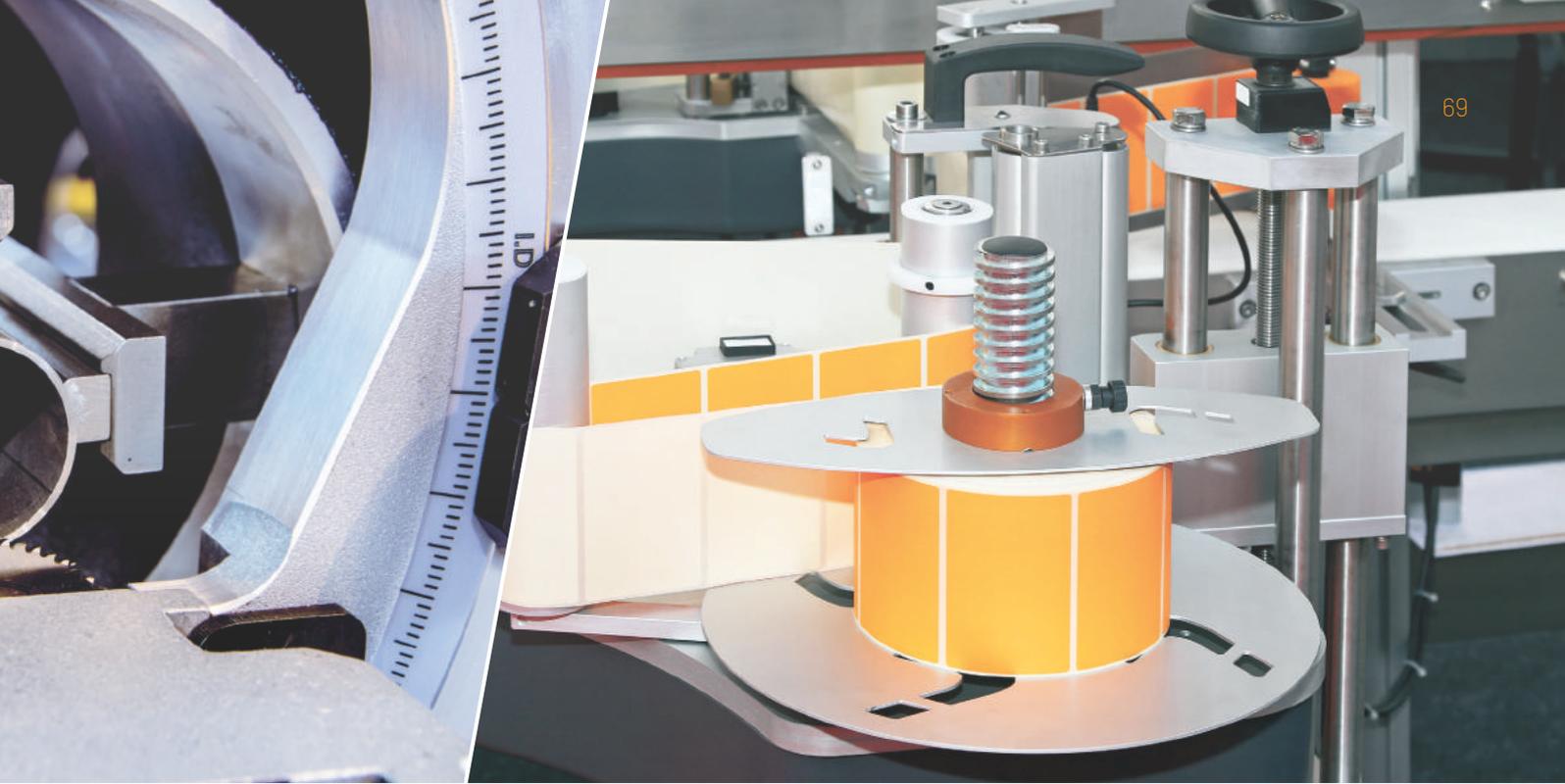
B&R has expanded its mapp Axis software component to include jerk-limited trajectory planning for individual axes. This means that jerk limits can now also be taken into account when planning the entire axis movement. Movements can be completed faster while at the same time minimizing mechanical wear.

The new software function is particularly beneficial for highly dynamic systems where vibrations can occur, like filleting machines for fish and meat. The jerk limits can be set for each axis in mapp Axis. The software automatically calculates a profile for the individual axis to complete its movement as quickly as possible within the specified limits. There is no longer a need for a jerk filter. Jerk values can be configured and adjusted at runtime.

The new planning method also improves the accuracy of the axis, because the geometric path is not coupled to the speed. Jerk-limited trajectory planning makes it possible to precisely predict and reproduce axis movements. Smoother, more fluid movements generate considerably fewer vibrations. This reduces mechanical wear, extends the machine's service life and makes it run a lot more quietly.

Highlights

- Faster, more precise axis movements
- Reduced mechanical wear
- Extended machine service life
- Reduced noise during operation



The jerk limits can be set for each axis in mapp Axis. The software automatically calculates a profile for the individual axis to complete its movement as quickly as possible within the specified limits.

Control technology





Less space, more power

B&R introduces a new PLC family: the X20 embedded. The controllers combine high performance and numerous integrated interfaces in a housing only 55 mm wide. Machine builders save on both costs and cabinet space.

The controllers have a sleek new housing design and come standard with two USB ports, an integrated flash memory card and two Ethernet ports. An integrated switch supports daisy-chain cabling without any additional network infrastructure.

Integrated interfaces

Hardware interfaces for POWERLINK and RS485 are included in the compact housing. The RS485 interface can be used to connect a frequency inverter to the PLC without any additional interface cards or I/O modules. Since the power supply is also integrated, a separate power supply module is not required.

Additional fieldbus protocols are optionally available. The PLCs come with an interface slot for this purpose. All B&R interface cards can be used with X20 embedded devices. Likewise, all X20 I/O modules can be connected to the controller as usual.

Powerful processors

With their powerful Intel Atom processors, the new PLCs are also suitable for demanding applications with short cycle times. The 55 millimeter-wide devices can even control a full-fledged robotics application.

Highlights

- Space savings
- High performance
- Lower costs



The compact, powerful X20 embedded saves machine builders costs and cabinet space.

Technical data →

	X20EMx611	X20EMx612
CPU	0.4 GHz (comp.)	0.8 GHz
Shortest cycle time	400 µs	200 µs
RAM	512 MB (LPDDR4)	
Integrated flash memory	1 GB (eMMC)	
Nonvolatile RAM	64 kB (FRAM)	
Ethernet	2x 10/100 BASE-T	
Integrated switch	Yes	
 POWERLINK	1x	
Integrated interface	RS485	
USB 2.0	2x	
Interface slots	0 / 1	

Powerful

Intel Atom processor
512 MB RAM

USB 2.0

For program/system updates
Freely available for the application

Flexible slots

For all commonly used protocols
Optional slot for interface module

Totally maintenance-free

No fans
No batteries
Nonvolatile real-time clock



**Local expansion**

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

Integrated eMMC memory

1 GB
Extremely short access times

Integrated interface

RS485

Higher-level communication

Standard Ethernet
Integrated switch for daisy chaining

ETHERNET 
POWERLINK



More resistant for more applications

B&R is continually expanding its X20 PLC and I/O system to meet new market demands. For this reason, it has recently expanded the temperature and input voltage range of the X20 system. Certifications like DNV GL, KR, LR and ABS also enable X20 systems to be used in maritime and offshore applications.

The X20 system's already wide temperature range of -25°C to +60°C will now be expanded even further. The coated variants allow start-up temperatures of up to -40°C. The extended temperature range now allows use in applications such as intralogistics for refrigerated warehouses. X20coated modules are standard X20 units whose circuit boards have been specially coated to protect them from condensation, harmful gases and other factors.

Ready to handle any voltage

An extended input voltage range opens up additional areas of application for the X20 family. The 24 VDC power supply now tolerates deviations from -25% to +30%. That equates to a voltage range of 18 to 31.2 VDC. This facilitates use in power networks that are spread out over large

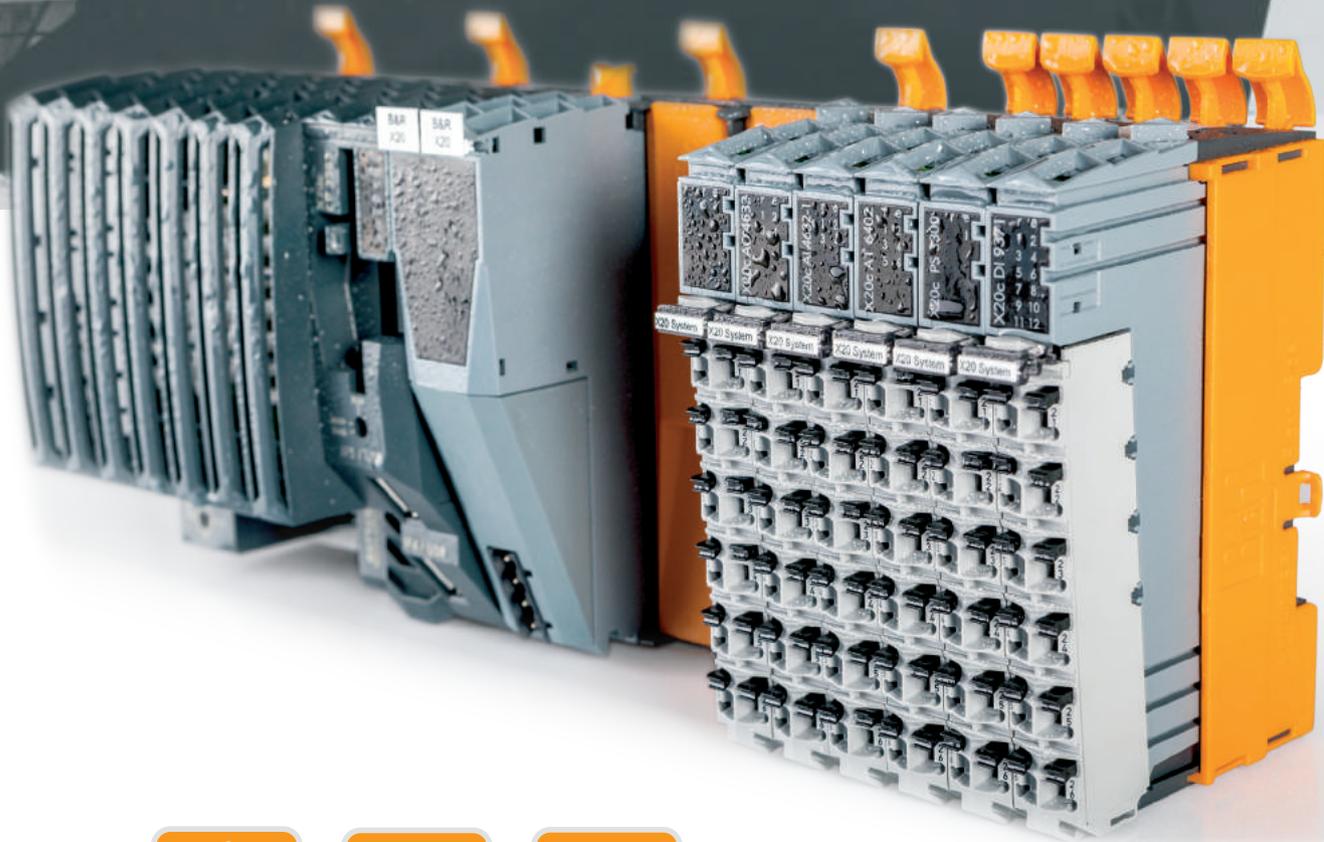
areas, such as those found on ships. Even with the voltage drops that occur over long cables, there is no need for distributed power supplies.

At home at sea

B&R is continually subjecting its PLC and I/O system to testing and certifications that allow it to be used in new regions and applications. Recently, the X20 system received type test certificates from DNV GL, KR, LR and ABS. These now permit the X20 system to be used in maritime and offshore applications. DNV GL certifications are known for their strict testing, and they enjoy a very high level of international recognition.

Highlights

- Reliable performance under harsh conditions
- Wide range of applications
- Replaces costly specialized hardware



-40°C

The coated versions of X20 modules now allow starting temperatures of down to -40°C.



X20 – Proven performance and versatility

B&R continues to expand and improve its ground-breaking X20 PLC and I/O system. The system is so extremely flexible and robust, it can also be used in applications that would otherwise only be possible with expensive, specially developed hardware.

Stepper motor module with integrated 5 V incremental encoder

With a new module in its X20 series, B&R makes it easier than ever to use stepper motors with an incremental encoder. The new module X20SM1444-1 can operate a stepper motor with an operating voltage of 18 to 60 VDC with a nominal current of up to 5 A. A 5 V incremental encoder can also be connected to it directly.

The encoder interface's reset inputs R+ and R- can optionally be used as digital inputs to implement QuickStop and enable functions. When the enable function is triggered, current to the motor is cut off and it spins freely. With QuickStop, a configurable deceleration ramp is initiated, after which the motor is supplied with the holding current. Alternatively, the inputs can be used as limit switches.

Save up to 75% of energy

The new X20 stepper motor module can identify the connected motor based on the coil

characteristics. This makes it possible to detect not only wiring errors, but also the use of incorrect motor types. The module also features load-dependent current control, which enables energy savings of up to 75%.

The 5 V encoders can be powered via the new X20PD0053 potential distributor module. It provides 5 V and ground connections for up to six incremental encoders.

Highlights

- Direct connection of 5 V incremental encoders
- Low energy consumption
- QuickStop and enable function



More channels

B&R has expanded its digital I/O portfolio to include two versions with particularly high integration density. The X20DIF372 is a 16-channel input module with source circuitry, whereas the X20DOF321 has 16 sink outputs. The circuitry makes the modules particularly well suited for how machines are commonly wired in Asian countries. The modules are only 12.5 mm wide and equipped with single-wire connections.

