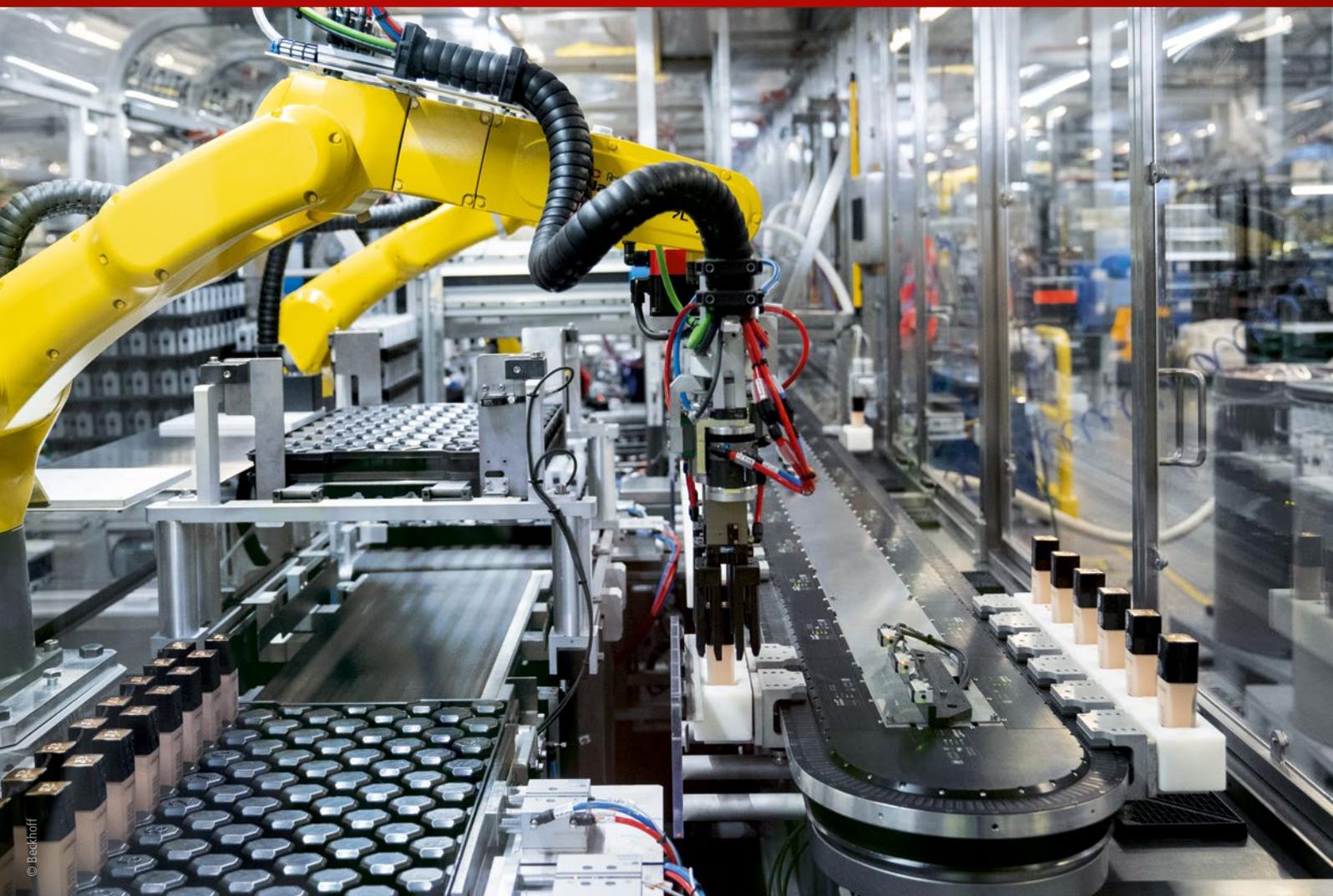


**BECKHOFF** New Automation Technology

Highly efficient, flexible and  
resource-conserving:  
PC-based control for the packaging industry

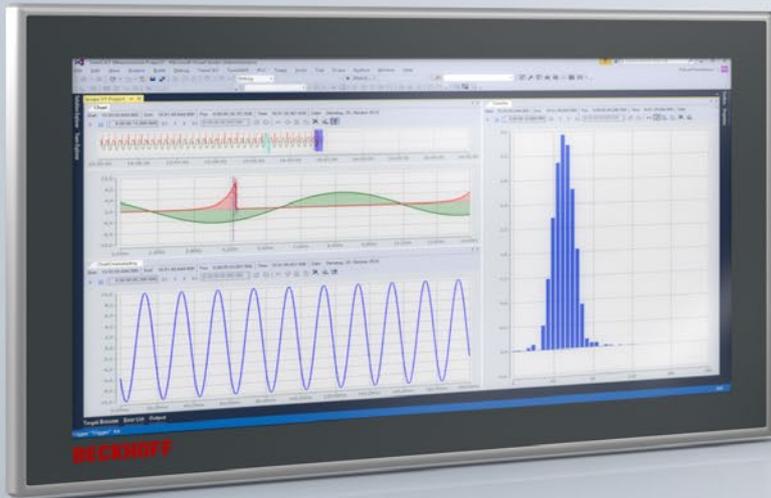


# PC-based control optimizes packaging machine automation

With its PC-based technology and EtherCAT, Beckhoff offers a control solution for highly efficient, flexible and resource-conserving packaging machines. Predestined for applications where high speed and precision are of utmost importance, the PC platform is perfect for synchronizing all process and motion control workflows. The bottom line: work steps are accelerated, and the consumption of packaging materials declines. For example, the fast and precise recognition of fiducials means that you can seal blister packs closer to the product they contain, and the precise control of the sealing temperature makes it possible to use very thin plastic film. Even the wall thickness

of PET bottles can be minimized thanks to the Beckhoff technology's fast and highly accurate process control capabilities. The same applies to the use of paper and aluminum when manufacturing cardboard containers. And the more accurate approximation of the minimum fill level generates significant material and cost savings when packaging high-volume products.

The Beckhoff automation portfolio comprises everything you need for a technologically and financially superior packaging solution. All control and drive components are scalable to meet the performance requirements of the respective application perfectly. Optimally coordinated hardware

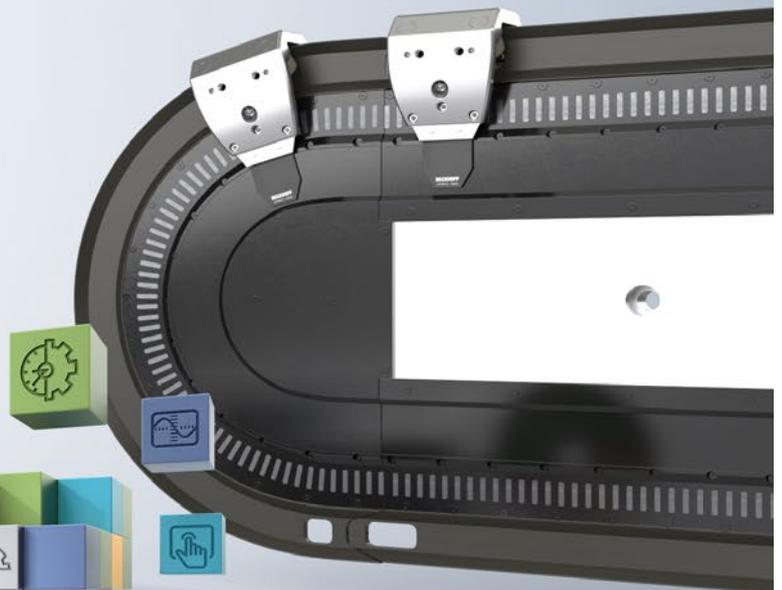


EtherCAT®



and software interfaces as well as extensive expertise in implementing each process step guarantee a high level of process stability. Applications can be realized by Beckhoff, a Beckhoff solution partner, or the customer himself. Another benefit of the Beckhoff automation platform is its support for common industry standards like FDA, EHEDG, FDA, Weihenstephaner Standards, OMAC, and GPM.

