**BECKHOFF** New Automation Technology

# PC-based Control
# for the Rubber and Tire Industries

IPC

I/O

Motion

Automation

IPC                    I/O                Motion              Automation

# PC-based control: Strengthen your competitive edge in rubber and tire production …

Beckhoff has been developing PC-based automation and control solutions for over 30 years. As a globally operating company, with headquarters and production facilities in Verl, Germany, the company employs more than 2700* staff worldwide. A total of 34* subsidiaries and distributors extend the company's global reach, providing representation in more than 70 countries.
Continuous technological development, economic growth, high-level vertical integration, and extensive production capacities ensure long-term availability and delivery reliability for our customers. Robust, industry-proven components, coupled with over 20 years of experience in rubber and tire application areas, make Beckhoff a competent, reliable partner and valuable engineering asset to manufacturers in this industry.

* as of 11/2014

# … with customised automation solutions.

PC-based control technology provides a wealth of benefits, necessary to satisfy global market requirements in the rubber and tire industries: increased production speed and product quality, high system availability and optimised energy efficiency, all with lower total costs. Suitable for both centralised and distributed control architectures, high-performance Industrial PCs offer central intelligence for controlling and monitoring the whole system, including visualisation, Motion Control, safety, and measuring tasks. In expansive systems, the fast EtherCAT industrial Ethernet system also enables solutions with distributed I/Os. Thanks to the modularity and scalability of the individual components, it is possible to create a wide range of customised, cost-effective solutions. Examples include integrated automation of new production lines, control system retrofits of existing machines, as well as application of individual components or system solutions.

▶ **www.beckhoff.com/rubber**

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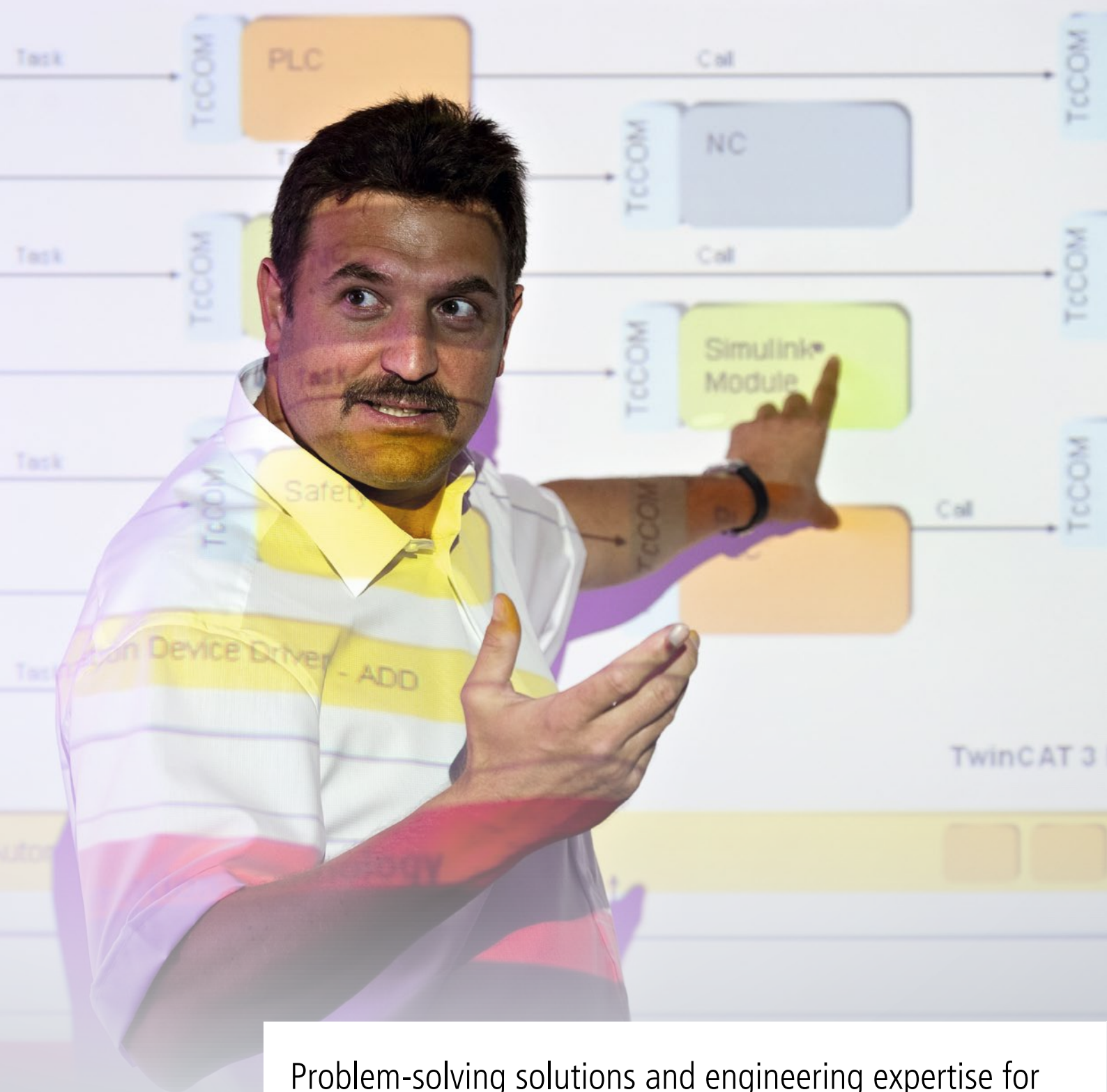
# Problem-solving solutions and engineering expertise for your industry …

Through many years of close cooperation with machine manufacturers and customers in the rubber and tire industries, Beckhoff has developed sound application expertise and delivers problem-solving solutions. Our team of knowledgeable experts provides advice and support throughout, from control design, to control cabinet construction, and ultimately the realisation and commissioning of your machine. Robust control component design ensures reliable 24/7 operation even in harsh production environments with high temperatures and high levels of contamination.