The X20 I/O system is known for delivering exceptional flexibility and performance in a compact design. The three-part modularity – bus module, electronics module and terminal block – makes X20 modules particularly easy to install and maintain. When necessary, only the electronics module needs to be replaced, and the fully wired terminal block can simply be reconnected. Time-consuming and error-prone rewiring is not necessary.

Highlights

- High integration density
- Only 12.5 mm wide
- Special wiring for Asian region



Technical data →

		New		New
	X20DIF371	X20DIF372	X20DOF321	X20DOF322
Module type	Digital input module	Digital input module	Digital output module	Digital output module
Wiring	Sink	Source	Sink	Source
Number of channels	16			
Width	12.5 mm			
Voltage	24 VDC			

Safe switching up to 250 VDC



The new X20D04F49 relay module can switch up to 250 VDC. That makes it particularly well suited for use in power generation and exciter units.

Users have four relay outputs at their disposal. Two are normally open and two are changeover contacts.

External isolation monitoring for temperature channels

B&R makes it easy to implement external isolation monitoring systems for temperature sensors, like those used to monitor ship engines. The new X20AT2321 module is equipped with electrically isolated input channels.

Ships require more than a conventional isolation monitoring solution, where a pure DC measuring voltage is used to check whether any undesirable current is flowing between conductor and ground. They instead use a special monitoring method that requires electrically isolated input channels, which is supported by the new X20 module. It has two electrically isolated inputs for resistance temperature measurement with PT1000 sensors.



Reliable detection of wear

With a new POWERLINK bus controller, B&R has expanded its portfolio with a gate measurement module for efficient monitoring of machinery and processes. The module measures switching operations with very high precision. Changes in machine components due to wear or environmental influences can thus be detected quickly and reliably – and then automatically compensated for. The IP67-rated module stands up to the most demanding conditions.

The new gate measurement module helps keep manufacturing processes consistent and reduces the rate of rejection, thus increasing both quality and productivity. It can also be used to implement condition-based maintenance to prevent unplanned machine downtime.

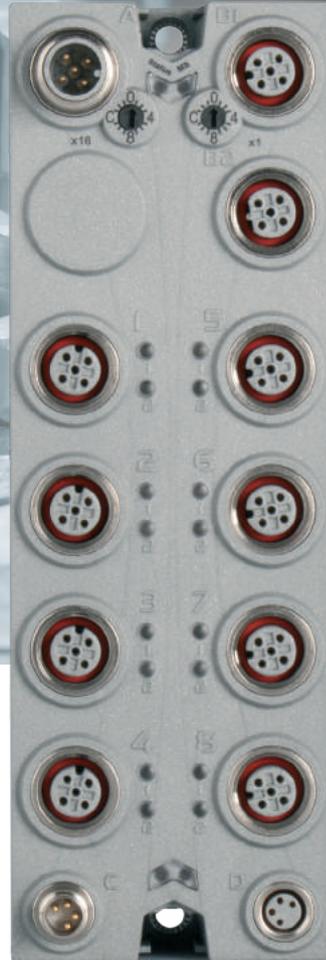
Independent gate measurement

The module has six digital outputs with readable status and six digital inputs. In addition, the

digital channels can be configured in pairs to perform gate measurement with 100 μ s resolution directly on the module, independently of the controller. Gate measurement can be triggered on positive or negative edges. The device is also equipped with an analog input with configurable filter functions and a local X2X connection for modular expansion with up to 250 modules. The digital outputs are protected against overload and short-circuits and also report these errors as status information.

Highlights

- Improved product quality
- Increased productivity
- Less unplanned downtime



X67BC8513.L12-1 →

Technical data

Bus controller

POWERLINK controlled node

Interfaces

X2X bus supply, 15 W

Digital channels

6 digital outputs, source circuit
6 digital inputs, sink circuit

Analog channels

1 channel, 12-bit analog input, 0-20 mA

Gate measurements

6 channels, resolution 100 μ s, counting depth 16-bit

Protection

IP67

PC and panel systems

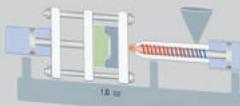


Zone	Temp	Humidity
Zone 1	6.8104G	2.3529H
Zone 2	21.6801H	8.0279F
Zone 3	4.2758I	2.0022S
Zone 4	0.4275L	0.2092T



27

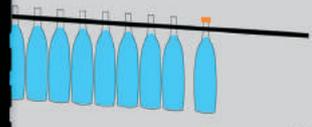
PRODUCTION



Zone 1	Zone 2	Zone 3	Zone 4
189.3 °C	149.3 °C	99.6 °C	80.2 °C
190.0 °C	150.0 °C	100.0 °C	80.0 °C

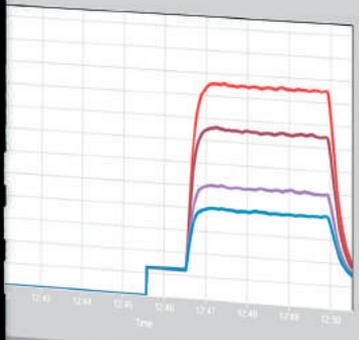
12:17

RUNNING



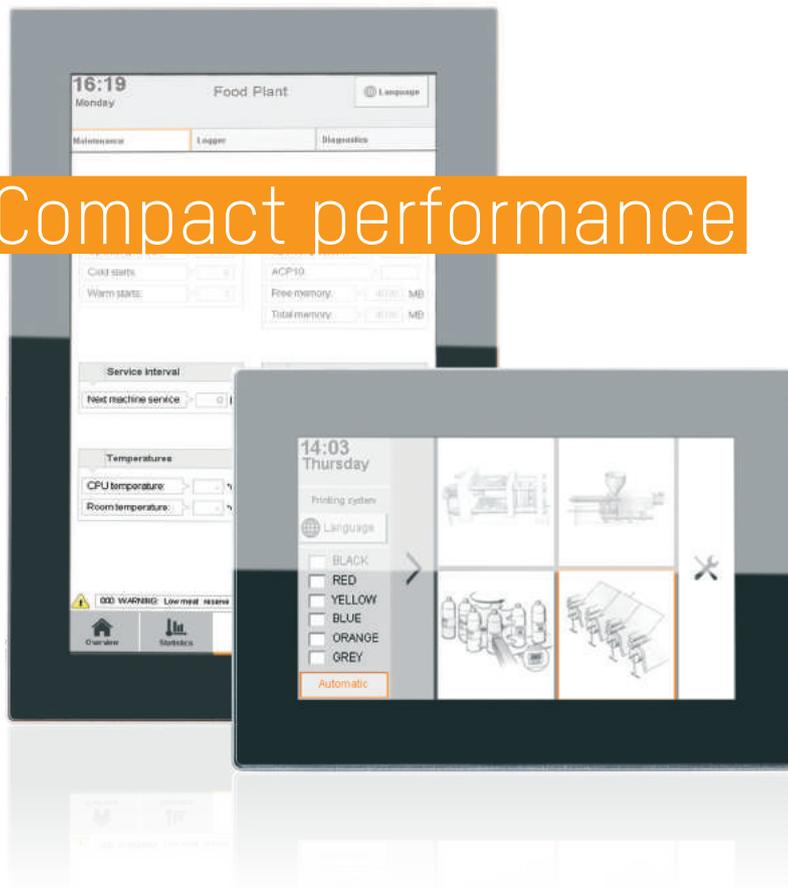
10,000 b/h	1164	77
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COOLING



- Zone 2
- Zone 3
- Zone 4

Compact performance



With the Panel PC 1200, B&R offers a compact and cost-effective all-in-one PC. Equipped with the latest Intel Atom processors and up to 256 GB of expandable mass storage, the Panel PC 1200 is ideal for running HMI applications under Windows or Linux operating systems.

With 2x Gigabit Ethernet and 2x USB 3.0, the Panel PC 1200 has all the interfaces it needs to be seamlessly incorporated into any machine network. Compact CFast cards are used for data storage.

Maximum convenience

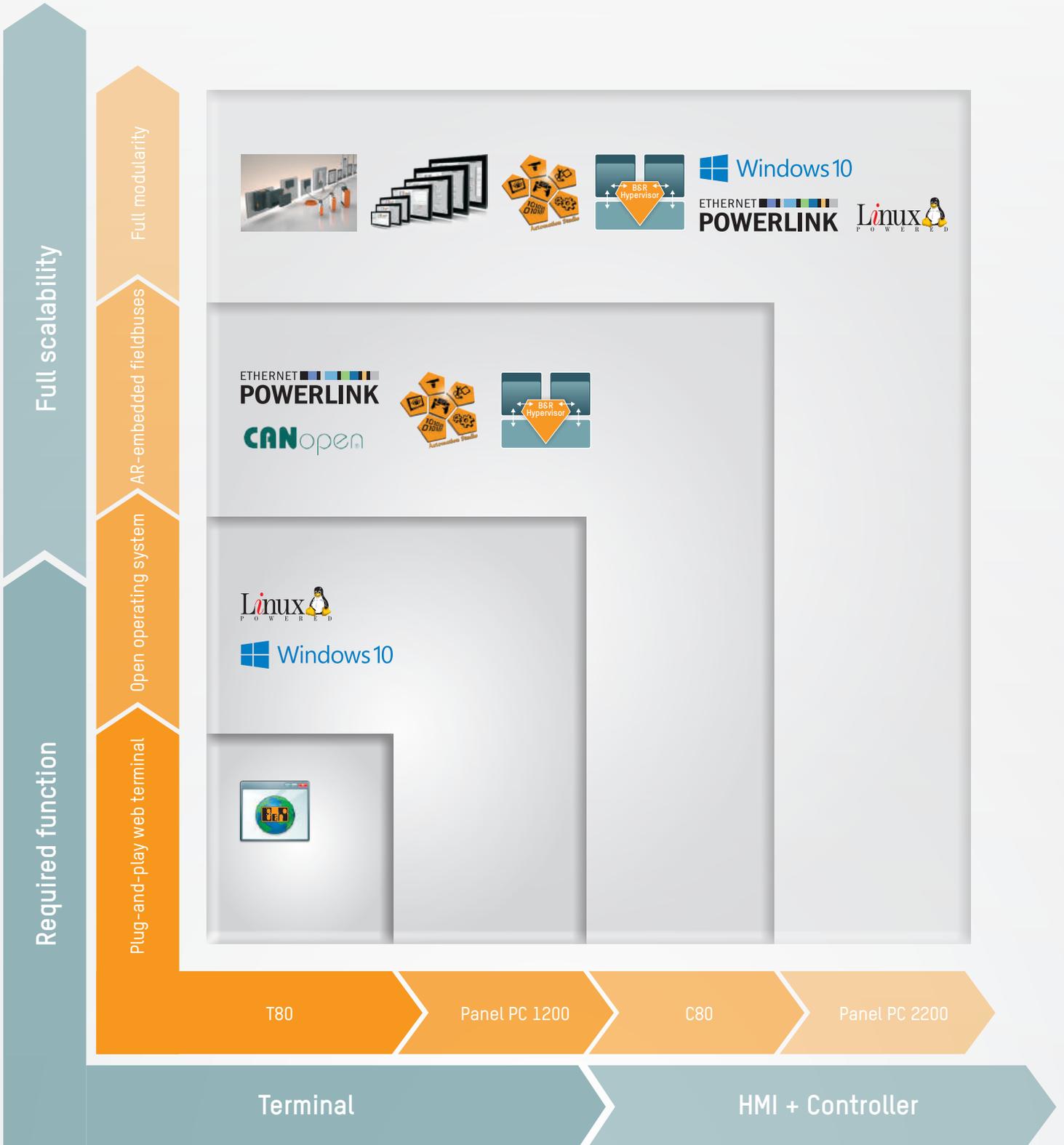
The Panel PC 1200 is available in four sizes from 7.0" to 15.6" with projected capacitive touch screens with resolutions up to HD. Equipped with either clear or anti-glare glass, the state-of-the-art multi-touch panel PC perfectly complements a high-end machine design. Gestures such as zoom or swipe provide an intuitive user experience. The projected capacitive touch screen responds precisely and reliably, even when operated while wearing thick leather gloves.

Compact and low maintenance

The Panel PC 1200 is characterized by its compact dimensions, robust construction and shallow installation depth. It fits easily into any control cabinet. Despite the passive cooling and fanless operation, the Panel PC 1200 can be operated in the extended temperature range of -20°C to $+60^{\circ}\text{C}$. That makes it ideal for a wide range of applications – even under harsh industrial conditions.