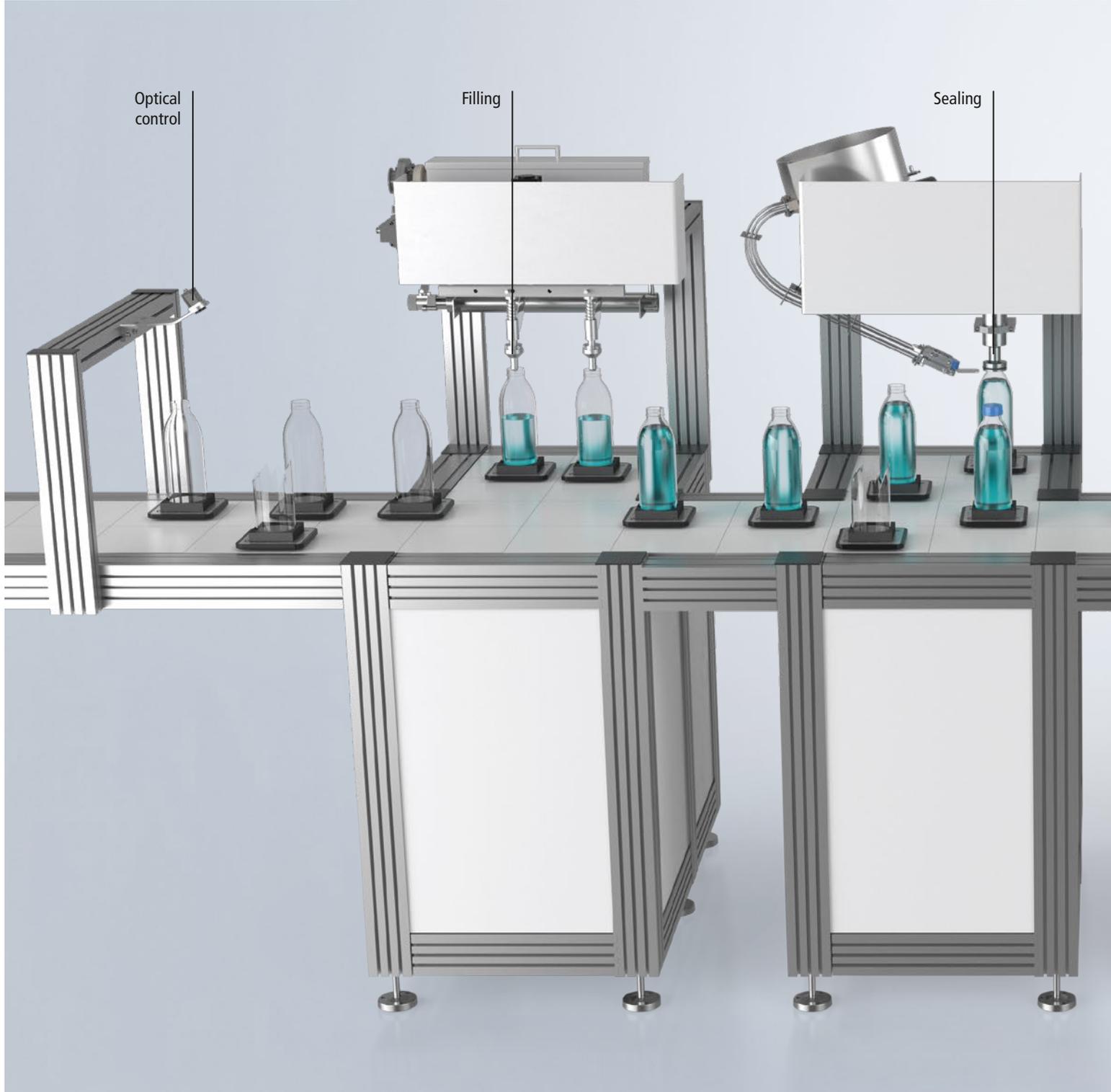
**XPlanar®**



# PC-based control automates the entire packaging process

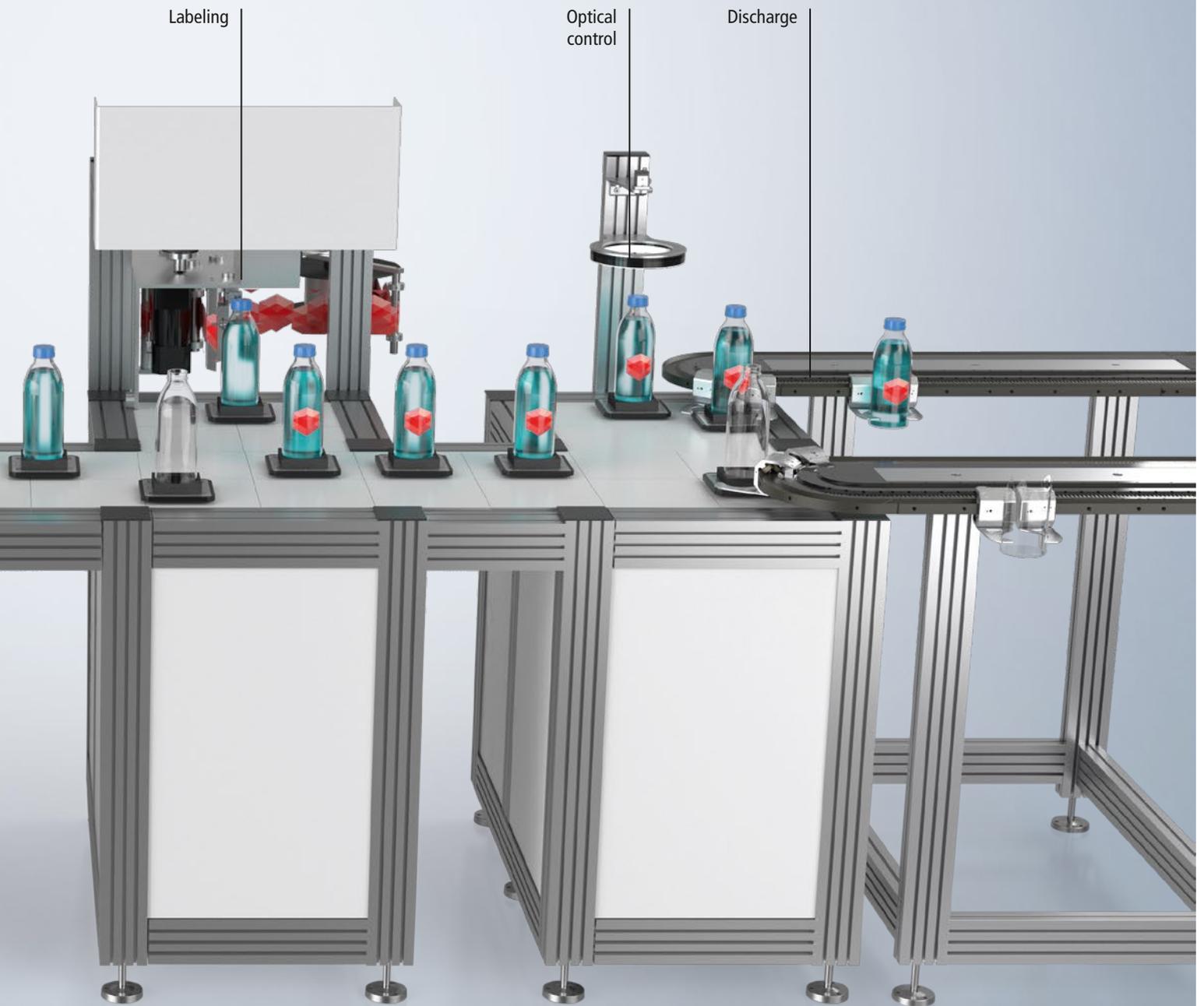
Thanks to its openness and continuity, you can use PC- and EtherCAT-based control technology from Beckhoff to automate individual packaging machines as well as entire lines. All steps such as forming, filling, sealing, labeling, collecting, boxing and palleting can be programmed and controlled via a single platform. This ensures maximum flexibility for applications where packaging systems must be quickly adaptable to changing requirements or be able to easily accommodate new features. Open interfaces in hardware and software allow for continuous communication from the sensor to the cloud.

On the hardware side, Beckhoff offers a broad spectrum of Control Panels, control cabinet PCs and Panel PCs, I/O components, and highly dynamic servo drive technology. TwinCAT is the uniform software and engineering platform for automation processes ranging from PLCs, visualization, motion control, robotics, safety technology and measurement technology to vision system integration and cloud-based communication. Software libraries for items like stepper control, cam plate functionality, register control or cross-cutting cover all the standard packaging machine requirements. Their compatibility with industry standards like OMAC and



WS Food enables Beckhoff technologies to be easily integrated into existing installations and packaging lines.

With the linear transport system XTS (eXtended Transport System) and the XPlanar eXtended planar motor system, Beckhoff has brought to market two intelligent drive solutions that are revolutionizing packaging machine design with their exceptionally flexible transport capabilities. Besides making machines much more compact and easily adaptable to packaging design changes, they support the demand for sustainability and efficiency with their reduced resource consumption.