# … supporting you around the world every day.

Beckhoff is your reliable partner for consulting, technical support and services, offering a strong industry management team in Germany, as well as local experts worldwide. Beckhoff also has well-established industrial experience in building control cabinets for the tire and rubber industries. The Beckhoff Engineering department manufactures control cabinets to exacting end customer specifications and standards: significant flexibility can be found in the components used, and their location in the control cabinet, in addition to air conditioning and ventilation choices as well as equipment labelling and logistics support.

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# Highly integrated PC-based automation technology …

The Beckhoff product range includes high-performance Industrial PCs, an extensive range of I/O and fieldbus components, highly dynamic drive technology, and the universal TwinCAT automation software platform. Using state-of-the-art processor architectures in combination with the high-speed EtherCAT communication system, the PC-based control system provides the performance required to map all automation functions on one centralised CPU: safety technology, measurement technology, condition monitoring, and robotics can all be integrated into the controller, in addition to sequential control tasks, Motion Control, and visualisation. The openness of PC Control, with regard to IT standards and interfaces, enables seamless interfacing with higher-level MES and ERP systems.

## … optimises efficiency and reduces costs throughout the enterprise.

As a high-performance control platform for the whole production process, ranging from the field level to drives and the command level, PC-based Control ensures optimum system communication and efficient production processes. TwinCAT, the integrated automation software platform from Beckhoff, simplifies engineering and commissioning, reducing costs at the same time. The integration of measurement technology and Condition Monitoring improves process quality, reduces resource consumption, and increases machine availability through continuous monitoring and intelligent diagnostics. TwinSAFE provides an EtherCAT-based, decentralised safety solution: Distributed safety devices such as emergency stop buttons or light curtains are integrated in the central control system via safe EtherCAT I/O modules, minimising cabling times and costs.

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# Open and modular control technology ensures flexibility …

The "fieldbus-neutral" Bus Terminals and high-performance EtherCAT Terminals are available for over 400 different signal types, with varying I/O channel density from 1 to 16 channels. Beckhoff supports all common fieldbus systems, including EtherCAT, PROFINET, EtherNet/IP and CANopen. The Beckhoff Bus Terminal system offers machine manufacturers the highest degree of flexibility and openness, enabling machines to be designed in an identical manner at the field level. When changing the fieldbus system, only the fieldbus connection has to be changed – this is a big advantage in view of the increasing globalisation of the tire industry.
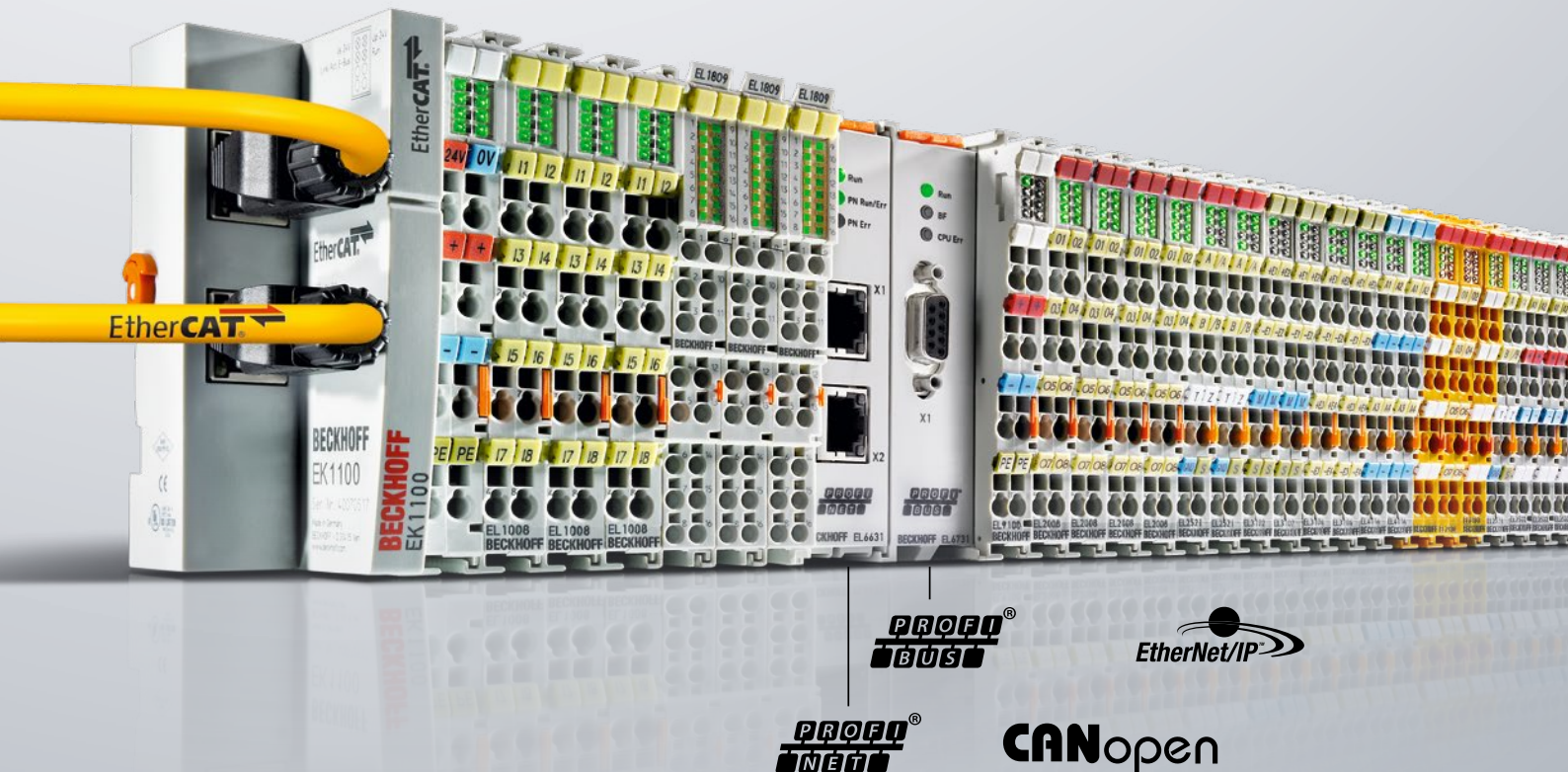
# … and secures your competitive edge in production.