Highlights

- Projected capacitive multi-touch
- Widescreen variants from 7.0" to 15.6"
- Low maintenance thanks to passive cooling and fanless operation
- Expanded temperature range from -20°C to $+60^{\circ}\text{C}$
- Integrated TPM module





Versatile
Widescreen displays
7.0" / 10.1" / 12.1" / 15.6"

Operating systems
Windows 10 IoT Enterprise 64-bit
Linux

Low maintenance
Battery with lifespan of up to 8 years

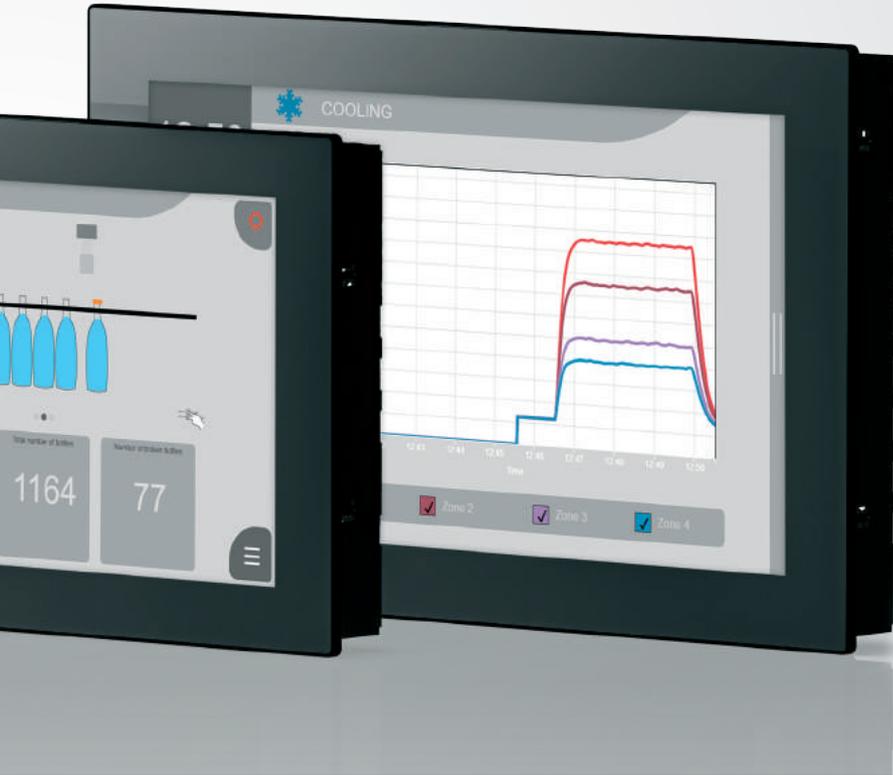


Integrated VESA100 connection

2x Ethernet 10/100/1000

CFast

LED status indicators



Easy handling
Projected capacitive touch screen
Elegant glass surface
Gloved operation



Fanless
Fanless design for use in harsh environments

Powerful Intel processor
Atom E3940
1.6 GHz quad core
4 GB RAM

2x USB 3.0

24 VDC power supply

Powerful performance in a modular design



B&R is introducing an Automation PC 910 with three PCI/PCIe slots. With the ability to choose between variants with one, two, three or five slots, the industrial PCs are now more scalable than ever to save costs and space in the control cabinet.

With the 3-slot Automation PC 910, B&R offers an ideal solution for mid-sized applications with high demands on power and performance.

Customized

Processor performance and housing size can be combined as required within the series. This allows the Automation PC to be adapted to different requirements and applications.

Future proof

The Automation PC 910 uses the state-of-the-art



PC technology with long-term availability. 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.

Reliable

Each PC and panel undergoes comprehensive function testing. This improves operational reliability and significantly reduces operating costs.

Fanless

The Automation PC 910 offers fanless operation in the 3-slot version as well. When this feature is combined with CFast cards and SSD drives, the PC system is completely free of rotating parts – for exceptionally low-maintenance operation.

Highlights

- Optimal solution for mid-sized applications
- Compact design saves cabinet space
- Low maintenance with fanless operation
- Great flexibility for wide range of applications
- Intensive function testing ensures high reliability and low costs



1x PCI- / PCI-express slot



2x PCI- / PCI-express slots



5x PCI- / PCI-express slots



4x USB 3.0

3 PCI / PCIe slots



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

CFast
 Combines the form factor of Compact-Flash cards with the faster SATA interface

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

2 modular interfaces
 Ethernet 10/100/1000
 RS232/RS422/RS485
 CAN/UPS/Audio/SRAM



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

2x Ethernet 10/100/1000

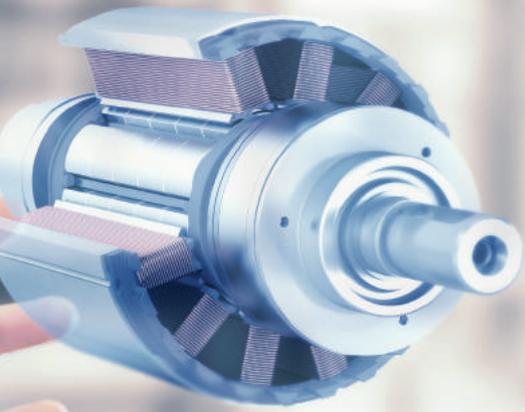
RS232

DisplayPort

SDL/DVI/Monitor

Software







What's new in Automation Studio?



There's lots on the horizon for Automation Studio. In addition to an optimized licensing structure for mapp Technology, users of B&R's universal engineering environment can look forward to a variety of upgrades and new features that will make creating and running machine applications easier and more secure.

Highlights

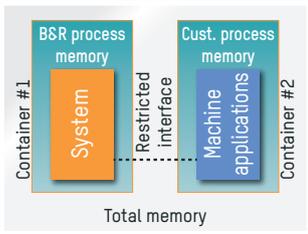
- Modular engineering made simple
- State-of-the-art security with global standards
- Protection against data loss
- More traceability for faster troubleshooting



Predict the failure, prevent the loss

When you can detect the signs of deteriorating disk health, you can replace storage media before data is lost in a crash. With Storage Health Data, the condition of storage media will be logged automatically and can be viewed in B&R's

System Diagnostics Manager tool. Service personnel can make timely and well informed recommendations, and new HMI functionality can do things like prompt users to replace storage media when it reaches 80% of its lifespan.



Easy tracing, quick troubleshooting

A new diagnostics enhancement will provide clear traceability for rapid troubleshooting of memory-related faults caused by user applications. Process area separation introduces additional provisions that strictly separate the

B&R system and the machine's application memory. Automatic logbook entries provide a clear record of memory violations, so users can troubleshoot quickly and prevent such errors in the future.



Modular engineering made simple

Dynamic node allocation (DNA) is an essential feature for network configuration and can now be configured automatically in Automation Studio. POWERLINK DNA makes it easier than ever to manage complex modular manufacturing systems in a

single software project. When modules are added or removed to scale or reconfigure a machine, all the user needs to do is set the head node number, and the rest of the machine is configured automatically.



Committed to global security standards

Automation Studio will support Version 1.2 of the Transport Layer Security (TLS) protocol, the most commonly used version of the broadly accepted encryption and authorization protocol. TLS 1.2 allows for data and message confidentiality, as

well as message authentication codes for message integrity and authentication. It provides a higher level of encryption on embedded devices, not just for TCP but also HTTP and other network traffic to and from the PLC.

New and improved mapp licensing

mapp
TECHNOLOGY

Starter

- Free of charge
- Basic functionality for simple applications
- No license required



Premium

- Use extended capabilities with a single package
- Most functionality for typical applications
- Only one license needed per target system



The streamlined new mapp licensing structure offers an array of commonly used functions free of charge and makes it easy to add advanced functionality where it is needed.

Ultimate

- Utilize all B&R has to offer
- All functionality for any application
- Only one license needed per target system



B&R is optimizing the licensing for its mapp software solutions. The greatly simplified three-tier structure reduces administrative overhead and streamlines field upgrades. With free licensing for basic applications, it's now easier than ever to start using ready-made mapp components to implement alarm and recipe handling, basic motion control operations and more.

The new mapp licensing structure offers three levels: Starter, Premium and Ultimate. The Starter package provides an array of frequently used functions free of charge, making it easy for machine builders to implement features like alarm and recipe handling and basic motion control functions or create HMI applications using essential mapp View widgets.

A mapp Premium license opens up access to an even broader selection of mapp components and covers the vast majority of user applications. For those who want ultimate peace of mind, an Ultimate license provides access to every single mapp component B&R offers. The three-tier license structure applies separately to each area of mapp Technology. This allows users to tailor their licensing to their specific needs. They could select a Starter license for mapp Motion to get the most commonly used motion control functions, for example, and a Premium license for mapp View to access the full selection of HMI widgets.

Easy field upgrades

The new licensing structure eliminates the dongles that were previously used to manage licenses in the field. That saves administrative overhead both during initial implementation as well as down the road. In the event that a future upgrade adds new functionality that would require an additional license, users can now simply install the new software and be done, rather than having to load new licenses onto a dongle and send a technician to replace it in the field.

Highlights

- Simplified package structure
- Basic functionality free
- No more license dongles

State-of-the-art user management

B&R's mapp Services package offers an array of software components that provide user management functions for industrial control systems. With these functions now fully integrated in B&R's mapp View, it's easier than ever for machine builders to offer their customers a state-of-the-art user experience.

For engineers, having user management functions available as mapp View widgets makes it easy to offer 21 CFR Part 11 compliance right out of the box. They can implement powerful web-based user management functionality without specialized training in web technology, and without writing a single line of code. For users, it means convenient new functions like automatic logout after a defined time has elapsed, automatic notification when passwords need to be changed or automatic lockout after multiple failed login attempts.

Easy login with RFID

Passwords scrawled on post-it notes stuck to the operator terminal are a security risk of the past. With the addition of RFID login capability, machine operators can now log in quickly and conveniently by scanning an RFID chip, rather than having to enter a password. The few seconds operators spend logging in each time they use a terminal can really add up. With easy RFID login, they can be more productive and stay focused on the task at hand.

Highlights

- Out-of-the-box 21 CFR compliance
- Enhanced user experience
- Easy, secure RFID login



The user management features of mapp Services offer state-of-the-art security and convenience for both developers and users.

What's new in mapp View?



Compare any two physical values: the new XY Chart widget allows you to freely define what to show on the x and y axis.

Innovative new features of B&R's web-based HMI solution mapp View will give operators more convenient and intuitive real-time insight into their machines. A range of improvements to engineering efficiency, including a streamlined startup mechanism and graphical editor extensions, will make creating HMI applications faster and easier than ever.

Highlights

- Compare any two physical values
- Combine touch and external controls
- Call up location-specific content
- Create HMI applications with fewer clicks and less coding

Compare any two physical values

B&R's extensive collection of mapp View widgets offers options for displaying live or recorded process values on the HMI screen in a variety of ready-made and easily configurable charts and graphs. Now they will be joined by the new XY Chart widget, bringing the ability to compare any

two physical values against each other graphically by freely defining what to show on the x and y axis. It's now possible, for example, for the operator of an injection molding machine to compare cylinder position to either pressure or temperature and easily toggle between the two views.

Beyond touch operation

With all the elegance of modern touch screen navigation, there will always be certain circumstances on the plant floor – entering data on a small screen with dirty gloves, for example – where more tactile controls like keyboards, dials

and knobs are simply more convenient. With new support for HMI operation using external hardware elements, mapp View is now more flexible than ever and ready to meet real-world needs with optimal ergonomics and operator friendliness.

Location-based HMI content

When it comes to what an operator wants to see on their HMI screen, it often depends on what part of the machine or plant they're currently working on. With the addition of location-based HMI content, hand-held HMI devices can now display content

specific to the current location in the production hall. When they arrive at a certain machine module or plant section, the operator or service technician simply scans a QR code with their tablet to view the relevant data and controls for that section.

Efficient engineering

A range of improvements to engineering efficiency are coming to mapp View that will make it easier and faster than ever for developers to create HMI applications with fewer clicks and even less coding. Frequently used widget combinations

saved as compound widgets are now also more powerful than ever, further reducing the amount of tedious repetitive work and allowing developers to focus on features that add real value.



Loop Optimizer in mapp Cockpit

B&R is making it easier than ever to get more out of your control system. Now integrated in mapp Cockpit, the new loop optimizer guides users step-by-step through the process of identification, tuning and verification.

Now conveniently integrated in the mapp Cockpit user interface, the successor to B&R's Servo Loop Optimizer provides a powerful graphical visualization of the control system's frequency response behavior. The new and improved tool guides users intuitively through each step in the process of identification, tuning and verification.

Users can choose whether to view their system behavior as a frequency response, step response or transfer function model and switch between these views at any time. With integration in mapp Cockpit, users have a consistent, familiar interface and GUI-guided workflow for optimizing all types of closed-loop systems – including hydraulic controllers, temperature controllers, tension controllers and more.

High control quality

The Loop Optimizer complements the already highly reliable results of B&R's autotuning function. Tweaking the autotuned parameter set-

tings can help users get those final few percentage points in terms of precision and dynamics that give them a competitive edge in control performance.

mapp Cockpit

mapp Cockpit is a powerful tool for commissioning and troubleshooting mapp components. Based on B&R's web-based mapp View HMI system, it can be used on any device with a browser and communicates with the machine controller via OPC UA. In the intuitive mapp Cockpit interface, users can control motion axes and execute control commands at the push of a button while observing the real-time reactions of the components in the Watch window.

Highlights

- Step-by-step guidance through advanced controller tuning
- Get a competitive edge in precision and dynamics
- Integrated in web-based commissioning and diagnostics tool mapp Cockpit





The new loop optimizer integrated in mapp Cockpit guides users step-by-step through the process of identification, tuning and verification.



Move payloads more efficiently with mapp Crane

B&R continues to advance the trajectory planning capabilities of its mapp Crane software package. By allowing cranes to move their payloads faster and with greater precision, this feature helps accelerate tasks like loading and unloading container ships.

mapp Crane's improved trajectory planning makes ship-to-shore and other crane operations much more efficient. The starting and end points of crane payload movements can be defined precisely and obstacles can be avoided effectively. The end point as well as the size and position of obstacles can even be changed after the crane has already started its movement. Not only does this make cranes more productive, it also makes the task of loading and unloading container ships safer for both humans and cargo.