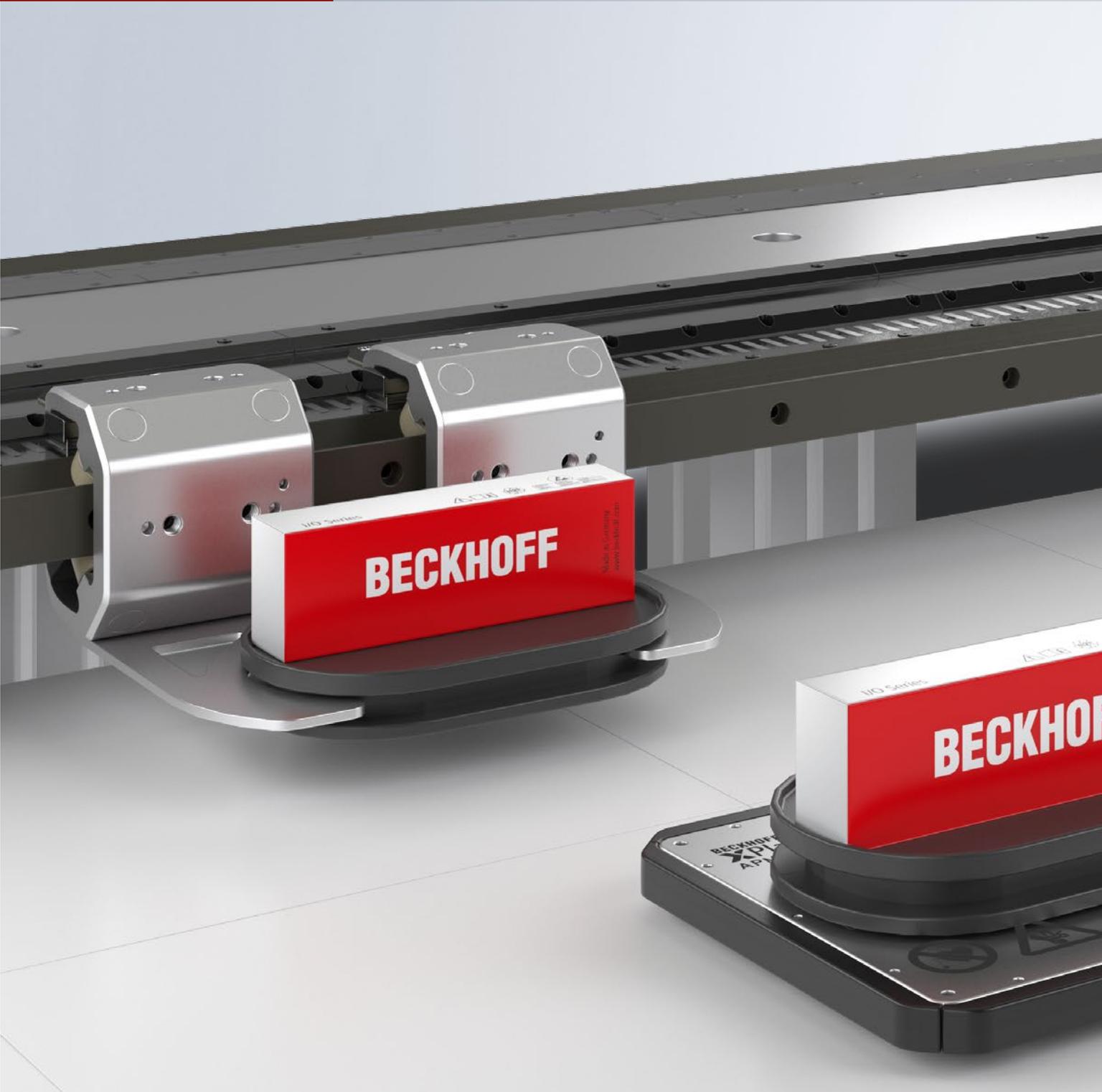


# Intelligent product transport optimizes packaging machines

Thanks to its versatility, the eXtended Transport System (XTS) has quickly become a known factor in the packaging machine market. With the introduction of the XPlanar eXtended planar motor system, Beckhoff is now taking the next step towards maximum flexibility in product transportation. Like the XTS, XPlanar is based on the principle of passive movers that can be moved individually and with outstanding precision. The necessary planar tiles can be arranged in any pattern and allow for smooth and touchless movements along six axes.

Thanks to the individually controllable movers and the flexible topologies of these transport

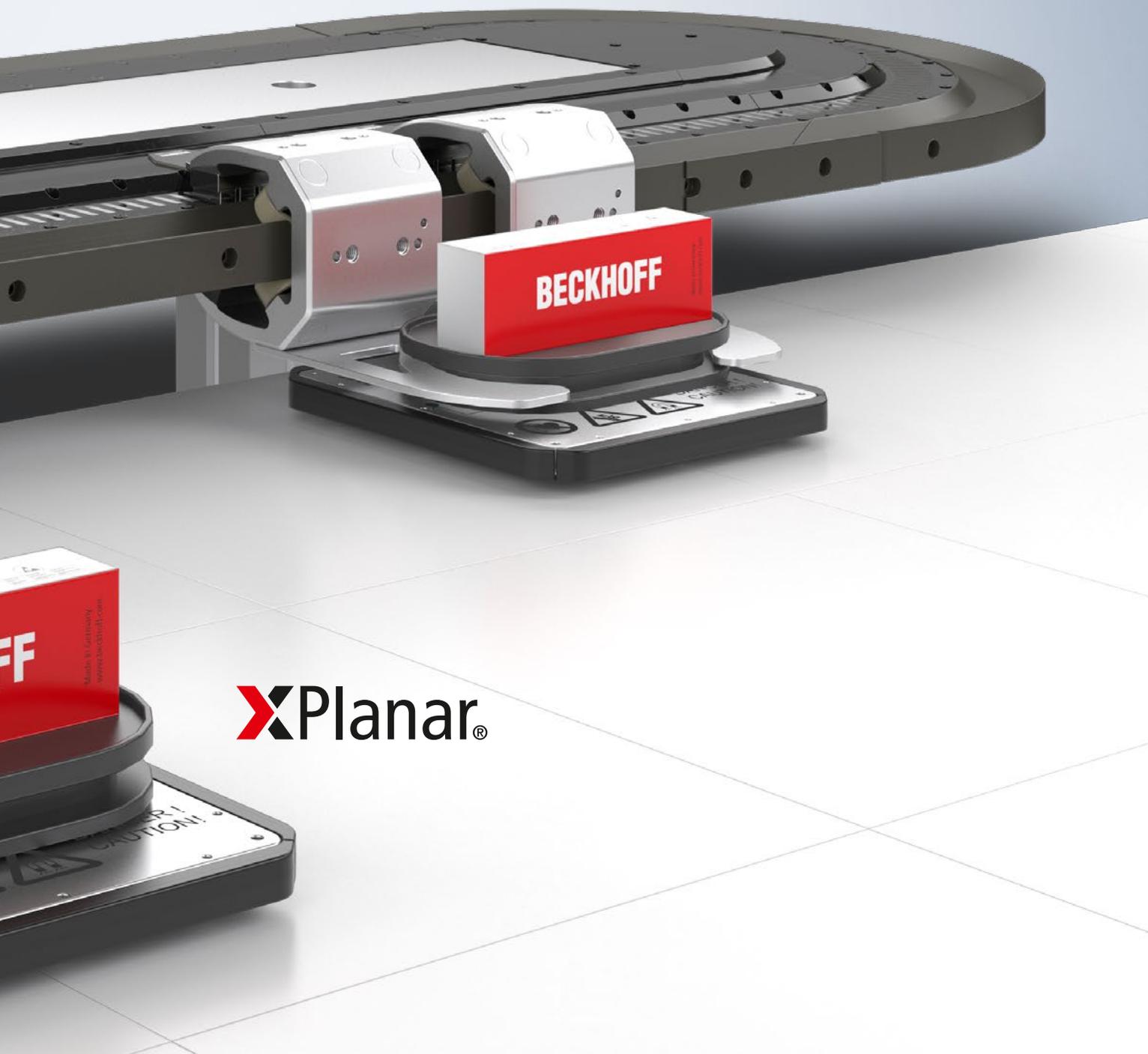
systems, packaging machines can be designed in entirely new ways. The flexibility with which the planar tiles or the raceway modules of the XTS can be arranged provides the machine manufacturer with nearly unlimited freedom in designing the machine's transport paths, and the functionality of the track management software makes the product streams fully user-definable. Workstations can be skipped, buffer areas added as needed, and movers freely inserted or removed. Beckhoff's intelligent transport systems increase product throughput, minimize travel between workstations, and reduce the machine's footprint. By integrating software-driven format changes, the machine's



flexibility can be increased further so that even small lot sizes can be produced efficiently and cost-effectively.

As a specialist for PC-based control technology, Beckhoff offers perfectly coordinated and highly scalable hardware and software components to ensure that its intelligent transport systems run with maximum performance at all times. First among these is the TwinCAT control software that ensures not only continuous travel path optimization and collision avoidance but integrates all other machine functions from PLC to robotics, vision, measurement technology and IoT on a central platform. The application

runs on an Industrial PC from the extensive and scalable Beckhoff portfolio. The communication functions run over high-performance EtherCAT and EtherCAT G fieldbus systems.