Measurement technology is becoming much more important for compliance with higher quality standards – and not just in final tire testing, but also during earlier production stages. High-precision control processes and high-precision measurement applications, e.g. with a resolution of 24 bits and an accuracy of 0.01 %, can be directly implemented with the comprehensive Beckhoff I/O system. Standard measuring terminals can be simply integrated into the Bus Terminal row and – with the acquired data processed by the PC control system – without without the need for additional hardware. Complete tracking of the tire throughout the entire production process is possible with integrated interface modules for RFID and barcode readers. Interfacing of database systems is handled by the TwinCAT Database Server.

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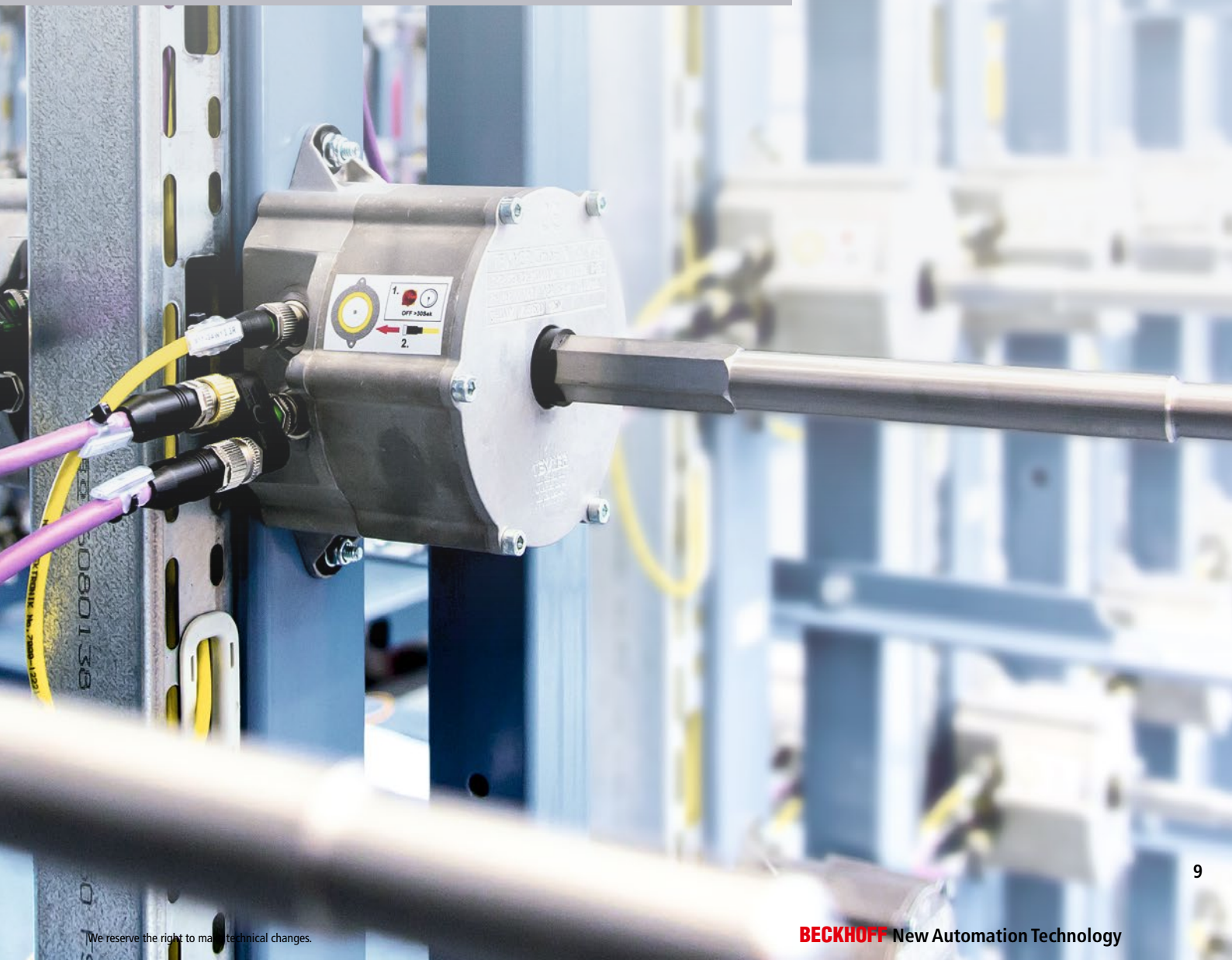
# Preparation and tire building
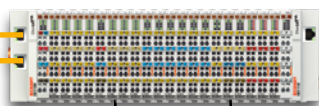
Ethernet