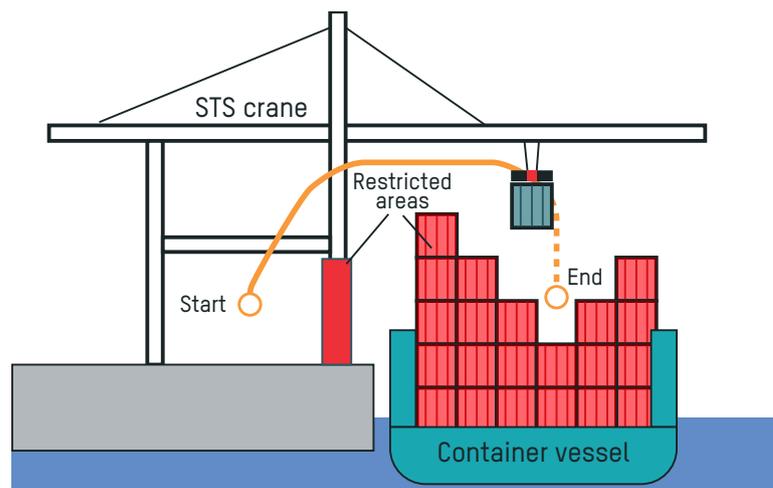
Optimized movements

mapp Crane determines the maximum possible acceleration and speed at which crane movements can be carried out without causing the payload to begin oscillating. This increases efficiency and saves time. With its new trajectory

planning, mapp Crane helps to increase the throughput when loading a container ship from 25 containers per hour to 30. For an entire ship, that adds up to an entire day of savings.

Suppress both linear and rotational sway

mapp Crane provides closed-loop control solutions for cranes with suspended loads. To operate such systems efficiently, the motion control system needs to compensate for the tendency of the load to oscillate. This prevents the formation of uncontrolled sway and skew oscillations. Payloads can be delivered more quickly while at the same time improving safety for both humans and materials. Potential applications include overhead bridge (OHB), rail-mounted gantry (RMG) and ship-to-shore (STS) cranes.



mapp Crane's new trajectory planning makes it possible to precisely define the starting and end points of crane payload movements and effectively avoid obstacles along the way.

Highlights

- Precise payload movements, start to finish
- Adjust on-the-fly during crane movement
- Increased productivity
- Increased efficiency
- Safer for humans and cargo



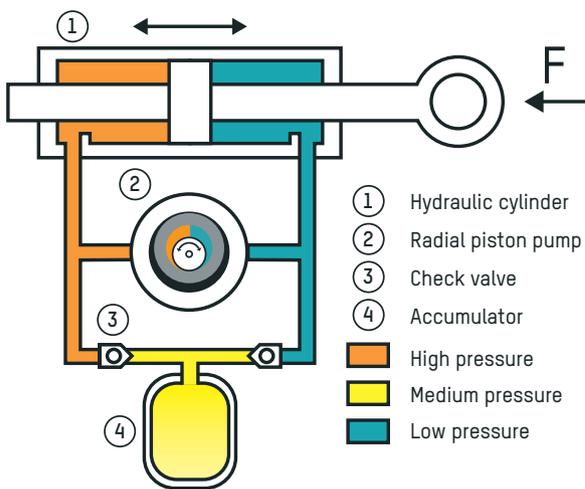
Hydraulic presses benefit from servo pump technology

The mapp Hydraulics software package opens up new applications for servo pumps. Calibration, powder and isostatic presses have conventionally used proportional valve technology. B&R now makes it possible to switch to the far more energy-efficient four-quadrant servo pumps.

Two-quadrant servo pumps can only rotate in one direction, so they require a switching valve to reverse the direction of the hydraulic cylinder. As a result, it is not possible to hold a precise cylinder position, which is a key requirement for press applications. That's why hydraulic presses have so far relied on proportional valve technology. With

mapp Hydraulics, it is now possible to equip presses with much more energy-efficient four-quadrant servo pumps in a closed hydraulic circuit. As a result, there is no longer a need for switching valves.

Like with proportional valve technology, a four-quadrant servo pump holds the cylinder in place hydraulically and can move it back and forth like an electric gearbox. This allows the cylinder to be positioned and held in place with micrometer precision. In addition, with a closed hydraulic circuit, the oil tank can be replaced by a small hydraulic accumulator, using up to 90% less oil.



Like with proportional valve technology, a four-quadrant servo pump holds the cylinder in place hydraulically and can move it back and forth like an electric gearbox.

mapp Hydraulics offers a variety of safety functions as well as a sophisticated autotuning function for servo pumps. The plug-and-play software solution is quick and easy to deploy, saving time and money during the commissioning of machinery and presses.

Highlights

- Reduced oil consumption
- Energy and space savings
- Quiet operation
- Precise positioning

Easy registration mark detection

B&R has added registration mark detection to the range of functions in its mapp Web Handling software package. The only hardware needed is a B&R ACOPOS drive and a contrast sensor. It has never been easier to implement applications for printers, labelers, cross cutters and more.

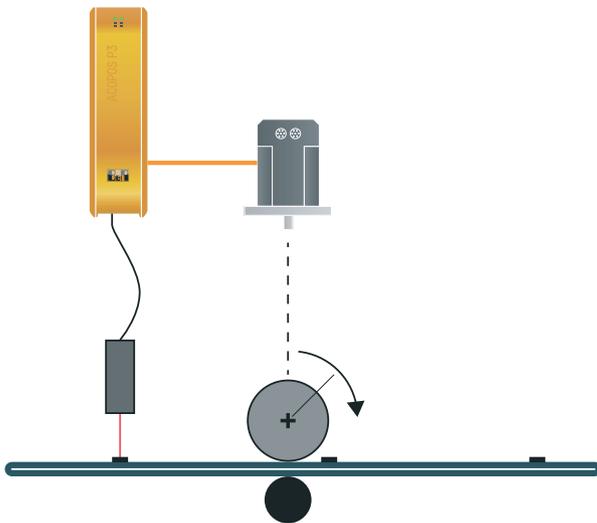
To implement registration mark detection, the contrast sensor is connected directly to the drive. Whenever a registration mark is detected, the drive evaluates the current position. This is a simple and precise way to determine setpoint and actual positions. Having the sensor connected directly to the drive makes it possible to perform

the highly accurate measurements required for demanding applications like high-speed printing.

mapp Web Handling supports a comprehensive set of options for evaluating registration mark position. This makes it easy to calculate registration error and to make the corresponding adjustments in the system to maintain process synchronization. The distance between two registration marks can also be easily measured to determine the current product length.

Maximum productivity with minimal waste

mapp Web Handling makes it easy to implement machinery with continuous webs such as printing,



With mapp Web Handling registration mark detection, the sensor is connected directly to the drive. This makes it possible to perform the highly accurate measurements required for demanding applications like high-speed printing.

packaging or blow molding machines. Ready-made software modules allow machine applications to be assembled without programming a single line of code. Additional functions and integrated simulation make things even easier.

Highlights

- High-precision measurement
- Easy configuration
- Flexible applications

A more gentle path to operating temperature

B&R's mapp Temperature software package provides a new pre-programmed way to get plants and machinery up to temperature. The soft-start function heats up all machine components gently and evenly. It reduces mechanical stresses and allows liquid residues in the machine to evaporate in a controlled manner.

With mapp Temperature's soft-start function, equipment such as injection molding, filtration systems, and extruders can be brought to operating temperature quickly and easily. This is done either by targeted heating with limited power or by using a defined temperature gradient. All zones are heated synchronously in a way that is gentle on the material.

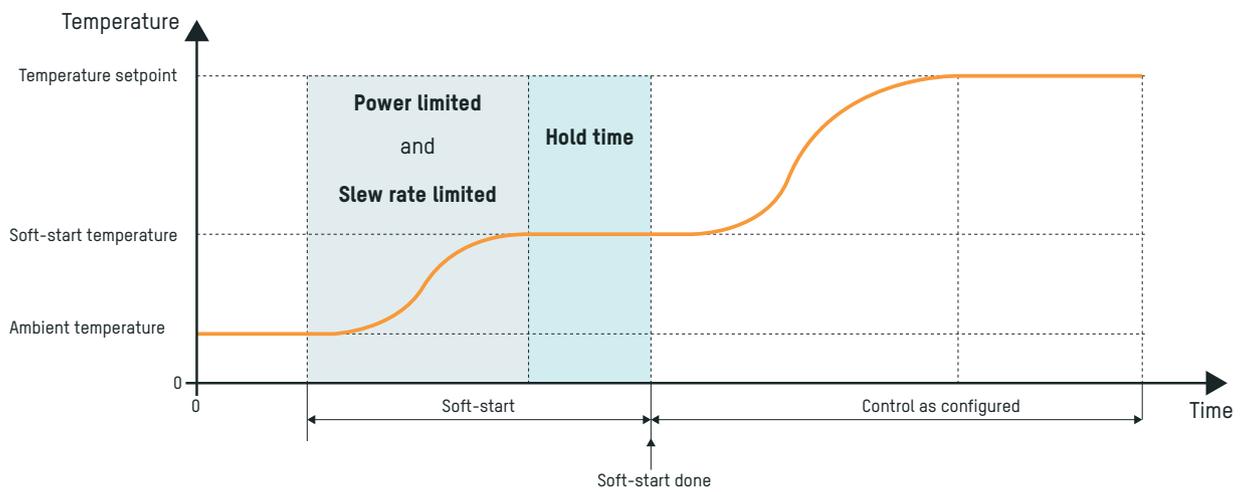
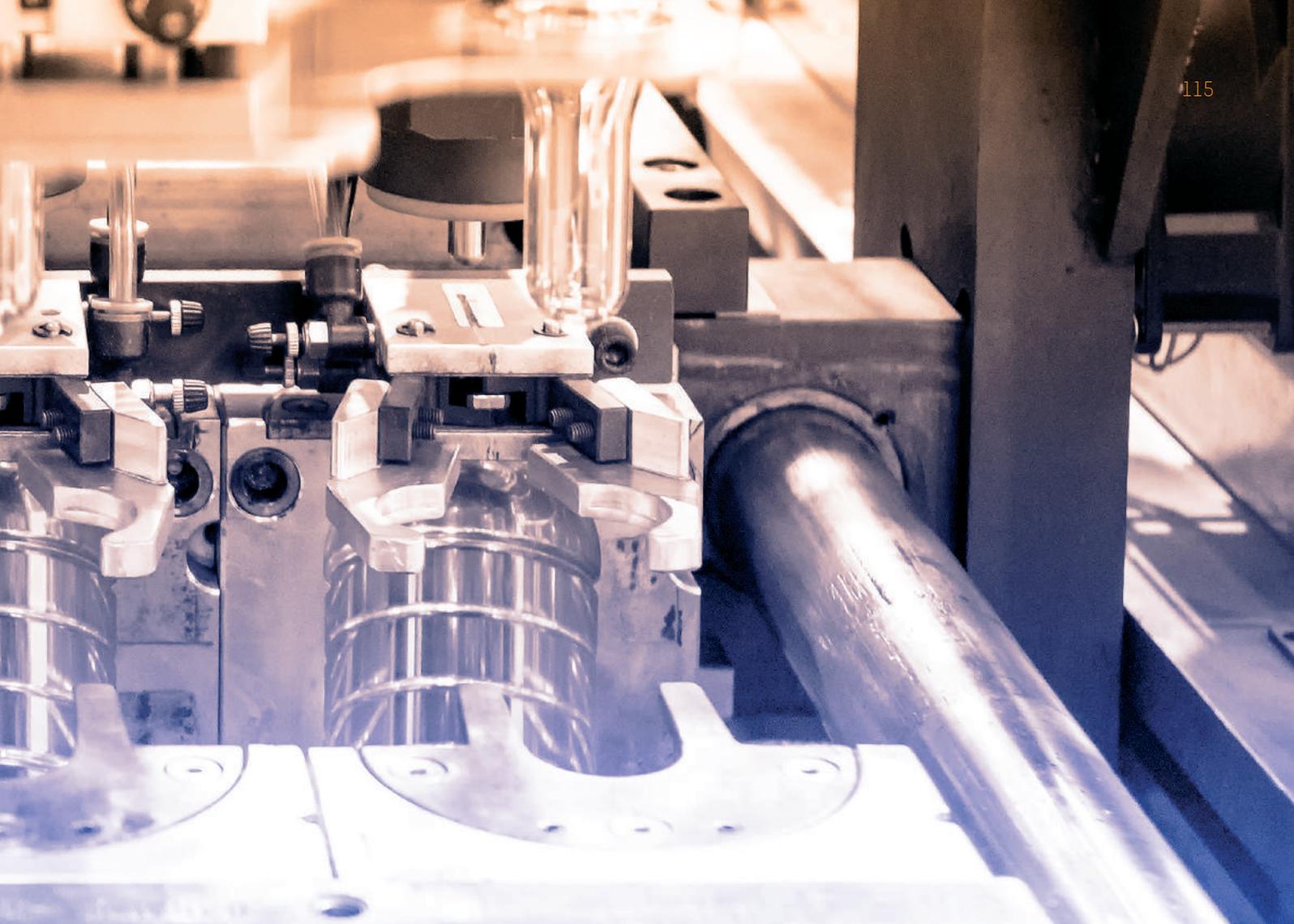
No programming required

All the necessary settings, such as the target temperature, are easy to configure in mapp Temperature.

Individual heating zones can be adjusted individually, or even excluded from the soft-start if necessary. This makes temperature control much more flexible and offers more options for different heating zones. The heating process is started at the push of a button. The tedious programming that used to be involved is no longer necessary.

Highlights

- All components heated evenly
- Reduced mechanical stress
- Controlled evaporation of liquid residue
- No programming required
- Extended service life of heating elements



mapp Temperature's soft-start function brings machines and systems up to operating temperature either through targeted heating with limited power or by following a defined temperature gradient.

New simulation options

With B&R's Automation Studio engineering environment, simulation is woven into every stage of machine development. For machine models created in FMI (Functional Mock-up Interface) format, it's now possible to import even more machine model settings directly into Automation Studio. This opens up new horizons for developers modeling their machines.

FMI simulation models can simply be dragged and dropped into Automation Studio. More than 100 modeling and simulation tools support this format. B&R was among the first automation companies to integrate the FMI standard into its development environment and is continually expanding the range of functions. Machine developers now have even more freedom to choose whichever modeling and simulation tool is best for any given task. B&R supports FMI imports for commonly used tools like MapleSim, DYMOLA and SimulationX.