**XPlanar®**

# XPlanar revolutionizes the packaging industry with flying motion

The eXtended planar motor system features movers that use electromagnetic force to float smoothly over freely arrangeable tiles at speeds of up to 2 meters per second along six axes without bumping into each other. Traveling magnetic fields, which are generated within the planar tiles, position the movers accurately and dynamically.

With XPlanar, packaging machines can be designed in entirely new ways. Since the tiles can be arranged as needed, product streams can be freely directed. Quick setup changeovers shorten the machine downtime and allow for the economic production of small lot sizes. The system's

two-dimensional arrangement makes it easy to set up buffer zones and shorten the distances between the processing stations. The total area and geometry are fully variable. XPlanar tiles can also be combined to bridge long distances. Since adding more tiles along the route is all it takes to set up a waiting area or a passing lane, typical congestion situations can be easily prevented.

Each mover can travel and be positioned dynamically with no danger of becoming involved in a collision. The system can also accommodate production-specific moves such as lifting, lowering, weighing, tilting or rotating an item while it is



**0.4 kg  
payload**

**APM4220-0000-0000**  
XPlanar mover, anodized aluminum housing, 115 mm x 115 mm x 12 mm



**1.5 kg  
payload**

**APM4330-0000-0000**  
XPlanar mover, anodized aluminum housing, 155 mm x 155 mm x 12 mm



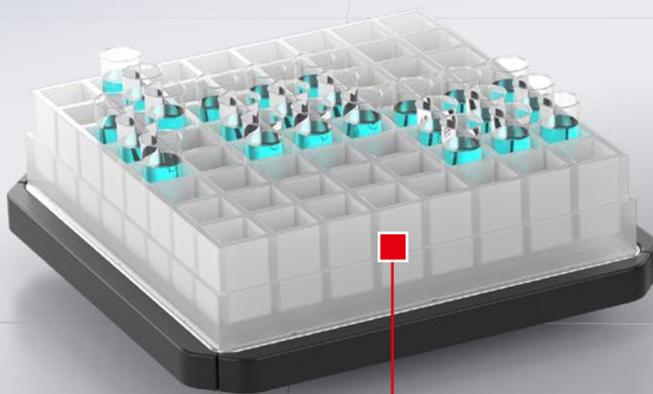
**4.2 kg  
payload**

**APM4550-0000-0000**  
XPlanar mover, anodized aluminum housing, 235 mm x 235 mm x 12 mm



**1.0 kg  
payload**

**APM4330-0001-0000**  
XPlanar mover, stainless steel housing, 155 mm x 155 mm x 12 mm



- jerk-free positioning
- high dynamics
- flexible application
- no spilling of liquids
- no carryover of contaminations



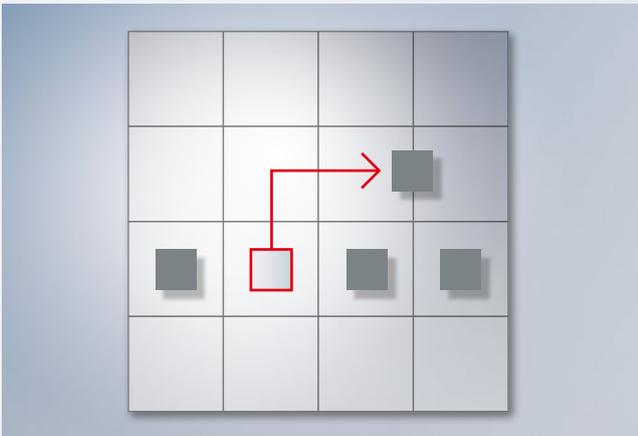
- excellent cleanability
- chemically resistant surfaces
- hygienic product handling
- no friction, no wear

being transported. The movers are available in various formats and for different loads. The bandwidth ranges from small and light movers to large ones that accommodate loads of up to 4 kilograms. Larger loads can be handled by combining movers. Different types of movers can travel simultaneously across the planar tiles.

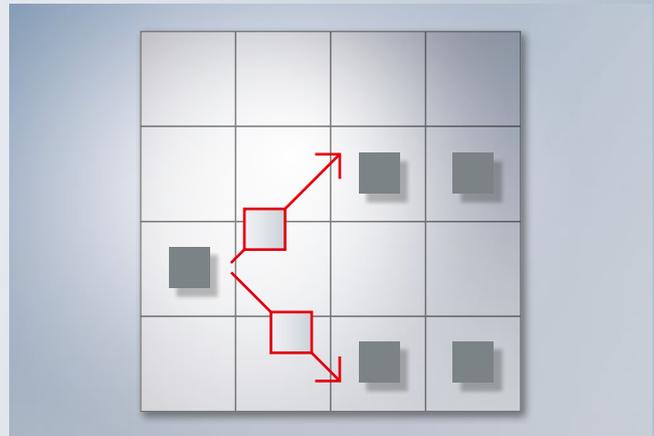
XPlanar puts an end to friction, wear and contamination. The dynamic, touchless motion prevents the surface from being contaminated. Even liquids can be moved without slopping over, and there is no friction that can cause emissions from wear. Since the surfaces of glass, stainless steel or plastic are chemically stable and easy to

clean, the XPlanar system is ideal for handling products in accordance with strict hygiene standards of the kind required in the food and pharma industries or in cleanroom environments.