TwinCAT PLC/NC

Control Panel

DVI/USB
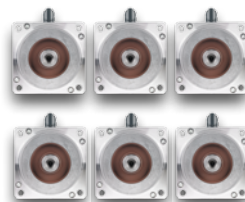
Industrial PC

EtherCAT Terminals

Servomotors

EtherCAT

Servo Drives

Servomotors

**Preparation and tire building**
Together with TwinCAT software modules, high-performance Industrial PCs and Control Panels form the control platform for the Beckhoff Motion Control system. Servo technology from Beckhoff not only supports electronic motor identification plates for plug-and-play capability, but also advanced safety functions. Drive parameterisation and parameter storage are completely integrated into TwinCAT. Servomotors can be cost-effectively connected via "One Cable Technology" (OCT) from Beckhoff, which combines power supply and feedback signals in one standard motor cable. For adjustable axes with absolute encoders, Beckhoff also offers servomotor terminals as an exceptionally compact solution for the I/O system.
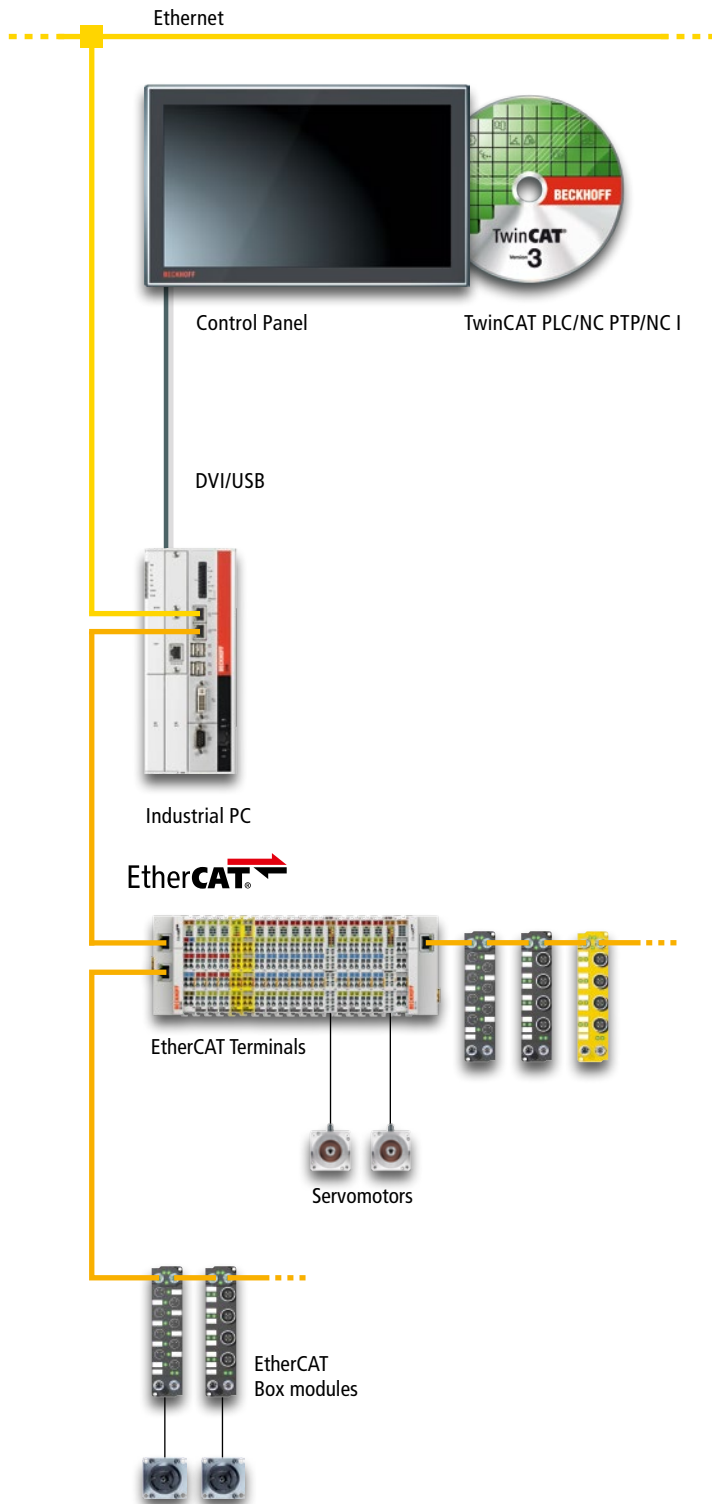
# Curing