Automatic transfer

The FMI standard differentiates between two different types of transfer values on machine

models: input values that can be changed at any time and initial values that can only be changed when the simulation is started. Automation Studio differentiates between these values during the import process, so there is no longer any additional effort when importing machine models in FMI format. By automatically applying all values correctly, Automation Studio ensures that machine modules always run as designed.

Highlights

- Import models from an array of modeling and simulation tools
- Safe testing environment for machine software verification
- Simplified machine development
- Shorter time to market
- Software and hardware simulation in real time



AUTOMATION
THE ABB GROUP





Finished machine in a matter of clicks

With Automation Studio, the developer can immediately start the virtual model on the PC and connect to the controller in a software- or hardware-in-the-loop configuration. The application software can be developed, verified and tested in advance, and performance requirements can be tested on the controller.

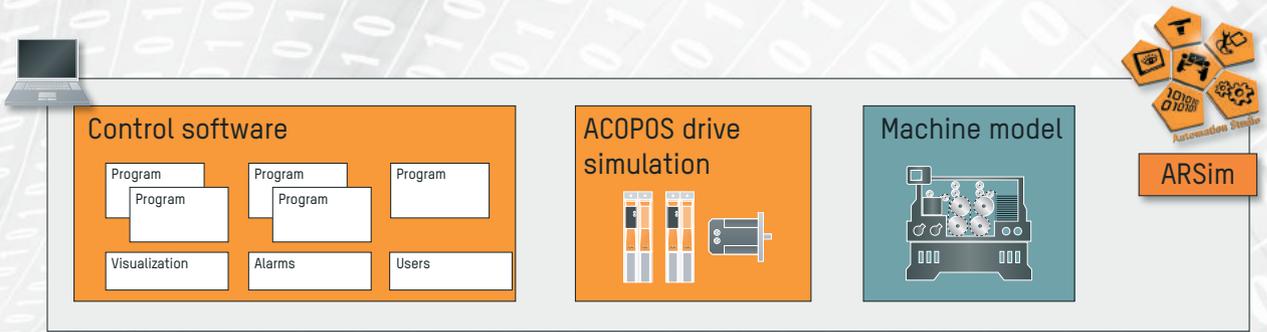
Efficient software testing

In a software-in-the-loop configuration, developers can test the machine software on a virtual machine in virtual real time. They can check step sequences and timing and make appropriate adjustments if necessary. The basis for this is the Automation Runtime simulation. Execution of the machine software and the simulation models is synchronized so that the timing of sequences is reproduced accurately. Once it is complete, the finished software is transferred to the real machine with a click of the mouse.

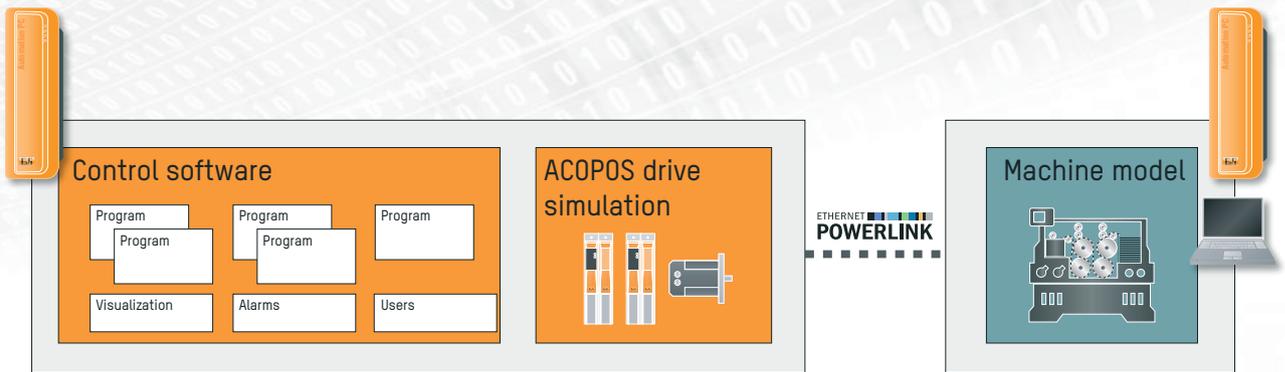
Simulate hardware in real time

Automation Studio also offers extensive simulation options for numerous B&R hardware components. These options can be used to select drive technology components and test them with the digital model of the machine in a software-in-the-loop and hardware-in-the-loop configuration. The high costs associated with oversized or undersized components can be avoided.

The hardware-in-the-loop simulation runs in real time. It can run on a Windows PC or on a B&R target system, such as an X20 controller. It gives developers a detailed overview of component timing. Integration testing and fine-tuning of the interactions between the various hardware and software components can be carried out just as on a real machine.



The Automation Runtime simulation allows machine software to be executed synchronously with simulation models – such as ones imported via FMI import from a tool like MapleSim.



A hardware-in-the-loop (HiL) configuration can be created in Automation Studio using two B&R targets. The software components are mapped accordingly and the simulation takes place in hard real time.

The screenshot shows the Automation Studio interface. The 'Import FMI' wizard is open, showing the 'Import new FMI' tab. The 'File name' field contains 'C:\Bfmu.fmu'. Below, the 'FMI import names' section shows 'Package name' as 'Bfmu.Pkg', 'Library name' as 'BfmuLib', and 'Function block name' as 'Bfmu'. The 'Add FMI usage sample program' checkbox is checked. An orange arrow points from the 'Finish' button to a program diagram on the right. The diagram, titled 'PROGRAM_CYCLIC', shows a block named 'Bfmu' with an 'Enable' input set to 'TRUE' and four outputs: 'fmuOutput_1' (0.0), 'fmuOutput_2' (0.0), 'fmuOutput_3' (0.0), and 'fmuOutput_4' (3.14). The 'fmuInput_1' and 'fmuInput_2' inputs are connected to a 'BrFmu_Inst_01' block.

The FMI (Functional Mock-Up Interface) model is selected using the import wizard and is then available in Automation Studio as a standard software block that can be easily linked to the machine software.

Java

No-SQL

Block

RUST

exOS: The world's largest
software ecosystem

ly Node-RED

JavaScript

Docker

HTML5

Python

C++

SQL

PHP

C#

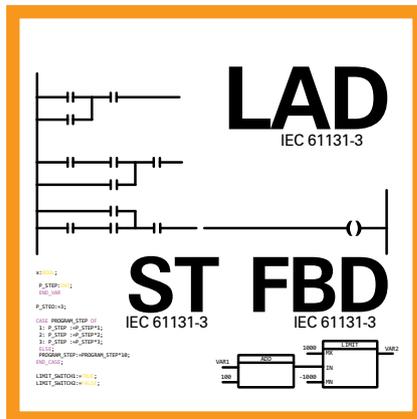
GO

K



exOS

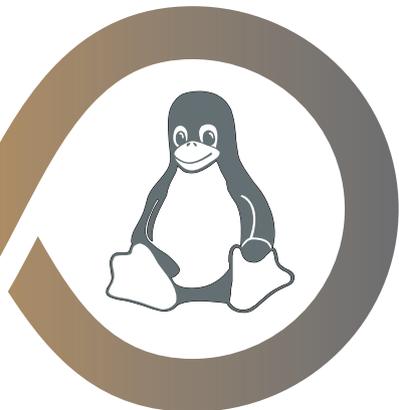
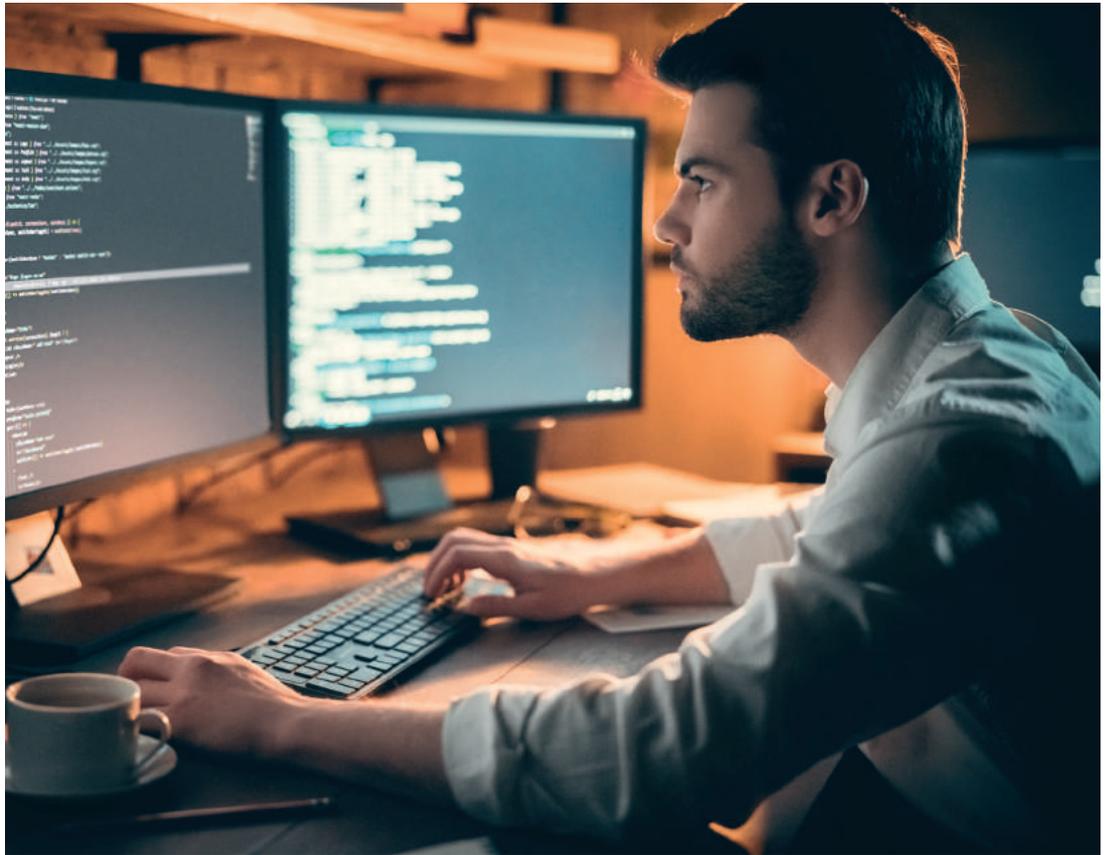
enhanced crossover Operating System



ex
ex

B&R's enhanced crossover Operating System – exOS for short – makes it possible to incorporate open-source Linux software into industrial control systems. This enables the type of advanced automation solutions envisioned by Industry 4.0 and the Industrial IoT.

To create today's most advanced machine designs, OEMs rely on interdisciplinary teams comprising experts in both operational technology (OT) and information technology (IT). The problem is that today's control systems are unable to execute higher level programming languages. OT and



OS



IT experts work in different programming languages, making it difficult to find common ground for a joint solution. While OT experts are well-versed in machine design, PLC programming and commissioning, their IT colleagues are more at home using high-level programming languages like C++,

Python or JavaScript and working with open-source software and Linux. By enabling control systems to understand high-level programming languages, exOS now offers machine builders an entirely new way to develop complex hybrid solutions for their machines.

No-SQL Java

124

Blockly Node-RED

RUST JavaScript Docker

HTML5 Python

exOS — Use any Linux code
in the B&R system

C++
SQL
PHP
C#
GO
K

With exOS, machine builders can use any Linux code in their B&R system. This gives them unprecedented freedom in the design of their automation solutions. Code written in C++, Python, JavaScript and more can be easily integrated in the machine application.

With the enhanced crossover connection between Linux and B&R's real-time operating system, Automation Runtime, software developers can write, compile and debug their code in the integrated development environment (IDE) of their choice and then easily load and run it on the control system.

One central engineering tool

With the program code integrated in the B&R system, Automation Studio can serve as a central engineering tool. The Linux code can be imported into Automation Studio as an exOS package. Software management and diagnostics become considerably more streamlined and organized, with no extra tools required. Defective hardware can simply be replaced without any additional programming.



exOS

Highlights

- Design freedom for automation solutions
- Future proof
- Efficient maintenance minimizes downtime
- Long-term availability

exOS in action

Databases

Process data can be stored directly in highly developed database systems on industrial automation hardware.

Application: Injection molding machine

Production data must be stored in a database for quality control purposes. The database, for example MongoDB, runs in Linux. The machine control software, on the other hand, runs in Automation Runtime. exOS combines the two in a hypervisor configuration on a Panel PC 910. The efficient maintenance made possible by exOS helps minimize downtime after hardware replacements.



IoT algorithms

Machine learning algorithms can be executed directly at the edge. Machine and device data can easily be accessed and collected from the machine controller.

Application: Painting booth

Machine learning (ML) is used to optimize maintenance. A Tensorflow ML model runs in Linux on an Automation PC 2200. It receives machine data from the dedicated X20 PLC via the exOS interface. exOS makes integration fast and connection easy.

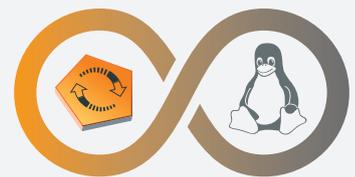


Existing codebases

The Linux application code can run hand-in-hand with control applications on an automation platform with reliable long-term availability.

Application: Driverless transport system

Autonomous transport systems are based on a robotics platform. Dynamic path planning is executed in ROS under Linux, while motion control tasks are handled in Automation Runtime. With exOS, the two can be optimally synchronized in a hypervisor configuration and loaded on an Automation PC mobile 3100.



A solution for every occasion

exOS enables full scalability in terms of hardware and processing power, granting developers of automation solutions based on exOS a high degree of flexibility in the hardware configuration. That starts with two basic setups, which can be implemented with any X20 PLC or Automation PC.