## Applications

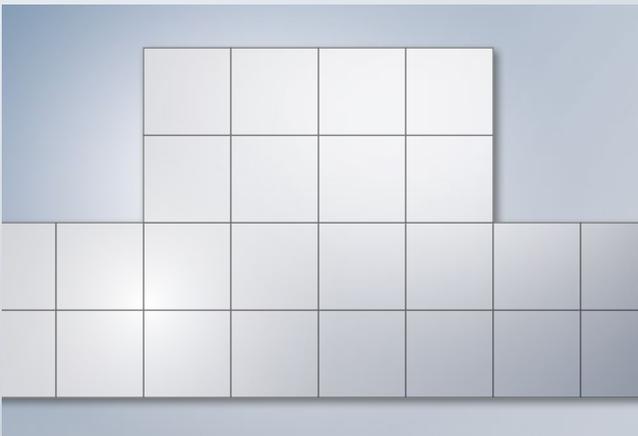


**Overtaking:**  
Movers can change lane and accelerate.

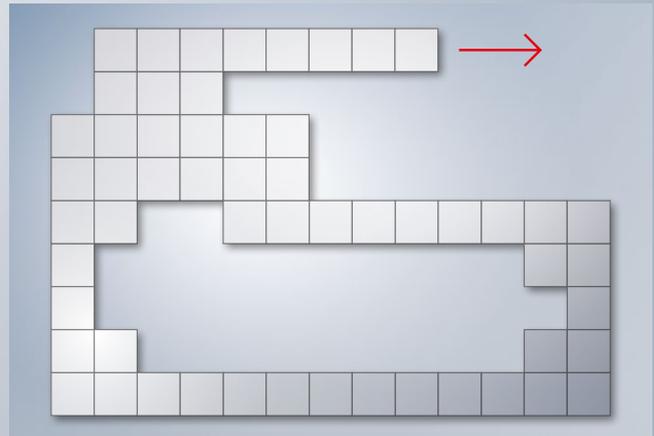


**Dividing:**  
Simple flow division, e.g. diversion of a product flow into several channels

## Geometries



**Waiting zones:**  
Can be set up directly alongside the track



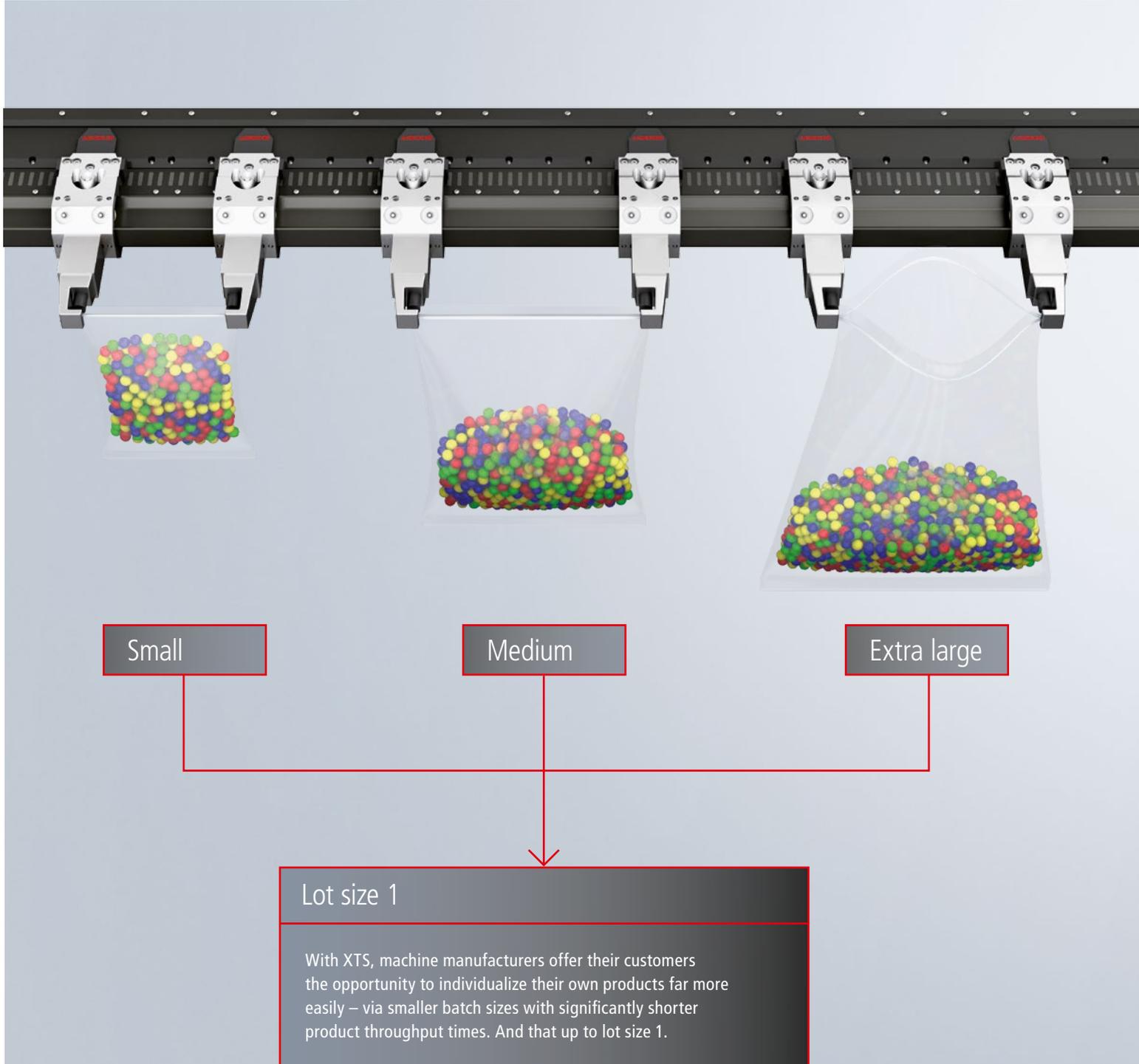
**Free-form shapes:**  
Provide a match for any space requirements

# Highly flexible parts movement with the XTS eXtended Transport System

The XTS eXtended Transport System combines the benefits of a linear transport system with those of a rotary solution. In addition to routing flexibility, the user benefits from all the advantages of direct drive technology such as highly dynamic and accurate positioning, low vibration, wear-free operation, and low power consumption. Since both straight sections and the curves are used to transport materials, there are no empty trips, making for a faster overall packaging process. With the XTS, products can be transported independently of each other, which opens the door to totally new machine designs. The packaging steps are optimally synchronized to prevent any

downtime. And since the motion profiles don't require any complex mechanics, there is less maintenance, and the machine footprint can be reduced by up to 50%.

Rapid format changes during product changeovers and small lots – for example, for special advertising campaigns or to produce individualized packaging with lot sizes of 1 – are no longer a problem with the XTS. The PC-based control platform executes machine setup or packaging changeovers essentially through software by changing the process parameters. This speeds up the process considerably, resulting in faster product changes and more



line efficiency for the owner. And with the XTS's Track Management software functionality, you can split the XTS system into individual, physically separate sections to do things like inserting or removing movers. You can thus carry out tool changes or maintenance activities without having to interrupt the regular production flow.

To enable application-specific system designs, the XTS comprises various motor module geometries. The modules are easily linked via lateral contacts for the transmission of power and data. For food and pharmaceutical applications, the XTS is available in a hygienic version. The fully

encapsulated system made of stainless steel is chemically stable and easy to clean while delivering all the benefits of this intelligent transport system.

The No Cable Technology (NCT) for the XTS represents a further quantum leap in terms of machine flexibility. This is made possible by a contactless power supply and synchronous real-time data communication, with which the individual XTS movers can be expanded into mobile handling and processing stations. The XTS construction kit has been expanded for NCT to include a special motor module and electronics that can be mounted on the mover. The hardware required for the

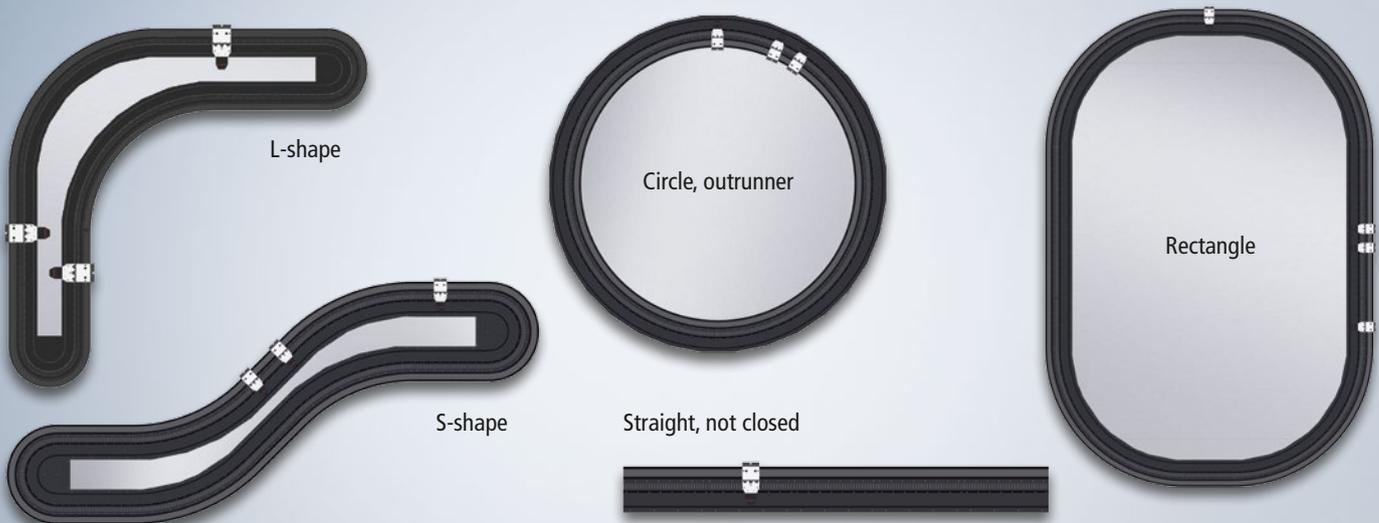
transmission technology is fully integrated into the motor module, so that the existing functionalities and compact set-up are retained.

## XTS with No Cable Technology (NCT)



Contactless energy and data transfer to the XTS movers enables maximum machine flexibility.

## XTS trajectories



The XTS motor modules can be combined as desired.

# Scalable and modular control solutions for packaging machines

With its open, modular and precisely scalable control technology, Beckhoff meets the packaging industry's demand for solutions that are performance-oriented and cost-efficient. You can pick precisely the components you need for your particular type of machine and/or production line from a wide-ranging portfolio of Industrial PCs as well as Control Panels and displays in all performance categories and form factors. EtherCAT, the global standard for real-time communication, offers maximum performance for all components, including those from third-party providers. And the Beckhoff I/O system covers a broad spectrum of sensor and actuator technologies that interface

with many fieldbus systems. For machines being produced in high volumes, Beckhoff EJ modules provide an efficient and compact solution, and TwinSAFE is an integrated safety solution for I/O and motion control applications. Beckhoff's drive technology portfolio ranges from compact servo terminals to powerful EtherCAT drives and servomotors with One Cable Technology to the XTS eXtended Transport System and the eXtended XPlanar planar motor system. TwinCAT integrates the engineering environment and the controller in a single software platform.