TwinCAT PLC/NC

Control Panel

DVI/USB

Industrial PC

EtherCAT®

EtherCAT Terminals

EtherCAT Box modules
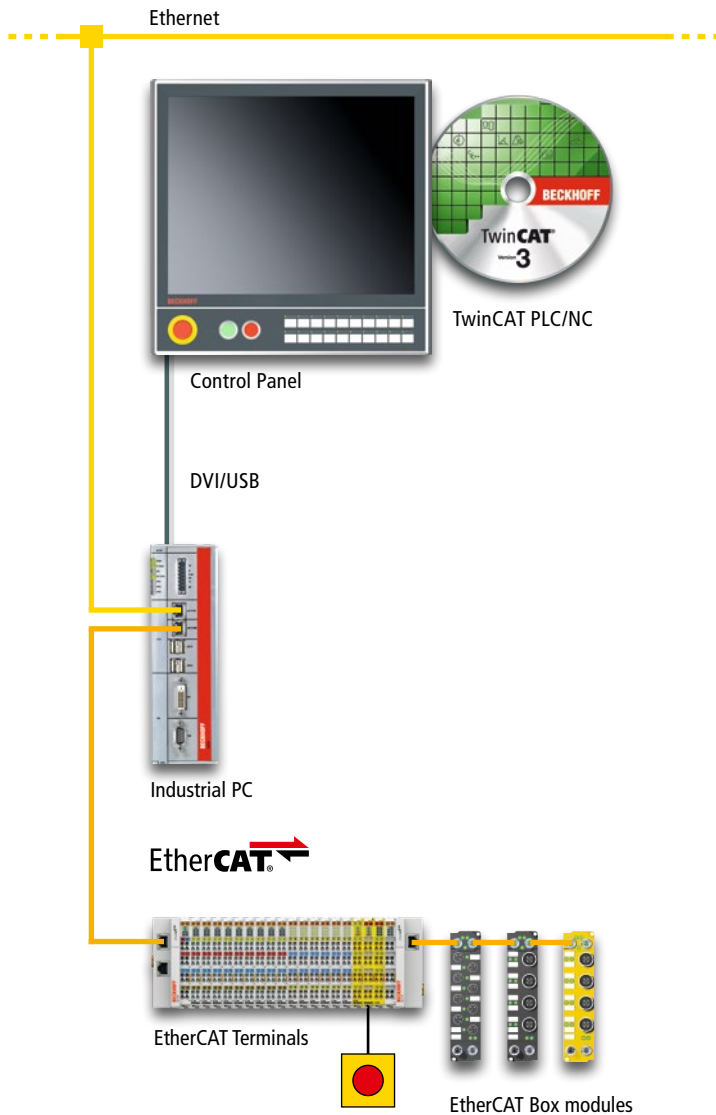
## Curing

Robust Beckhoff Control Panels can be used by operators for monitoring and fast control of pressure and temperature in curing applications. These rugged industrial displays are designed for use in tire and rubber production facilities and feature protection class IP 65, a PLC function keypad on the side, and a special film to protect the electronics against harsh environmental influences. In addition, Beckhoff offers IP 67-rated I/O modules for standard and safety signals, Bus Terminals with extended operating temperature range, and highly precise, calibrated temperature measuring terminals, representing the ideal system for heating press controllers. The basic software for hydraulic and mechanical curing presses and the TwinCAT controller toolbox help manufacturers maintain a faster time-to-market. Archiving production data is possible using built-in mass storage, network connectivity, and direct database connectivity from the PLC.

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# Conveyor systems and material handling