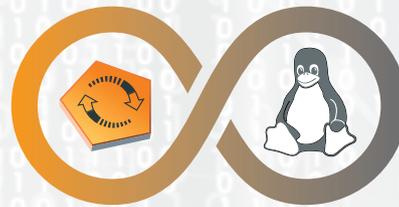
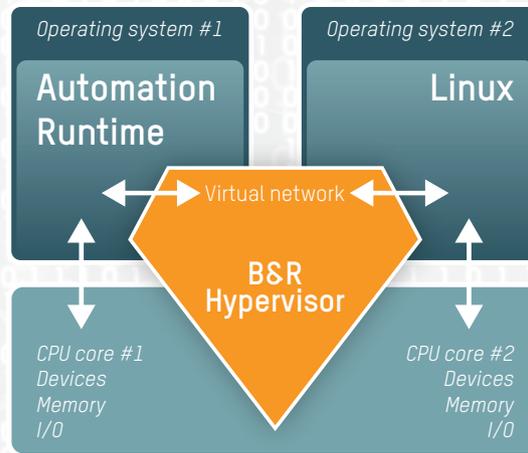
Highlights

- Flexible configurations
- Scalable hardware and processing power
- Supported by any B&R Automation PC, including the rugged outdoor variant for mobile applications



Dedicated physical systems

In this setup, the control system and Linux system are connected via an Ethernet interface. Having the two systems running on separate hardware maximizes utilization of the available processing capacity. Automation Runtime can run on any X20 PLC or Automation PC, while Linux runs on its own B&R hardware, such as an Automation PC.



exOS



Automation Runtime and Linux on an Automation PC

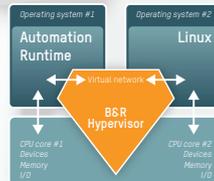
In this model, Automation Runtime and Linux both run on an Automation PC. The two systems are connected internally via B&R Hypervisor. Any Automation PC from B&R can be used. The system is very compact and delivers excellent processing power.

Easy implementation of hybrid machine applications

Automation Studio & Automation Runtime



Hypervisor (optional)



Linux



exOS uses technology and tools from the B&R system and integrates the Linux application into the B&R engineering environment.

exOS offers numerous integrated functions that make it easier to implement hybrid machine applications with a combination of machine control and Linux code.

The integrated functions are executed symmetrically in Automation Runtime and Linux. exOS uses technology and tools from the B&R system and integrates the Linux application into the B&R engineering environment. All the freedom of Linux remains. B&R Linux with driver support is available as a base system. B&R Hypervisor can optionally be used for hardware-integrated configurations.



The world's largest software ecosystem



Central project management in Automation Studio

- Import Linux code into Automation Studio as exOS package
- Easy configuration of Linux parameters
- Uniform management of control and Linux code



Transfer and install Linux code effortlessly

- Linux code transferred from Automation Studio to controller and executed automatically
- Linux code installed and updated automatically



Configurable execution

- Automation Runtime can control execution of Linux code (e.g. start automatically after installation)



Extensive diagnostic possibilities

- Comprehensive diagnostics during installation and execution
- Seamless error logging in B&R system



High-performance data exchange

- Easy, buffered process data communication between controller and Linux
- Consistent transmission in microsecond range



Synchronized execution of applications

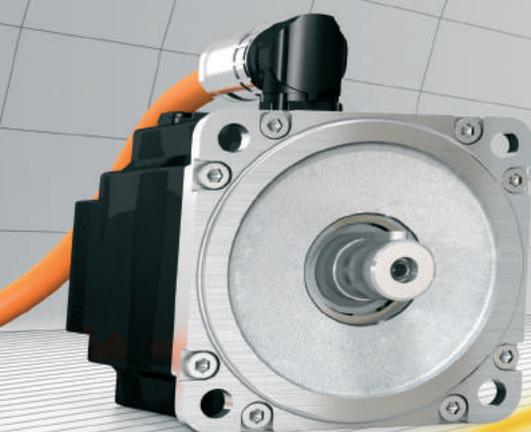
- Timestamped process data via NetTime mechanism for consistent timing of data with microsecond precision (e.g. servo axis position setpoints)
- Consistent timing basis



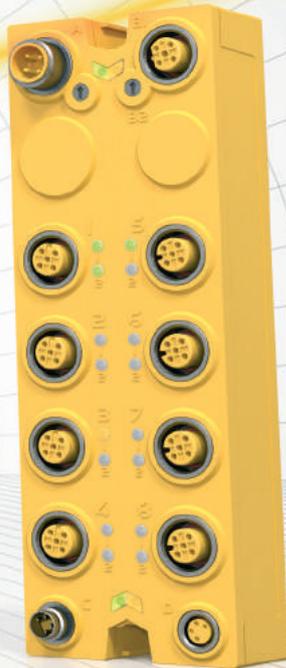
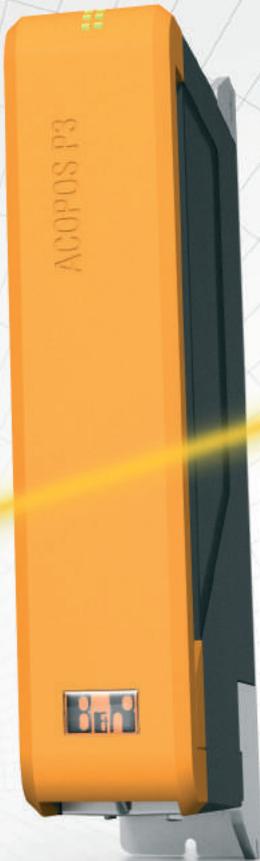
Simple and efficient maintenance

- Hardware replacement without reprogramming
- Out-of-the-box solution
- Defined machine status after hardware exchange
- Automatic transfer, installation and initialization for minimum downtime

Safety technology



open 
SAFETY



ETHERNET 
POWERLINK

Hiperface DSL Safety

The safety functions of the B&R ACOPOS P3 servo drive are now also available for motors with a safe Hiperface DSL encoder. Hiperface DSL Safety has established itself on the market alongside EnDat 2.2 Safety as a leading industry standard for safe data transfer between motors and servo drives.

Machine builders now have a much broader selection of motors when implementing safe motion control applications. Just like EnDat 2.2, HDSL Safety is compatible with all B&R safety functions. That includes functions such as Safely Limited Speed (SLS), Safe Operating Stop (SOS) and Safe Limited Increment (SLI).

For every application

HDSL Safety support is available with an easy firmware update. The encoder type is defined by

parameters on the servo drive's SafeMOTION module. Modules can be combined freely in a safety application, regardless of whether they were configured with EnDat 2.2 or with HDSL Safety. It is possible to choose the best encoder system for any given application.

Highlights

- Larger selection of motors
- Compatible with all B&R safety functions
- Available via firmware update
- Mixed operation of HDSL and EnDat 2.2 possible

HIPERFACE[®]
DSL

PLK   Ax3
R/E   Ax2
SE   Ax1

ACOPOS P3





Torque safely under control

B&R has equipped the ACOPOS P3 servo drive with safe torque monitoring. Current measurement is handled by the integrated SafeMOTION module, so no external sensors are necessary. This guarantees a maximum fault detection time of 8 ms.

Safe torque monitoring enables safety functions such as SLT, SBT and SSO on the ACOPOS P3. Torque can be safely monitored up to SIL 2 / PL d.

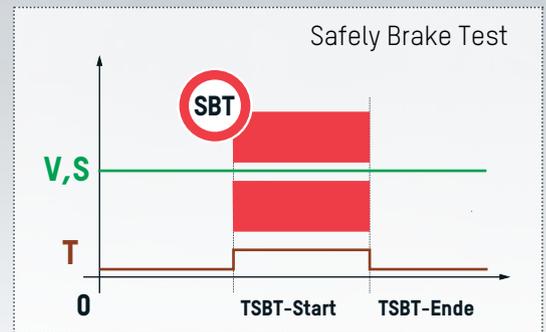
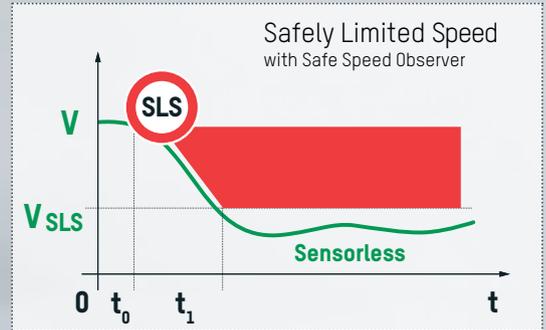
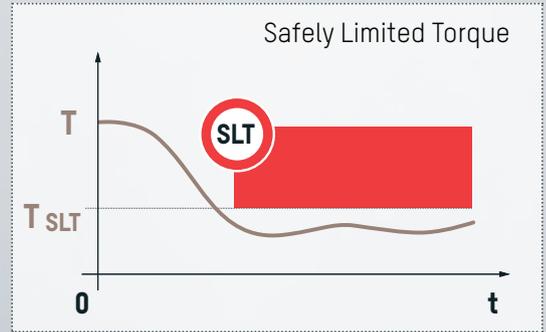
Safe prevention of overload

The recorded torque data can be processed in many ways. The Safely Limited Torque (SLT)

function can be used, for example, to safely limit the torque applied by the power transmission system. This minimizes the risk of operators being injured via pinching or crushing while working on a machine. SLT can also help prevent mechanical overload.

Reliable holding brake control

The Safe Brake Test (SBT) function can be used to safely monitor the performance of a holding brake. The test sequence begins with activation of the brake while at a standstill. Then, the axis is energized to define a torque. Safe torque monitoring



guarantees that this torque is actually applied to the brake. Data about the movement of the holding brake is monitored and evaluated. It provides insight into the condition of the brake and any damage or wear.

Ensuring operator safety

Safe Speed Observer (SSO) is a virtual speed sensor that makes it possible to use the Safely Limited Speed (SLS) safety function. The SLS function cuts off power to axes if they exceed defined speed limits to prevent equipment damage or

operator injury. Since a safe encoder is no longer required, the cost of implementing this safety function is reduced.

Highlights

- Faster response time
- SIL 2 / PL d / CAT 3
- No encoder required

High performance, fewer channels



With mapp Safety 5.12, B&R's safe I/O modules with digital inputs support the DYNlink solution from ABB Jokab. Existing I/O modules can be updated to mapp Safety 5.12 with a simple firmware update. The DYNlink solution makes it possible to achieve SIL 3 / PL e with only one safety input.

connection blocks are easily installed in the field and support star topologies. They are connected to the B&R system with prefabricated cables from ABB Jokab. These cables carry the signals needed for DYNlink as well as the information output signals of the sensors.

Up to ten safety sensors can be connected to form a DYNlink loop without compromising the performance level. An entire DYNlink loop occupies only one safe digital input. This drastically reduces the total number of safety channels required.

Simple installation

The ABB Jokab TINA 8A and TINA 4A connection blocks make installation much easier. The

Highlights

- SIL 3 / PL e with only one safety input
- Fewer safety channels
- Cost savings



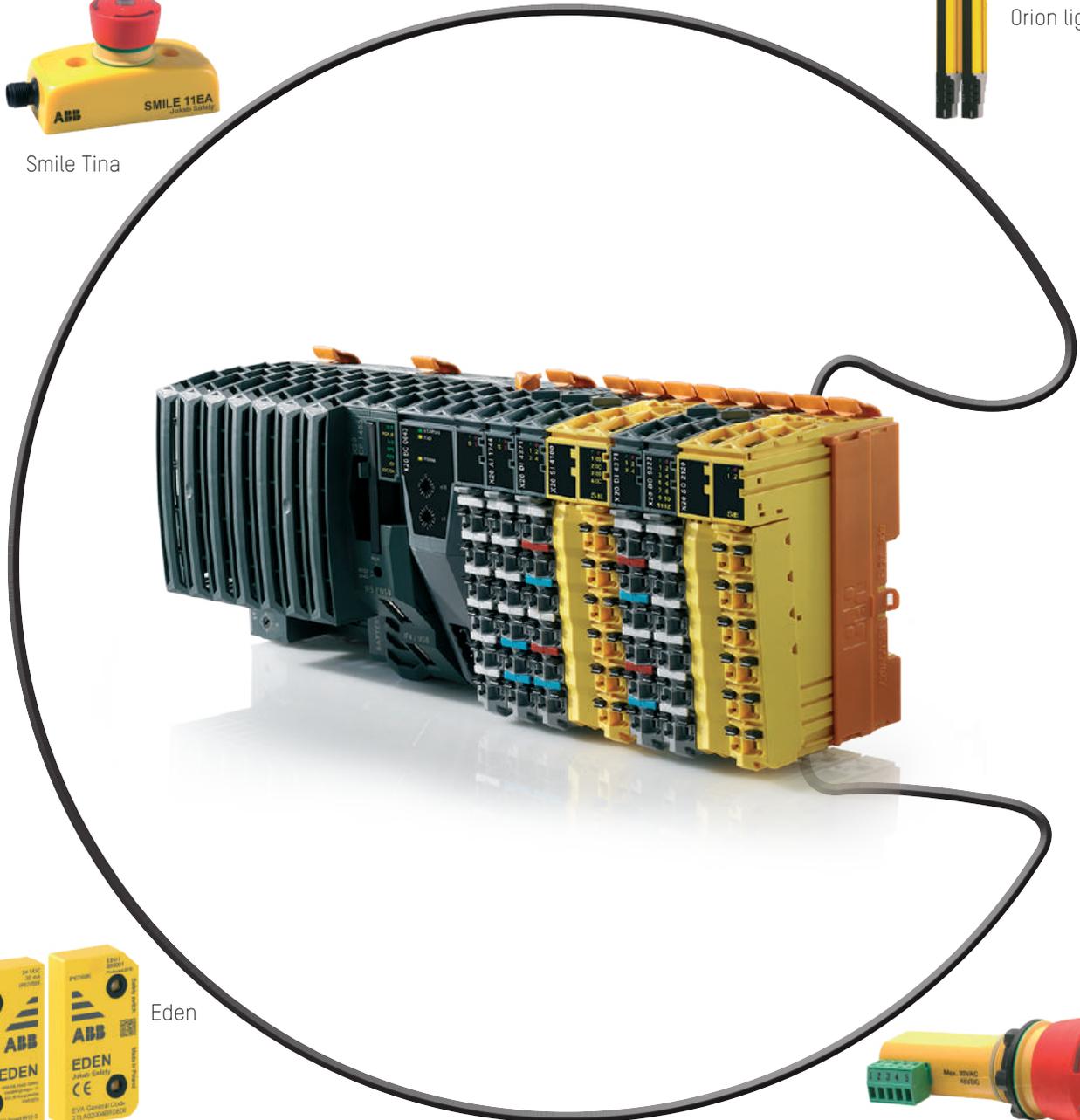
Orion light grid



Orion light grid



Smile Tina



Eden



Eden



Inca Tina



Easy safety for complex machines

With a new programming interface in mapp Safety, B&R makes it significantly easier to create safety solutions for complex machine designs. Modular machines can be commissioned or retrofitted easily, simultaneously and safely.