For packaging applications in the food, beverage and pharmaceutical industries, Beckhoff offers



Control Panel: multi-touch display and Control Panels



Industrial PC: control cabinet and Panel PCs



Embedded PC: Industrial PCs with integrated I/O level



XTS: eXtended Transport System



EtherCAT I/Os: broad I/O spectrum in IP20 and IP67



Highly dynamic servo drive technology



Servo terminals: compact drive technology



Servo drive with integrated power electronics

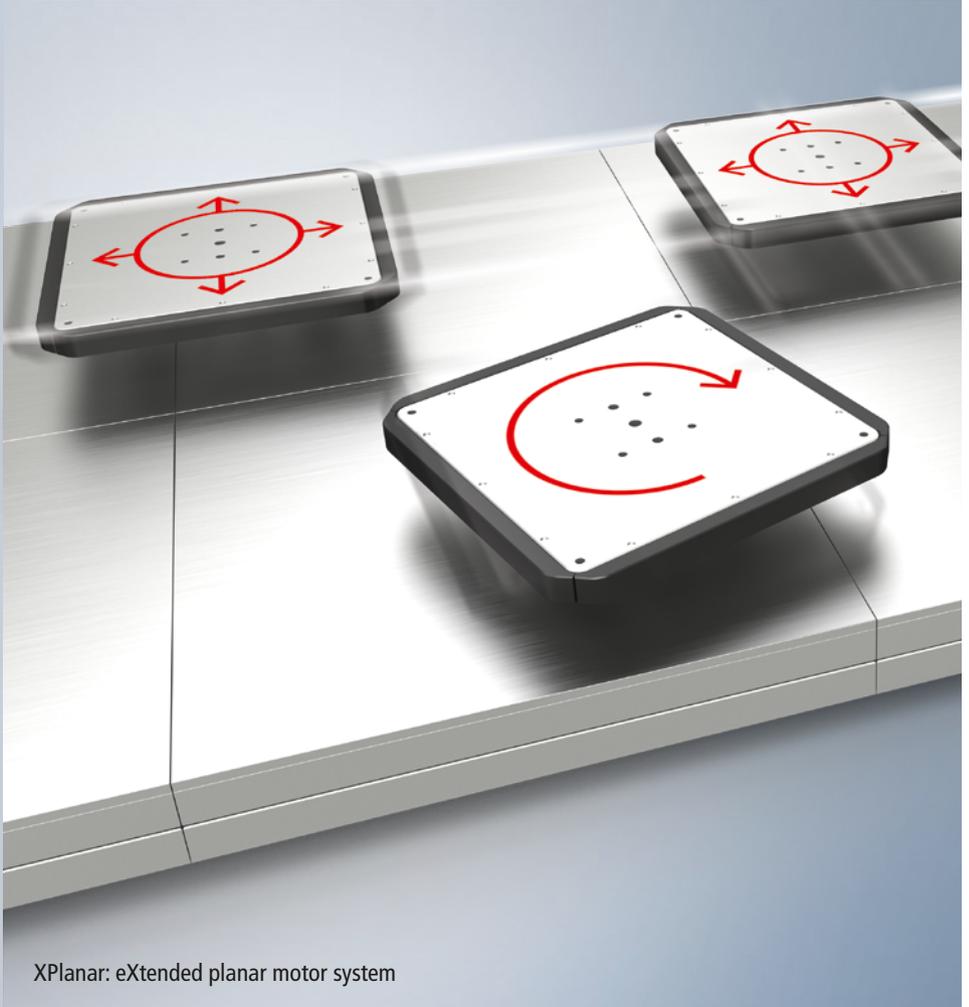
a complete control solution in stainless steel with its hygienic design that meets the strictest sanitary and cleanroom requirements.



XTS Hygienic in stainless steel with IP69K



TwinCAT: software for engineering and runtime



XPlanar: eXtended planar motor system



TwinSAFE: integrated safety solution



Control Panels and Panel PCs in stainless steel



Stainless steel EtherCAT Box in IP69K



Stainless steel servomotor in IP67 or IP69K

# TwinCAT: The integrated engineering and control platform

The TwinCAT 3 automation software integrates all engineering and runtime processes and features a consistent development environment for implementing all control tasks in the packaging industry. Thanks to TwinCAT's support for programming in all common IEC PLC dialects and the integration of C/C++ algorithms and MATLAB®/Simulink®, the machine builder can pick the programming method that works best for his application. TwinCAT's interfaces to machine learning algorithms make it possible to use AI methods in the traditional controller environment. The use of Microsoft Visual Studio® as the standard programming workbench supports different ver-

sion management systems and simplifies team-based programming. For high-volume production applications, TwinCAT features open interfaces for integrating commercial IT systems into the machine program generation process.

Prefabricated packaging software modules for functions like dancer control, cam plate, register control or cross-cutter control as well as support for PackML standards in the latest version of the OMAC specification simplify the engineering and shorten the development and commissioning times.

Extensive TwinCAT libraries for motion control and supplements for various robot kinematics



MATLAB®/Simulink® for  
virtual machine development



TcCom modules encapsulate  
customer know-how



PLC



with tested and optimized algorithms save on development time. You can accelerate and improve commissioning and service procedures with TwinCAT Scope, a software oscilloscope that is fully integrated into the TwinCAT system architecture.

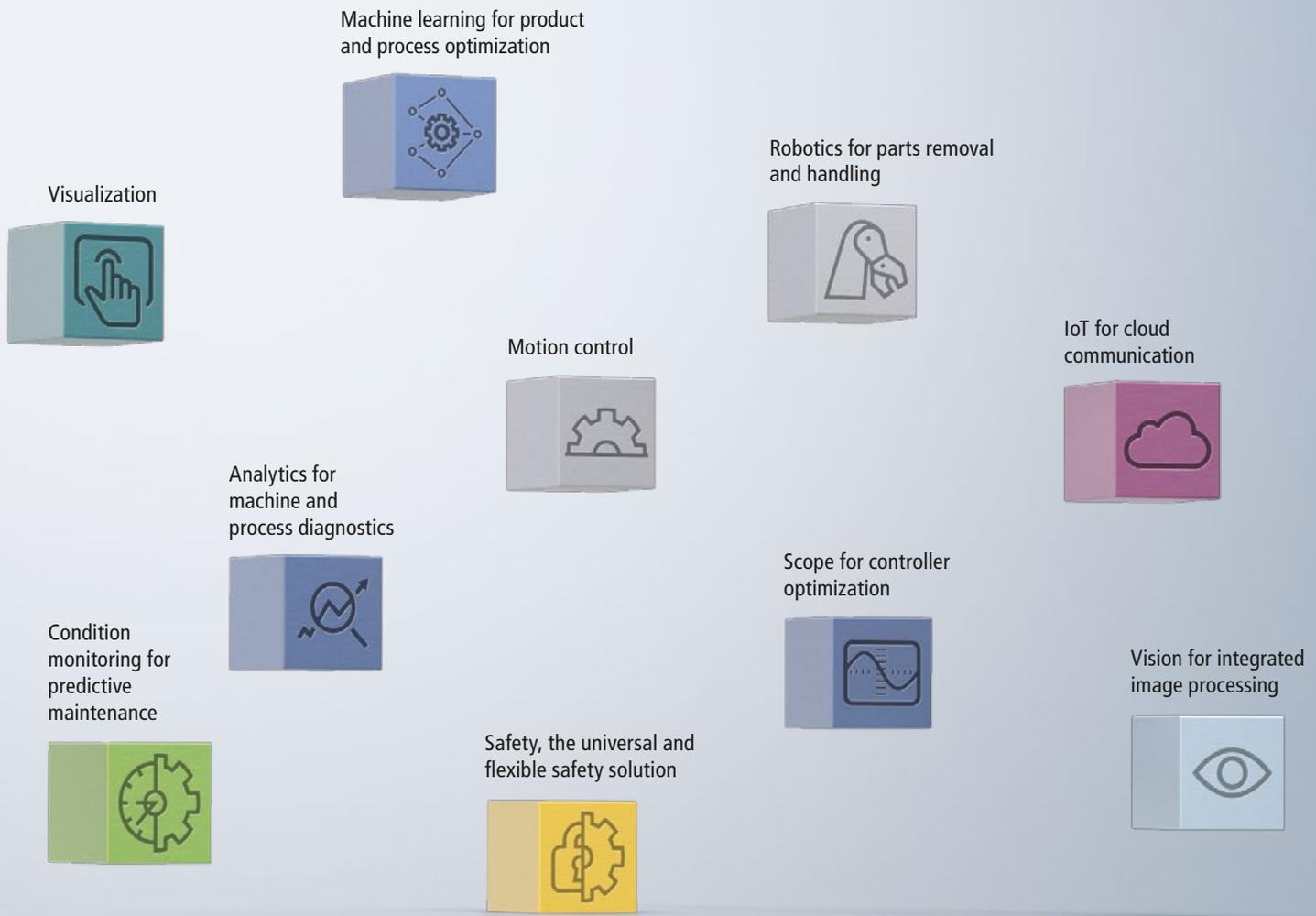
With TwinCAT Vision, images can be processed directly in the unified control platform. Since components like these allow you to perform configuration and programming tasks in a familiar environment, they simplify the engineering process considerably. They also allow you to synchronize all image-derived control functions in real time. Latencies are eliminated, and all image algorithms are executed in real-time.