Ethernet

Control Panel

TwinCAT PLC/NC PTP/NC I

DVI/USB

Industrial PC

EtherCAT
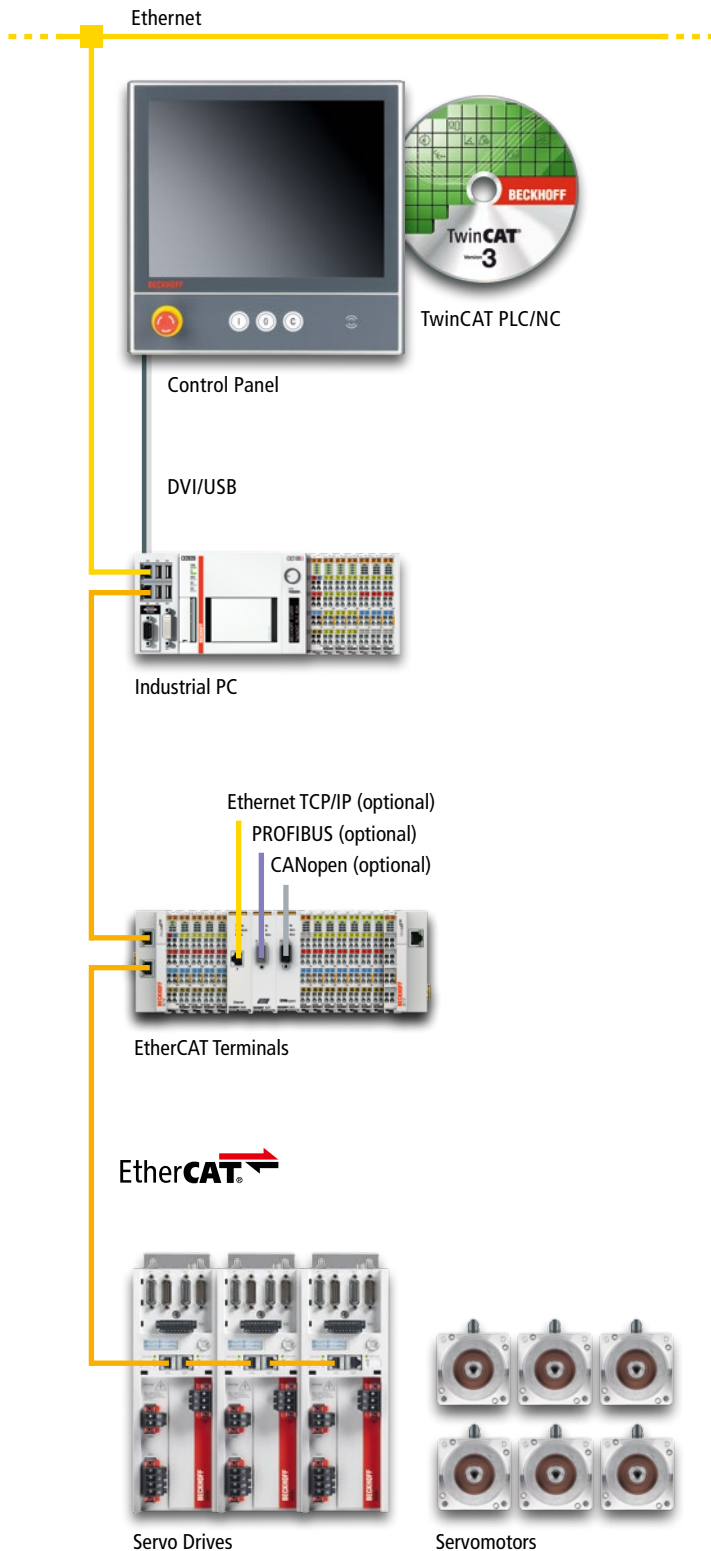
EtherCAT Terminals

Servomotors

EtherCAT
Box modules

**Conveyor systems and material handling**
Local EtherCAT Terminal I/Os are ideally suited
for application in extensive conveyor lines
for transporting tires from the machine to
downstream processing stations. EtherCAT enables
implementation of large systems, with distances
of up to 100 m between individual I/O stations.
The cable redundancy offered by EtherCAT ensures
high system availability. Local drive concepts
commonly found in conveyor systems can be easily
integrated into the central control system, thanks
to the multi-fieldbus capability of the Beckhoff
automation platform. Hardware components such
as scanners, RFID units or camera systems for
product tracking are controlled via gateways and
interfaces. The distributed TwinSAFE safety system
replaces hard-wired safety systems. The safety
terminals read the safe signals from the system
and reliably transfer data to the PC, based on the
Safety over EtherCAT protocol.

We reserve the right to make technical changes.

# Final inspection

Ethernet

TwinCAT PLC/NC

Control Panel

DVI/USB

Industrial PC

Ethernet TCP/IP (optional)
PROFIBUS (optional)
CANopen (optional)

EtherCAT Terminals

EtherCAT

Servo Drives          Servomotors

## Final inspection

Beckhoff Control Panels with multi-touch-capable screens and mechanical keypads, along with high-performance and expandable Industrial PCs, EtherCAT I/Os with gateways to lower-level fieldbus systems, TwinCAT for the control of machine processes and motion, and TwinSAFE for machine safety, combine to create the ideal foundation for advanced test and inspection machines. Sequential control and measuring functions are performed on a single platform. Through support of C/C++ and MATLAB®/ Simulink®, TwinCAT 3 opens up a wide range of application options in test and measurement applications.

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# TwinCAT, the universal automation platform …

TwinCAT, the open and scalable automation software platform, leverages industry-standard Windows operating systems and forms the heart of PC-based Control. It replaces conventional PLCs and motion controllers, transforming almost any compatible PC into a real-time controller with multi-PLC performance, NC axis control, a programming environment, and operator interface. Connectivity to all common fieldbuses and PC interfaces is supported. A wide range of software function blocks and libraries facilitate improved engineering. With the integration of Microsoft Visual Studio®, TwinCAT 3 offers an even greater degree of programming freedom: In addition to the object-oriented extensions of IEC 61131-3, C and C++ as well as MATLAB®/Simulink® are also available as programming tools for real-time applications. Thanks to the multi-core capability of TwinCAT 3, there are virtually no limits to further extend the automation functions of PC Control.

▶ **www.beckhoff.com/TwinCAT**

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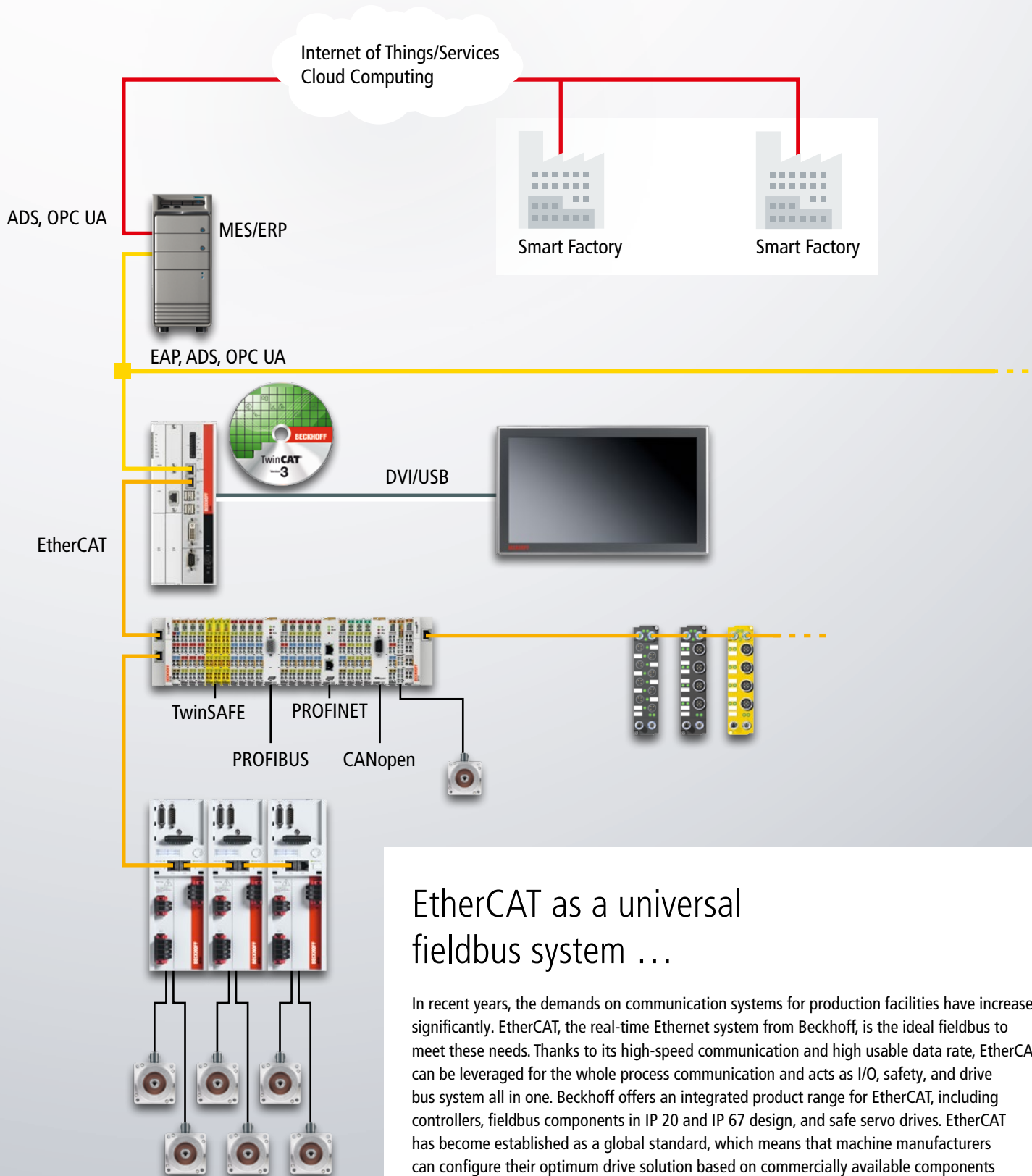
# … for greater efficiency in engineering.