Both during commissioning and when retrofitting a machine that is already in operation, it is often necessary to adjust parameters such as the speed limits for safety functions. The new programming interface brings together all safety-related data, leaving operators with only a single safety application to maintain, regardless

of how many different options and variants their machine offers.

Easy handling

Safety-related parameters can be set by a service technician or the end customer's personnel. The user rights required for this are defined in the application. Preconfigured mapp Safety components require hardly any programming effort, which simplifies the application enormously.

Adjust values safely

A variety of user roles are defined in a custom



safety concept. With the help of the programming interface, it is possible to define which users are permitted certain parameters and even what range of values those users are permitted to enter. Every change is logged and can be retraced at any time.

Many potential applications

Individual machine modules can be enabled or disabled using classic binary and numerical values. It is also possible to modify parameters in the drive system, for example to accommodate a

new gear ratio after replacing a gearbox. In robotics applications, the programming interface can be used to modify the workspace data used for SafeROBOTICS functions.

Highlights

- Easy handling
- Time and cost savings
- Application-specific user roles

Safety spanning multiple machines



By allowing up to 280 connections between safety controllers, B&R brings the advantages of programmable safety technology to entire plants or fleets of mobile machinery.

Integrated safety technology from B&R is revolutionizing applications in many areas of automation. Programmable safety behavior is no longer isolated to individual machines or devices, but can be applied and coordinated throughout the entire system. Just a few of the exciting possibilities include safe data exchange between construction and agricultural vehicles, coordination of AGV swarms and complex automation networks for the food and beverage and logistics industries.

Easy implementation with mapp Safety

Integrated safety technology from B&R meets this rapidly growing requirement. The software components in the mapp Safety package significantly improve communication between safety controllers (SafeLOGIC) and greatly simplify safety applications. Safety-related communication between plant subsystems can now be set up faster than ever.

Direct data exchange

SafeLOGIC safety controllers will allow users to configure up to 280 communication connections to other safety controllers. In addition, direct data exchange between the compact SafeLOGIC-X safety controllers is now also possible.



Virtual wiring replaces written code

Simple and secure creation of safety applications in SafeDESIGNER – the secure editor for Automation Studio software. Certified functions and a convenient visual editor allow virtual wiring. Development of safety applications in Automation Studio and its SafeDESIGNER tool has been completely redesigned in order to maintain a clear overview of even the most complex applications.

Safe communication

Data is exchanged between safety controllers using openSAFETY via real-time Ethernet POWERLINK or UDP. The next step will be adding OPC UA to this set of communication protocols. Reliable cables and wireless technology can be used as transmission media.

Highlights

- Safe communication between plant components
- Quick and easy implementation with mapp Safety
- Intuitive and flexible configuration

Mobile automation





Maximum performance with Intel i7



B&R is adding a high-performance PC to its mobile automation portfolio. The new PC offers significantly more processing power and memory, making it ideal for applications that are computationally intensive or involve larger volumes of data.

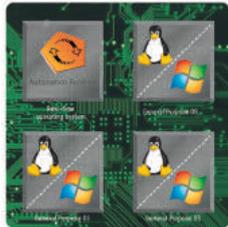
Inside the mobile PC's IP69K housing is a powerful Intel Core i7 processor. B&R has also equipped the PC with 16 GB RAM and 480 GB flash memory, giving it plenty of resources to implement auto-

nomous functions for agricultural and construction vehicles or self-driving transport systems.

Highlights

- Scalable performance
- For complex applications
- Ideal for autonomous functions

Controller and PC in one device



B&R now offers its hypervisor software on its PCs for mobile machinery. This enables it to serve simultaneously as both a high-performance controller and a Windows or Linux PC,

allowing smart farming applications to be implemented with only a single device.

The two operating systems are connected via a virtual network interface. Windows software with a cloud connection could be used to calculate the optimal path for a mobile machine to follow, for example, while the real-time operating system turns that information to specific commands for the drives.



Multiple operating systems

Combining two operating systems on one device lowers equipment costs. It also allows for a more compact design and makes more efficient use of available hardware resources. Not only that – it also speeds up communication.

Highlights

- Controller and PC in one device
- Reduced costs
- Real-time communication



Communicate in real time

A new option board gives the PC for mobile machinery four additional Ethernet interfaces that can be used to connect displays, sensors or other external devices. The interfaces are already equipped with the TSN Ethernet extension, making them optimally prepared for the OPC UA over TSN communication standard.



Connect external devices

To connect external I/O modules or sensors to the PC, B&R offers an additional option board with three CAN interfaces and one POWERLINK interface. The option board is often used in conjunction with the hypervisor software. This makes it possible to control complex applications like automated guided vehicles (AGVs) with a single device.

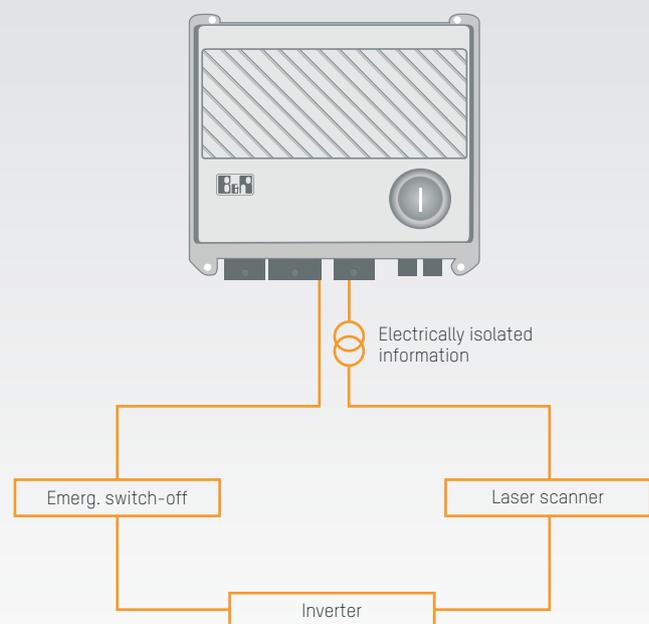
Floating-ground connection for external devices

A new safe relay module from B&R adds an option board with floating-ground connections for external devices. Safe drives, sensors or emergency shut-off elements can be connected directly to X90 controllers.

The safety level achieved when connecting external devices depends on the wiring. Possibilities include: four safety outputs at PL c or two outputs at PL e / SIL 3 for safe interruption of a floating-ground safety chain.

Highlights

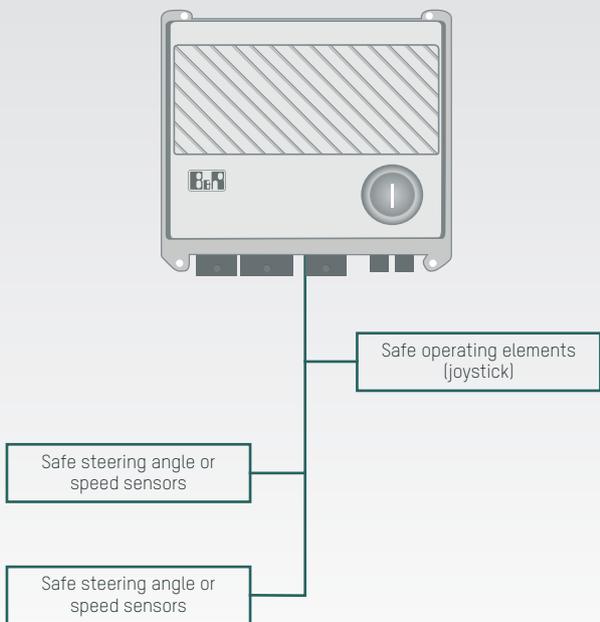
- Safe connection of external devices
- PL e / SIL 3
- Floating-ground safety chain



SIL3



More safety for mobile machinery



B&R supports the safety protocol CANopen Safety. External devices such as sensors or drives can be connected directly to safe X90 controllers from B&R. This greatly expands the selection of safe devices available for mobile machines with X90 controllers.

CANopen Safety is available via a simple software update and requires no new control hardware. External devices such as speed sensors or operating elements can be connected directly to X90 controllers. CANopen Safety devices are configured in B&R's Automation Studio engineering environment. With the ready-made software blocks provided by B&R, there is no traditional programming work to be done, which considerably reduces the overhead for safety functions.

- Highlights**
- Secure data transfer
 - Selection of safe sensors
 - Easy configuration



More rugged, more readable – T50 extended



B&R is adding an especially robust HMI device to its mobile automation portfolio. The T50 extended is even more resistant to shock, vibration, temperature extremes and unfavorable lighting conditions than the standard T50 mobile.

Highlights

- Better readability in sunlight
- Resistant to frosty temperatures
- Resistant to high g-forces



Better readability

Particularly in outdoor applications, machine terminals are often exposed to direct sunlight. This makes it difficult for users to read the screen or perform necessary operations. With the new extra bright displays, operators can read and operate their HMI with ease, even on the brightest day.



Extended temperature range

In addition to increased brightness, the devices are also rated for an extended range of operating temperatures. They can handle both frost and direct UV radiation. It is also possible to operate the built-in PCT touch screen with gloves.



Resistant against shock and vibration

Shock and vibration place extreme demands on the mechanical stability of automation components for construction vehicles and other mobile machines. This applies especially to the displays used to operate them. The automotive display used in the T50 extended panel is even more resilient to shock and vibration. The Power Panel is the right choice for demanding applications under harsh conditions with high g-forces – like demolishing buildings or crushing stone in quarries.

Process and factory automation





Cybersecurity with APROL

PKI/certificate	Status	Security mode	Expiry date	Filename
Project (DemoProject)		Secure/Insecure		
Controller				
Ctrl12 (0000_General/0000...are/Controller/Ctrl12/Ctrl12)				
Ctrl13 (0000_General/0000...are/Controller/Ctrl13/Ctrl13)				
APROL Control Computer				
bupa082 (0000_General/00...control computer/bupa082)				
HTTP				
Server		Default (Project: Secure)		
apache				
own				
HTTPServer@bupa082.crt		Default (Project: Secure)	03/24/2045 07:32:56 CET	
JasperReportServer		Default (Project: Secure)		
own				
JRServer@bupa082.crt			03/24/2045 07:32:56 CET	
monit		Default (Apache: Secure)		
own				
monit@bupa082.crt			03/24/2045 07:32:59 CET	
SQL				
Server				
AprSqlServer		Default (Project: Secure/Insecure)		
own				
SQLServer@bupa082.crt			03/19/2045 16:35:47 CET	
Clients				
SQLClient		Automatic		
Issuers				
SQL_CA@bupa082.crt			03/19/2045 16:35:46 CET	
Remote access				
own				
20r...cv@pnb082s.cu			03/19/2045 16:32:48 CET	
Issuers				
own				
own				

Cybersecurity is an important topic that comes up in many different areas of the automation industry. The APROL process control system offers a comprehensive package for detecting risks and averting possible hazards. New functions are being added all the time.

Generate self-signed certificates

Self-signed certificates for servers and clients of control computers can be created in the project's TLS configuration. To simplify the commissioning of an APROL server, self-signed certificates are automatically created locally by the system.

Import function for CA-signed certificates

Many companies require the use of digital certificates signed by a certificate authority (CA)

to verify the identity of communication partners. APROL supports the use of CA-signed certificates by allowing them to be imported into the common certificate store in the TLS configuration.

Highlights

- Transparent overview of encrypted communication
- Fast and comprehensive information about connection security
- Integrated encryption prevents subsequent manipulation without password

Better overview

Even in very large projects, the user has a transparent overview of the current status of encrypted communication. Depending on user requirements, a large number of certificates may be required in a project to cover the various protocols and instances. The new configuration overview offers the possibility to assign certificates and define the security mode. It also shows whether each certificate is in use one or more times and indicates how long it is valid. This view makes it easy to gain a quick and accurate overview of communication security.

Global firewall and whitelisting

Taking advantage of these convenient configuration options makes configuring and commissioning the new controller firewall go significantly faster. The firewall integrated on the controller uses defined rules to restrict network access based on the services used and sender or destination. The controller's network access is defined globally for all controllers using the firewall configuration (rules) in the project properties. This firewall configuration can also be disabled for specific controllers or overwritten with a local firewall configuration.