The software-based TwinSAFE safety technology simplifies the wiring of complex installations because variants can be mapped in software. That way, you can develop and commission production cells module by module, to name just one example.

The integrated, browser-based TwinCAT HMI visualization solution makes it easy to develop and maintain visualization objects and user interfaces. The information is presented on the machines or in a web browser over the internet.

By supporting standardized communication protocols for cloud applications, TwinCAT IoT enables you to aggregate data in the cloud or locally

at the production site. The collected data can then be analyzed with the help of TwinCAT Analytics. And with TwinCAT Cloud Engineering, the well-known TwinCAT engineering and runtime products can be used directly in the cloud.

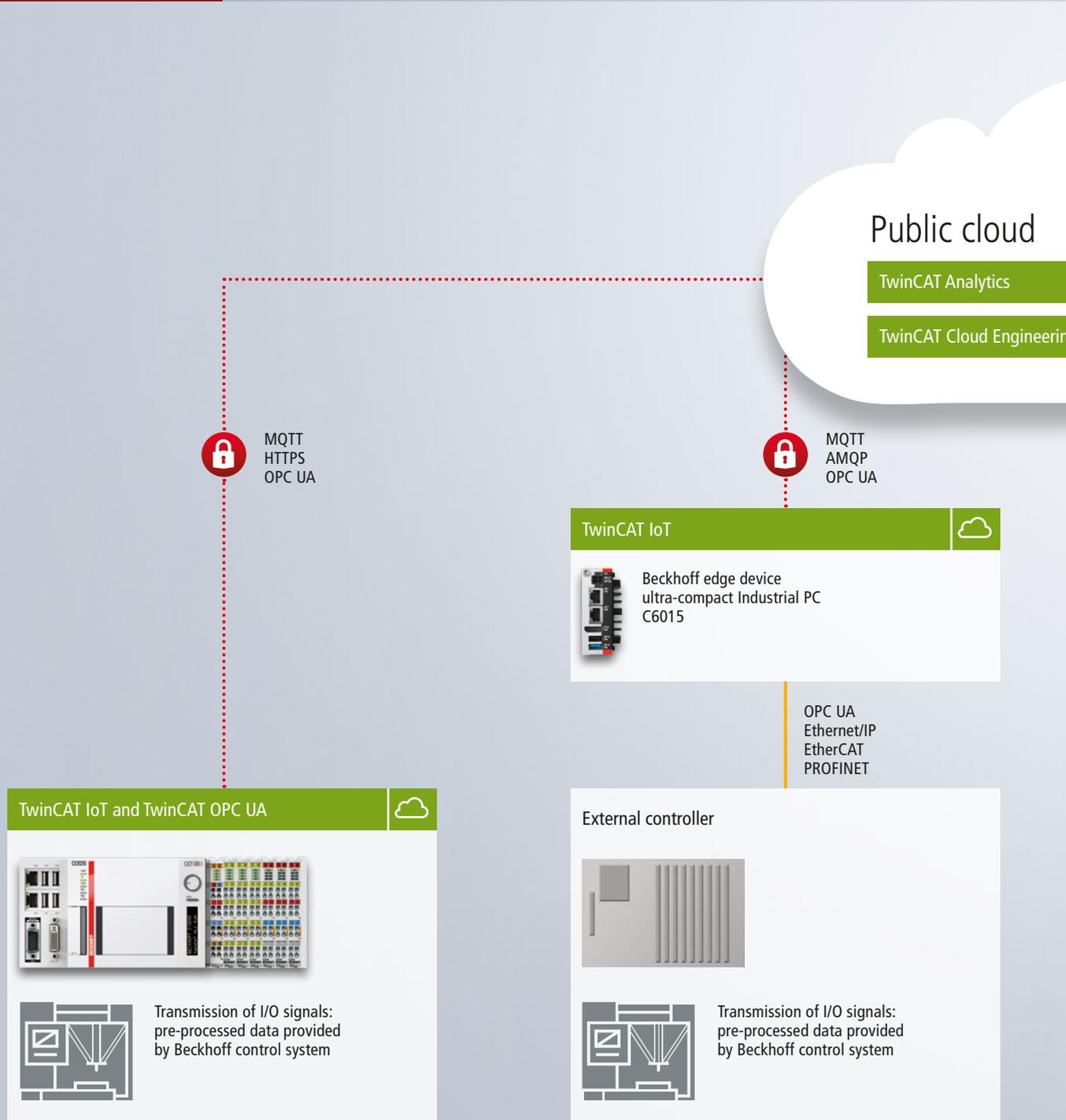


# System-integrated cloud communication and data analysis

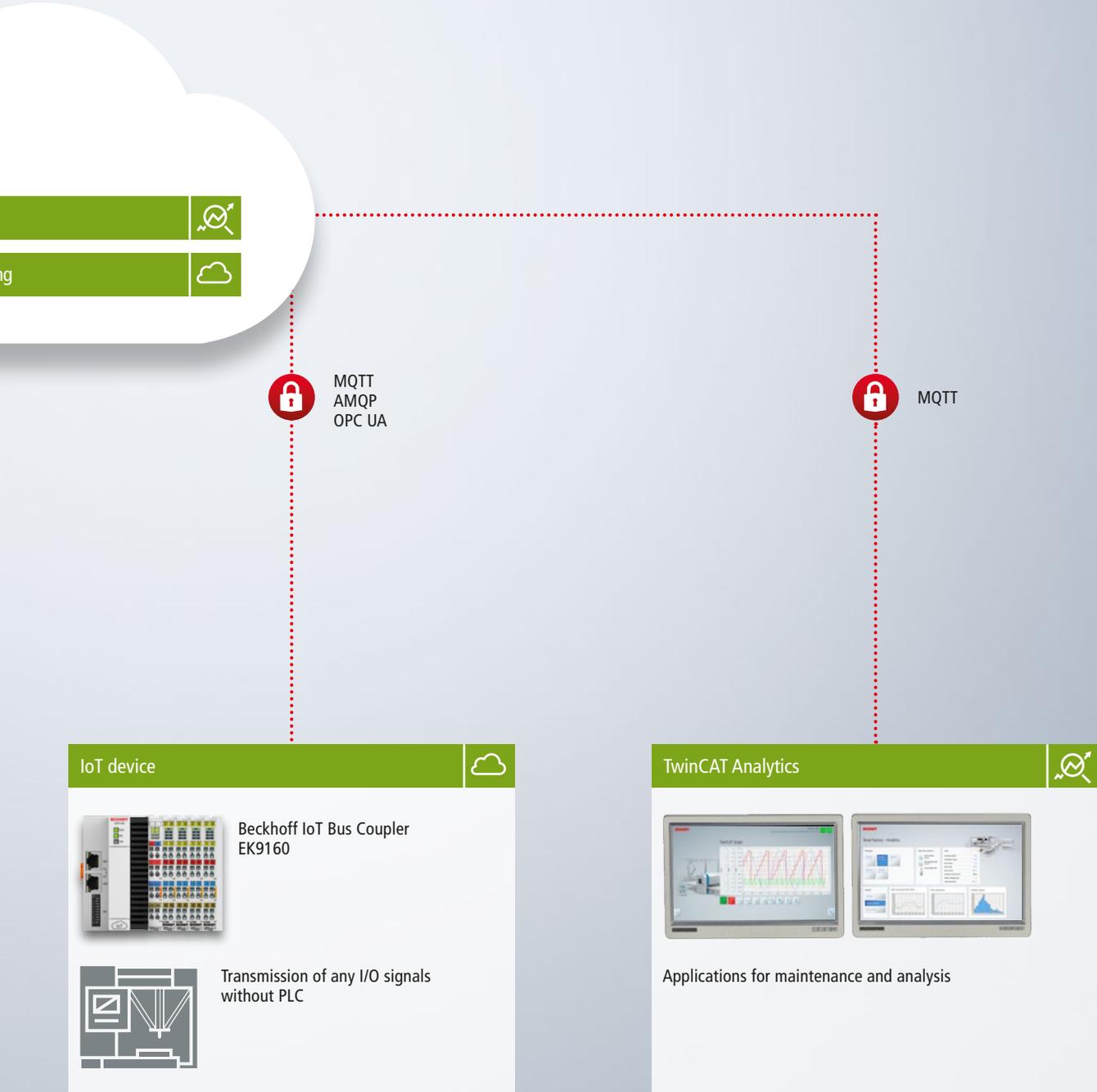
For the communication between machine controllers and cloud-based services, Beckhoff has developed the TwinCAT IoT software library. It supports the standardized OPC UA, AMQP and MQTT protocols for communication with common cloud systems such as Microsoft Azure™, Amazon Web Services and private cloud systems on your corporate network. Built-in security mechanisms prevent misuse of data as a result of unauthorized access and protect your intellectual property.