TwinCAT provides a universal and uniform engineering environment, enabling machine manufacturers to solve the toughest control challenges. The high degree of integration in TwinCAT shortens development and commissioning times, since only one tool needs to be used. Comprehensive TwinCAT libraries with control algorithms such as cam and hydraulic controls, flying saw, and cam plates simplify programming. Various motion functions cover all requirements of the tire industry: in addition to linear master-slave couplings with variable coupling factors, it is also possible to realise more complex, graphically editable cam plates. The measuring probe function integrated in TwinCAT enables extremely precise position and length measurement of materials.

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Internet of Things/Services
Cloud Computing

Smart Factory

Smart Factory

ADS, OPC UA

MES/ERP

EAP, ADS, OPC UA

DVI/USB

EtherCAT

TwinSAFE      PROFINET

PROFIBUS      CANopen

# EtherCAT as a universal fieldbus system …

In recent years, the demands on communication systems for production facilities have increased significantly. EtherCAT, the real-time Ethernet system from Beckhoff, is the ideal fieldbus to meet these needs. Thanks to its high-speed communication and high usable data rate, EtherCAT can be leveraged for the whole process communication and acts as I/O, safety, and drive bus system all in one. Beckhoff offers an integrated product range for EtherCAT, including controllers, fieldbus components in IP 20 and IP 67 design, and safe servo drives. EtherCAT has become established as a global standard, which means that machine manufacturers can configure their optimum drive solution based on commercially available components for integration into their own control architecture. Conventional fieldbus and industrial Ethernet systems, such as PROFIBUS or PROFINET, and corresponding peripherals can be easily integrated via gateways. EtherCAT provides a gateway between industrial I/Os and the standard Ethernet world, and can therefore be used for web-based services and cloud applications.

# … for extremely fast and highly precise control systems.

EtherCAT and the fast control technology based upon it – eXtreme Fast Control (XFC) from Beckhoff – optimise the most diverse areas of application in the tire industry. They provide advantages both in temperature and pressure monitoring during curing, as well as on tire testing machines. The timestamp function of XFC technology permits the highly precise recording of measuring probe events; coupled servo axes are synchronised with high precision via the EtherCAT Distributed Clocks function. Measured values for quality assurance are precisely recorded with oversampling terminals. Fast analog I/Os and TwinCAT control structures handle the control of process pressures as well as the highly precise and fast measurement of temperatures. Dedicated devices normally used in measuring and testing machines can be inexpensively replaced by standard XFC components and integrated into the EtherCAT I/O system.
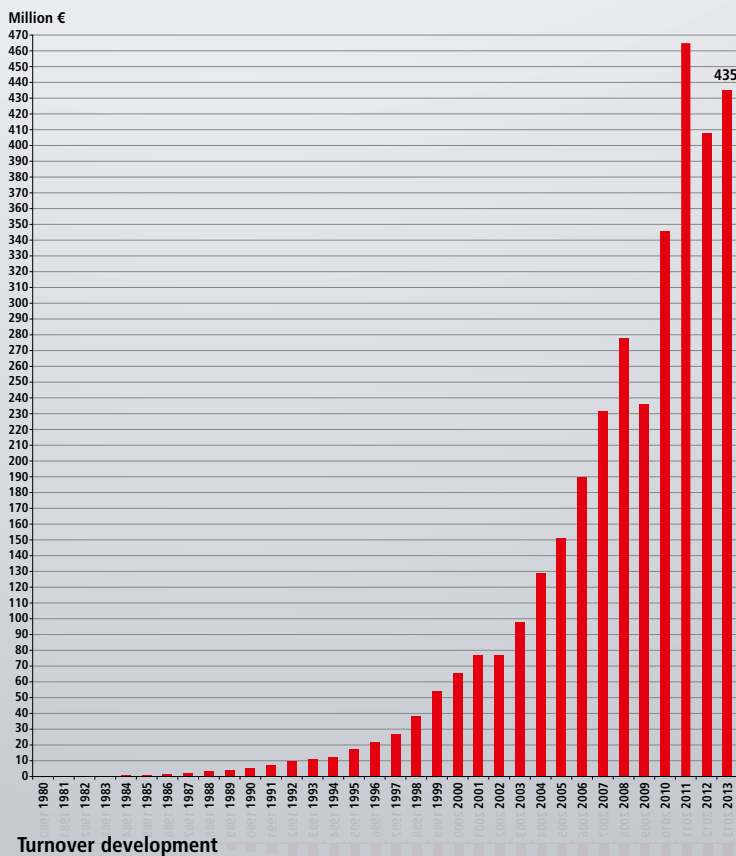
▶ **www.beckhoff.com/XFC**

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# Beckhoff – New Automation Technology

Beckhoff implements open automation systems based on PC Control technology. The product range covers Industrial PCs, I/O and fieldbus components, drive technology and automation software. Products that can be used as separate components or integrated into a complete and seamlessly matched control system are available for all industries. The Beckhoff "New Automation Technology" philosophy represents universal and open control and automation solutions used in a wide variety of applications worldwide, ranging from CNC-controlled machine tools to intelligent building automation.

