BECKHOFF New Automation Technology

News

01'2025



TwinCAT Core Boost for greater computing performance in real time



Basic identification and addressing with ID switch



Economy AX1000 servo drives and AF1000 variable frequency drives



TwinCAT PLC++:
Next generation PLC technology



Decentralized and controlcabinet free automation



Vision: Complete and systemintegrated image processing



3 | The IPC Company



6 | The I/O Company



10 | The Motion Company



Discover all our product

and innovations at

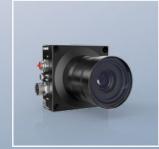
developments, extensions

▶ www.beckhoff.com/product-news

14 | The Automation Company



18 | The System Company



20 | The Vision Company

22 | Beckhoff Automation

The IPC Company

The Industrial PC (IPC) is the hardware centerpiece of PC-based control technology. Beckhoff supplies Industrial PCs suitable for any application, which are based on open standards, enabling individual configuration to meet a wide range of control requirements.

Whether in the form of an Embedded PC with a compact form-factor for DIN rail mounting, a control cabinet PC, or as a Panel PC, in-house motherboard development enables Beckhoff to respond quickly to IT trends and customer-specific requirements.

▶ www.beckhoff.com/ipc

- large model variety of Industrial PCs and Embedded PCs
- high-performance PCs, featuring a wide range of processors, from Intel® Celeron® to top of the line Intel® Core™ i9 processors
- long-term availability of all Industrial PCs and Embedded PCs
- As the inventor of PC-based control technology, Beckhoff closely cooperates with global technology partners Intel and Microsoft.







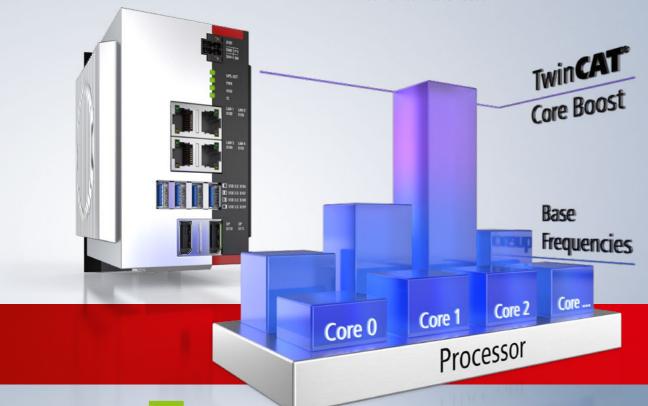


Achieve higher single-core performance with TwinCAT Core Boost

With TwinCAT Core Boost, the clock frequency of individual cores can be set individually. This allows him can be set individually. This allows higher clock frequencies to be achieved without compromising real time. Customers can allocate more resources to time-critical applications themselves, thus enabling faster computation. This reduces the application's cycle times or allows smaller processors to be used, thus cutting hardware and licensing costs.

TwinCAT Core Boost is based on Intel® Speed Shift Technology and can be used with the 11th, 12th, and 13th generations of Intel® Core™ processors in many industrial PCs, e.g. the C603x-0080 ultra-compact industrial PCs. Further PCs will follow, e.g. the C5240, C6640, C6650 and C6675 Industrial PCs with ATX motherboard.

- ▶ www.beckhoff.com/twincat-core-boost
- ▶ www.beckhoff.com/c6030-0080
- ▶ www.beckhoff.com/c6032-0080







Execute AI applications with a small footprint and a graphics card

The C6043 rounds out the ultra-compact industrial PC series with a particularly powerful device featuring the latest Intel® Core™ processors from the 12th and 13th generations. The hybrid architecture of the Intel® Core™ i5, i7, and i9 processors with a combination of performance and efficiency cores enables applications to be implemented on a total of up to 24 real cores.

What's more, the C6043 can also be equipped with an NVIDIA® GPU graphics card ex factory. Available options include the NVIDIA RTX™ A500 from the Ampere generation and the NVIDIA RTX™ 2000 from the Ada Lovelace generation. With up to 3,072 CUDA® cores and up to 8 GB of graphics memory, the NVIDIA RTX™ 2000 offers plenty of parallel computing power. It makes an ideal addition to the processor for machine learning and vision applications.