With TwinCAT Analytics, the process data is recorded and analyzed simultaneously with each machine cycle. It can be used for

predictive maintenance and machine improvements, to name just two examples. With the appropriate tools, you can derive the information you need to improve the machine in terms of its energy usage or process workflow. Post-mortem analysis, intermittent-error diagnostics and the early detection of quality shortfalls and production bottlenecks improve the installation's reliability and availability. The data analysis also provides extensive information about a machine's operating behavior, which can be used to reduce costs and make layouts more efficient by improving future machine design and production procedures.



TwinCAT Cloud Engineering enables the instantiation and use of existing TwinCAT engineering and runtime products directly in the cloud. Easy access is provided via the Beckhoff website, where registered users can generate TwinCAT Cloud Engineering instances. Real control hardware is linked to the TwinCAT Cloud Engineering instance via a secure transport channel. That way, the user gains access to the benefits of the TwinCAT architecture directly in the cloud, which makes it much easier for multiple developers to work together, to name just one of the advantages.



# EtherCAT, the fast fieldbus: Global standard for packaging machines

The EtherCAT technology was launched on the market by Beckhoff in 2003 and made available as an open standard for automation technology. With outstanding performance, flexible choice of topology, comprehensive diagnostics and simple configuration, EtherCAT is ideally suited for use in packaging machines. Beckhoff offers the largest number of EtherCAT-compatible automation modules for I/Os and for drive technology. Using the EtherCAT P standard, the AMP distributed servo drive system is supplied with power and data via a single cable, thus saving mounting space in the control cabinet.

EtherCAT is one of the most widely used standards in packaging technology. A large number of EtherCAT-compatible sensors and actuators are available on the market, which guarantees a high level of investment security. Future TSN implementations will be realized on the basis of the EtherCAT automation protocol.

The fast and high-precision Beckhoff control solution eXtreme Fast Control (XFC) is based on the fast communication network EtherCAT and special I/O modules optimized for XFC that record signals or trigger actions with a high degree of precision. With I/O response times of less than

## EtherCAT®



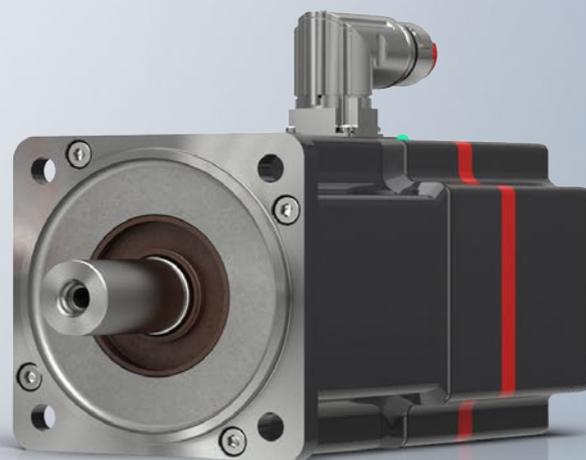
100  $\mu$ s, the system scans the machine's status up to 10,000 times per second for exceptional process control precision and repeat accuracy. This improves the productivity of packaging machines and reduces waste and the consumption of resources.

For high-performance machines and highly complex applications, Beckhoff has introduced EtherCAT G to the market. As an advanced version of the successful EtherCAT principle, it offers speeds ranging from 1 Gbit/s to 10 Gbit/s, which makes it possible to increase the current EtherCAT transmission rate of 100 Mbit/s 100-fold. Both

performance stages represent system-compliant enhancements of Beckhoff's EtherCAT technology – the well-known on-the-fly function principle remains unchanged. And thanks to the branching concept of EtherCAT G, 100 Mbit/s EtherCAT segments can be integrated into the network to reduce throughput times in large networks by processing segments in parallel.



EtherCAT® 



# Highly dynamic drive technology in a compact design

As a supplier of scalable drive technology, Beckhoff offers a broad portfolio of hardware and software for all drive concepts, price classes and application segments. The motion control solutions of the TwinCAT automation software are supplemented by a broad spectrum of servomotors and drive controllers ranging from compact servo drives in terminal format to the AX5000 servo drives for highly dynamic positioning tasks.

The AMP8000 distributed servo drive system breaks new ground in modular machine design. It integrates the servo drive directly into the servomotor, resulting in a highly compact form factor. By relocating the power electronics directly to the

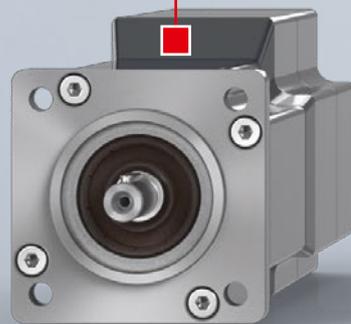
machine, the control cabinet needs to house only a single coupling module that supplies multiple servo drives over a single cable via a distribution module. The result: significant savings in terms of materials, cost, space, and installation effort. A supply module featuring a high protection class can even shift the entire system directly to the machine. With its few components, the AMP8000 system is easy to configure. Only a single type of cable is needed to connect supply modules, distribution modules and drives with each other. No additional components like motor chokes, circuit breakers or filters are needed. All connection and supply modules have an additional

## AMP8805 | Distribution module

- 5 motor outputs
- simple topology
- installation directly on the machine

## AMI8121 | Servo drive with integrated output stage

- compact design
- installation directly on the machine
- for motion requirements in the power range up to 400 W

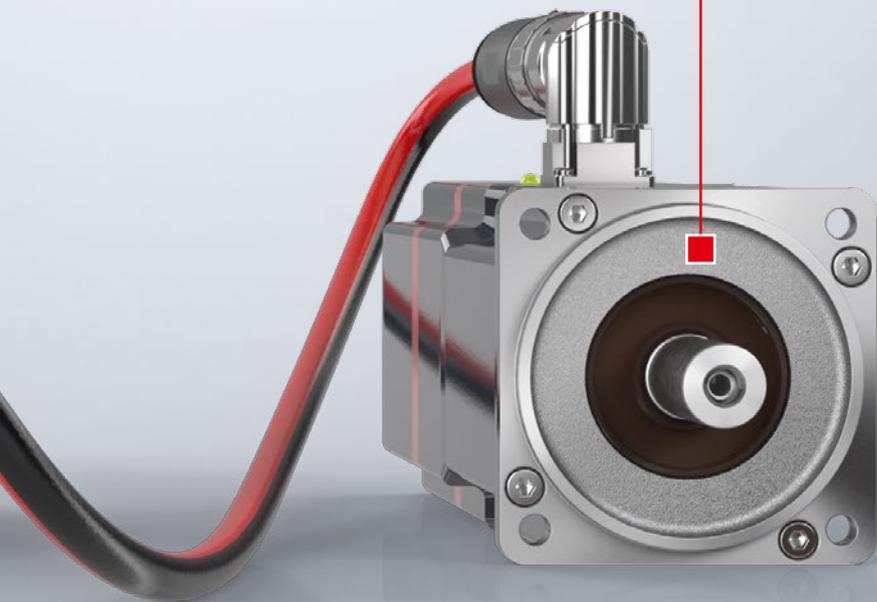


EtherCAT P connector for the Beckhoff I/O portfolio, which simplifies connections to additional inputs, encoders or latch units significantly.

The AMI812x servo drive combines servomotor, output stage and fieldbus connection in a compact design and supports the principle of control cabinet-free machines. Pooling the individual components in a single system results in a connection level with all interfaces directly on the drive, which eliminates the need for an upstream I/O level.

### AMP8000 I Distributed servo drive system

- compact design
- installation directly on the machine
- saves material, space and cost



Packaging solutions  
from Beckhoff:  
Highly efficient,  
flexible and  
eco-friendly

Syntegon Packaging  
Systems AG, Switzerland



High performance  
packaging systems  
for the food industry

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PC-based control optimizes  
robot-based packaging line.

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Highly efficient,  
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The compact Shiseido machine for closing cosmetics containers is based on XTS technology.

- ▶ [www.shiseidogroup.com/emea](http://www.shiseidogroup.com/emea)
- ▶ [www.unista.fr](http://www.unista.fr)



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KOCH Pac-Systeme GmbH,  
Germany

The XTS is used at the core of a labeling and grouping unit in a blister packaging line for toothbrushes.

- ▶ [www.koch-pac-systeme.com](http://www.koch-pac-systeme.com)

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TwinCAT robotic kinematics  
and Beckhoff servo drive  
technology for food packaging

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XTS boosts flexibility for a pill  
bottle cap assembly line.

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# Packaging solutions from Beckhoff: Highly efficient, flexible and eco-friendly

Optima Packaging Group,  
Germany



Ultra-compact Industrial PCs as  
flexible edge devices expand digitaliza-  
tion options for drug filling systems

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Brenton, USA



Pizza case packer with XTS  
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Packfeeder, Spain

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