Activated	Name	CPU	Security	AR-OS	AS version (Variant)	Interface	IP Address	MAC Address	Node (active)	Node	Description
—	AS/HW configuration								1		Project Default for AS/HW configuration
✓	Ctrl13 (Ctrl13)	X20CP3586	🟢	✓ A0473.2	4.7.3.92.SP (AS47)	F2 (F2 address via ANGL)	192.168.1.13	00:60:65:1c:56:22	4	4	Controller 13
✓	Ctrl12 (Ctrl12)	X20CP3586	🟢	✓ A0473.2	4.7.3.92.SP (AS47)	F2 (F2 address via ANGL)	192.168.1.12		12	12	Controller 12
—	DownloadManager								240		Project Default for DownloadManager
—	INA-driver								241		Project Default for Slave INA-drivers
—	INA-driver								242		Project Default for Master INA-drivers
—	ControllerManager								243		Project Default for ControllerManager
—	ControllerManager								244		Project Default for ControllerManager
—	ControllerManager								245		Project Default for ControllerManager
—	ControllerManager								246		Project Default for ControllerManager
—	ControllerManager								247		Project Default for ControllerManager
—	ControllerManager								248		Project Default for ControllerManager
—	ControllerManager								249		Project Default for ControllerManager
—	ControllerManager								250		Project Default for ControllerManager
—	ControllerManager								251		Project Default for ControllerManager
—	ControllerManager								252		Project Default for ControllerManager
—	ControllerManager								253		Project Default for ControllerManager
—	ControllerManager								254		Project Default for ControllerManager

The screenshot shows the USBGuard application window with a dark theme. It has two tabs: 'Devices' and 'Messages'. The 'Devices' tab is active, displaying a table of USB devices. The table has columns for ID, M, Target, USB ID, Name, Serial, Port, and Interfaces. The data is as follows:

ID	M	Target	USB ID	Name	Serial	Port	Interfaces
5		allow	1d6b:0002	EHC...ler	000...a.0	usb1	09:00:00
9		allow	8087:0024			1-1	09:00:00
...		allow	064f:2af9	Cod...ick	000...123	1-1.1	03:00:00
6		allow	1d6b:0002	EHC...ler	000...d.0	usb2	09:00:00
10		allow	8087:0024			2-1	09:00:00
7		allow	1d6b:0002	xHC...ler	000...4.0	usb3	09:00:00
11		allow	046a:0180	wir...ard		3-3	03:01:01 03:00:00
12		allow	046d:c016	Opt...use		3-4	03:01:02
8		allow	1d6b:0003	xHC...ler	000...4.0	usb4	09:00:00

ANSL connection security

A dialog box now displays a simple and clear overview of the security of ANSL communication to all controllers in the project.

The "Security" view provides a summary of connection security, including ANSL authentication (enabled/disabled), ANSL TLS (enabled/disabled) and the controller's firewall configuration.

The controller's firewall configuration shows whether it is enabled or disabled either globally or locally for the controller within the project. The dialog box also shows which version of the Automation Runtime operating system is being used on each controller. Showing all of this information together in one list provides the operator quick and comprehensive access to anything they need to know about connection security.

Check the time on hardware

A new function has been added to the Download-Manager that can be used to check the system

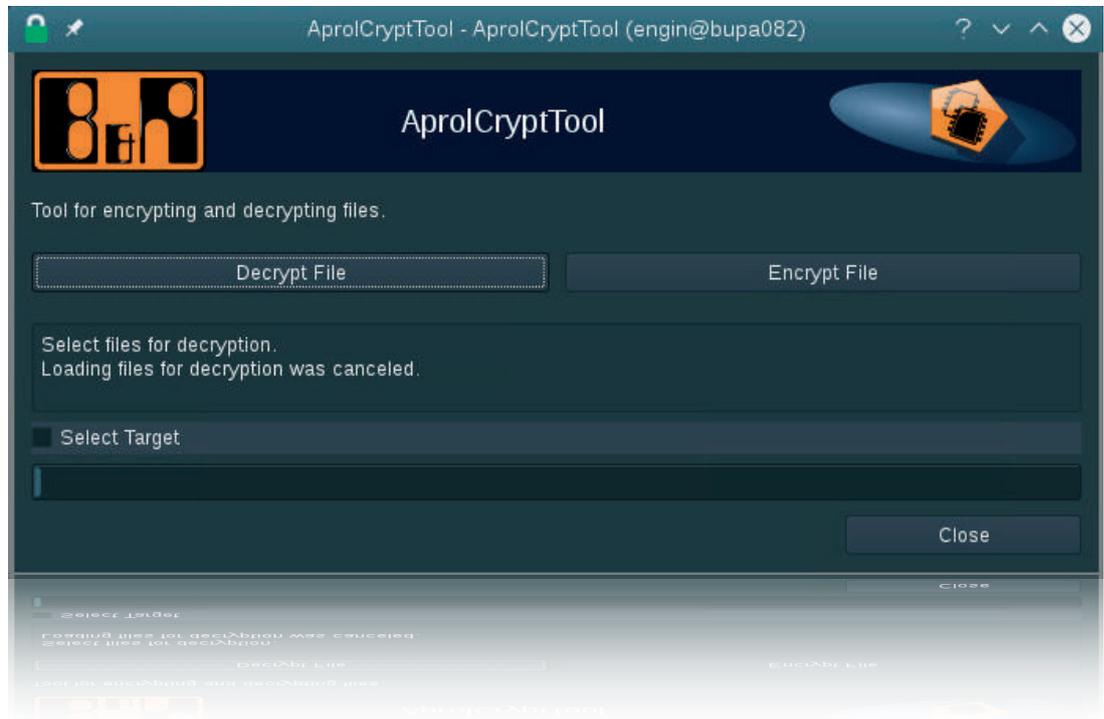
time on all download targets. This prevents accidentally causing a permanent lockout when using encrypted communication.

With TLS-secured connections, there is a risk that communication may be prevented by a system time conflict. The reason for this is that a certificate is only valid for a certain length of time. In order to reliably prevent a lockout, the DownloadManager checks whether the system time on the controller matches the system time on the engineering system before downloading to the controller. The permitted deviation is defined in the project properties. This ensures that once secure communication is enabled, it is not interrupted due to time conflicts between devices.

Protection against unauthorized USB devices

The new USBGuard function prevents unauthorized operation of USB devices and logs all activities seamlessly.

USB ports are often used to transfer files to or



from the control computer using USB mass storage devices. Since this violates security policies at many companies, APROL offers a software-based solution for regulating the use of USB devices.

The software "USBGuard" and "USBGuard QT Viewer" for Linux can be used to regulate the use of USB devices by permitting only devices that are explicitly approved in a whitelist. The "AprotSetSecurity" script can be used to enable additional devices other than the default USB devices. A message is displayed when known or unknown USB devices are connected to the USB port of a control computer.

Data security during import/export

In larger projects, tasks are often split up between team members scattered around the world. All configuration data is protected by encryption to guarantee the securest possible exchange of engineering data. Even after commissioning is complete, the entire project must be handed over to the responsible archivist in a tamper-resistant

manner. The integrated encryption prevents subsequent manipulation without the password, saving the user the time-consuming procedure of manual encryption.

Supported by an engineering option

The option "Encryption on save" allows the user to define globally whether to use no encryption, encryption by default or mandatory encryption. GNU Privacy Guard (GPG) is used as the cryptography system. This global function securely enforces the encryption of data without any additional process.

APROL utility for encryption and decryption

The newly integrated encryption utility makes it possible to safeguard any type of data against tampering. So that any data not exported/imported by the CaeManager can also be conveniently encrypted and decrypted, an additional utility is provided. This utility significantly simplifies and accelerates the procedure through familiar dialog boxes and predefined parameters.



What's new in APROL?

Generate PDFs in accordance with PDF/A

A new APROL function makes it possible to create PDF documents in accordance with specific PDF/A standards. PDF/A is a file format for long-term archiving of digital documents. Documentation and reports are created interactively through selections in the global engineering options of the CaeManager. With the AprCcTrigReport process control block, the desired format is passed via the block's "PdfOptions" input. This makes it possible to implement logic-controlled PDF generation. APROL now supports the optional use of ISO standards 1b, PDF/A-1a, PDF/A- 3b (default) and PDF/A-3a using the external tool Prince 13.

New CaeBackup/CaeRestore options

In CaeBackup, users can now lock used libraries and create library labels automatically. These two

options allow the user to prevent unwanted changes to libraries in the target environment at the commissioning site when they are transferred from the engineering environment and engineering site to the commissioning site. The system automatically prevents intentional or unintentional manipulation of user libraries.

Consistency across all parts of your project

In order to ensure and check the consistency of exchange between individual projects and libraries, all versions of project parts now include a checksum, or fingerprint. During database optimization, the checksums of all versions of the project parts are checked and corrected if necessary. CAE warnings are generated in case of defective or invalid fingerprints in the database. This allows the user to reliably detect changes and initiate any necessary corrective measures.



ARsim controller simulation

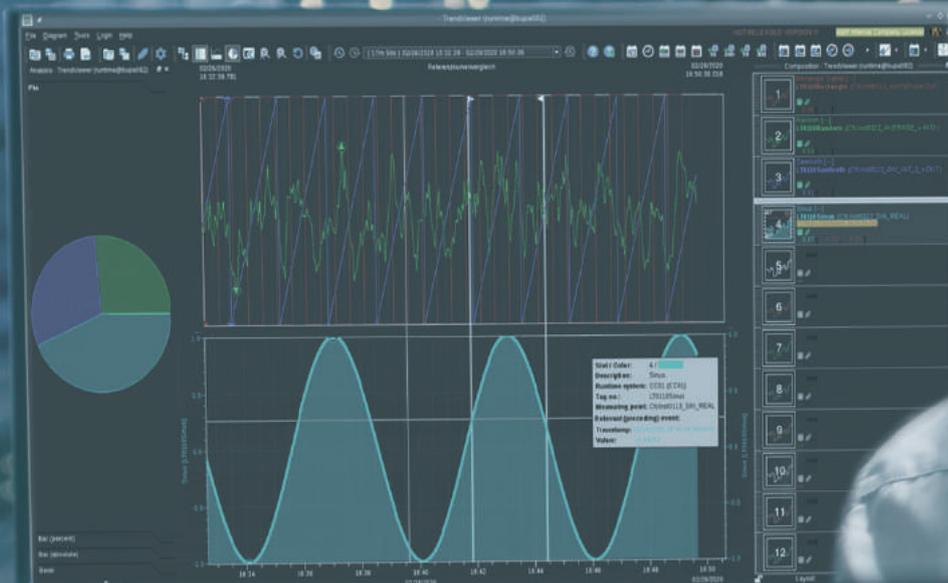
In the early phases of a project, the control hardware is often not yet available, be it for reasons of cost or organization. Now, simulation can easily fill in the gap and keep large projects moving efficiently toward completion. The efficiency of project creation is thus significantly increased.

ARsim can be used for simulation testing of non-redundant controllers. A simulation IP address must be configured for the controller. The download target of the controller and the AnsiDriver connection can be redirected to the simulation IP address. Active simulation is clearly marked with a simulation icon.

Multiple instances of ARsim can be used to simulate all the controllers in a project without any control hardware.

Highlights

- Automatically prevent manipulation of standardized libraries
- Detect changes with fingerprints
- Simulate controllers early in the project with ARsim



mapp View in APROL

The mapp View HMI solution is being integrated into APROL's existing HMI solution. Features such as library engineering are being further expanded. The graphic block is now also offered as a mapp View graphic block. This allows APROL to automatically generate all the graphics code and the necessary mapping for all application programs.

Visual editors

All the editors needed to create mapp View HMI applications are fully integrated in APROL. The desired layout of the mapp View HMI application is defined in the project properties using the layout editor. The content editor is used to create reusable content that is assigned in the page editor.

mapp View graphics block

The addition of mapp View significantly expands the possibilities for creating HMI applications. In the control modules (hyper macros), the mapp View graphic block can be used in the normal manner. The deep integration into the APROL system ensures engineering is streamlined and convenient.

APC relay module enables signal output

The APC relay module enables integration in APROL, supporting direct connection of system variables.

The APC plug-in module 5AC901.ISIO-00 (ready relay) can be controlled using the ApcHw service. Automatically provided system variables support any connection. Startup and shutdown behavior can be defined.

Any states in the automation logic can now be output via the operator station's Automation PC without any additional wiring effort.

OPC UA file transfer in UaRClient and UaRServer

The OPC UA file transfer makes it possible to transfer files between OPC UA servers and OPC UA clients using the OPC UA protocol. Blocks are provided so that the transfers can be triggered by logic. This function makes it possible to use traditional services for file transfer and ensures full compliance with cybersecurity requirements.

OPC UA methods for UaRClient and UaRServer

The use of OPC UA methods facilitates connectivity between automation devices from



different manufacturers with minimal configuration effort. By eliminating the classic handshake variables in the application context of the project, remote procedure calls in the real-time operating system are greatly simplified by OPC UA methods.

Support for new controller hardware

Support for the latest controllers simplifies lifecycle management for the customer. Even more powerful controllers are available for demanding projects.

APROL offers a total of seven new X20CPx68x PLCs. The most powerful is the X20CP3687X, which not only has higher processing power, but also has 2 GB SDRAM user memory, making it optimal for map View applications.

New PLCs in APROL: X20CP1684, X20CP1685, X20CP1686X, X20CP3684, X20CP3685, X20CP3686X, X20CP3687X

Support for project installation packages

Offline controller downloads can be performed via USB flash drives using "project installation packages". This is especially helpful for

controllers that only have internal memory. The controller or controllers for which the package should be created can be selected in the DownloadManager. Prepared USB flash drives make it possible to upgrade projects with large quantities of components in an organized and efficient manner.

Highlights

- map View brings new HMI possibilities to APROL
- OPC UA methods streamline configuration
- Efficient controllers ensure simple lifecycle management

Integrated automation
Global presence
Solid partnership



OPC UA
OVER TSN

ETHERNET
POWERLINK

open
SAFETY