▶ **www.beckhoff.com**

# Beckhoff at a glance

- Headquarters Verl, Germany
- Turnover 2013: 435 million euros
- Staff worldwide: over 2,700
- Branch offices Germany: 11
- Subsidiaries/branch offices worldwide: 34
- Representation worldwide: in more than 70 countries

(as of 11/2014)

**Million €**

435

**Turnover development**

NORTH AMERICA

Seattle
Minneapolis
North Fond du Lac
Montreal
Milwaukee
London
Mississauga
Chicago
Detroit
Boston
Denver
Mechanicsburg
San Francisco
Los Angeles
San Diego
Rogers
Raleigh
Charlotte
Atlanta
Austin
Dallas
San Luis Potosí

Bogotá
Quito
Lima
SO
Santiago

# Worldwide presence on all continents

The worldwide presence of Beckhoff in more than 70 countries ensures fast service and support for globally operating customers in their local language. Moreover, geographical proximity helps us develop an in-depth understanding of the technical challenges our customers are faced with around the world.

# Further information

The web page, "PC-based Control for the Rubber and Tire Industries" offers further information, such as application reports and industry-specific solutions.
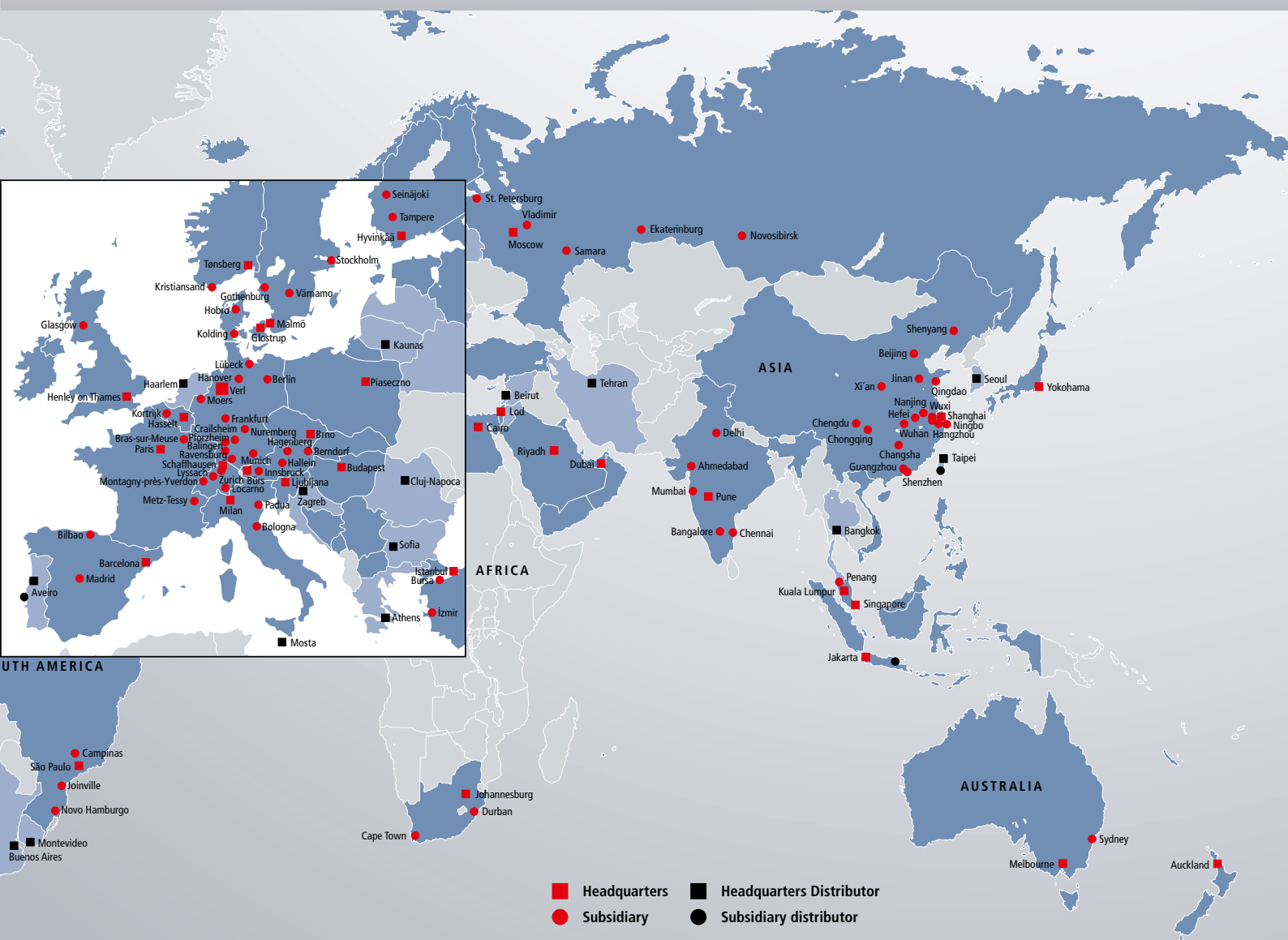
▶ **www.beckhoff.com/rubber**

Beckhoff catalogs and flyers are available for download on the company website.

▶ **www.beckhoff.com/media**

**Map legend:**

- ■ Headquarters
- ● Subsidiary
- ■ Headquarters Distributor
- ● Subsidiary distributor

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www.beckhoff.com/contact