▶ www.beckhoff.com/c6043

Industrial server for control cabinet installation

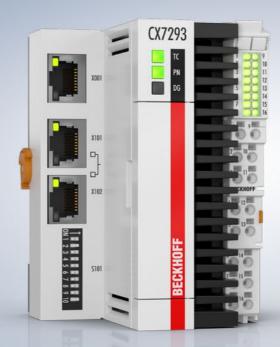
The new C6670-0020 industrial server is equipped with two Intel® Xeon® scalable processors from the 5th generation with up to 32 cores per CPU and a memory of 128 to 1,024 GB DDR5 RAM. This makes it ideal for machine controls with the XPlanar planar motor system. The C6670-0020 can be ordered with M.2 NVMe SSDs up to 640 GB and up to two hard disks with 1, 2, or 4 TB. It also features five free PCIe slots for EtherCAT or Ethernet fieldbus cards or similar.

▶ www.beckhoff.com/c6670-0020

We reserve the right to make technical changes



Embedded PCs for BACnet/IP and PROFINET RT device extend the CX7000 series



- Two new devices with Arm® Cortex®-A9 processor (720 MHz) are added to the
- CX7291: with BACnet/IP
- CX7293: with PROFINET RT device The basic configuration has a slot for a microSD card, an Ethernet interface as well as eight integrated multi-functional inputs and four integrated multi-functional outputs.
- ▶ www.beckhoff.com/cx7291
- ▶ www.beckhoff.com/cx7293

The I/O Company

Beckhoff supplies a complete range of fieldbus components for all common I/O and bus systems. With Bus Terminals offering IP20 protection and Fieldbus Box modules in IP67, a comprehensive range of devices is available for a wide variety of signal types and fieldbus systems. In addition to components for conventional bus systems, Beckhoff offers an integrated product range optimized for EtherCAT. Invented by Beckhoff, this real-time Ethernet solution for industrial automation has global acceptance and is characterized by outstanding performance and simple handling. The result is high-precision machine and plant control and significantly increased production efficiency.

- ▶ www.beckhoff.com/io
- ▶ www.beckhoff.com/ethercat > www.ethercat.org
- comprehensive, modular I/O system for all signal types and fieldbus systems
- universal product range optimized for EtherCAT
- high investment security: mature
 I/O technology based on more than
 years of success in the field
- EtherCAT communication has been proven in practice for 20 years and is a worldwide standard.











High-performance analog I/Os

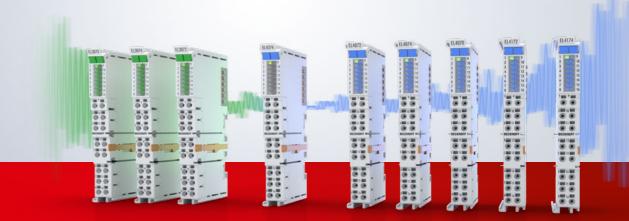
The range of analog multi-functional terminals is extended by the new EL4172 and EL4174 10 V/20 mA outputs, which cover even the most demanding applications.

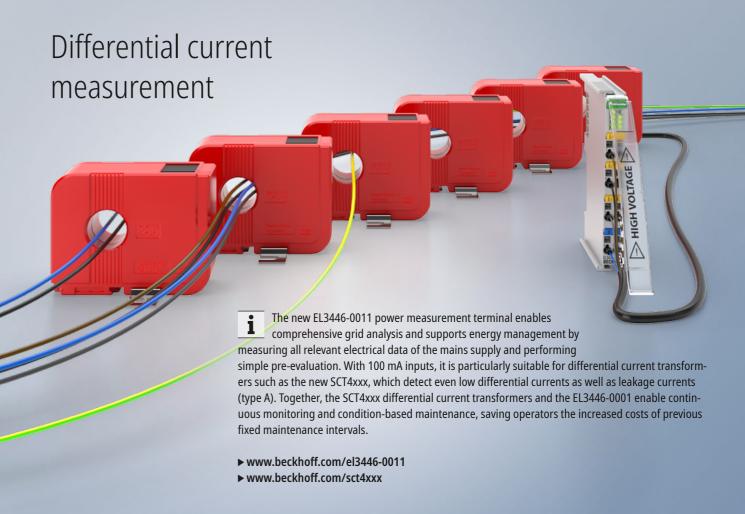
The EL417x series outputs bipolar signals of ± 10 V and ± 20 mA with a measuring range of 107%, enabling the transmission of atypical setpoints such as error information. Thanks to their powerful self-supply, the terminals drive current loads of up to 750 ohms. For the first time, analog feedback measurement via EtherCAT provides feedback on overloads, cable breaks or short circuits.

Each output can be parameterized individually and, with 16-bit resolution and 10 ksps, also supports dynamic positioning processes via distributed clocks. The EL4172 compensates for voltage drops in 4-wire mode and offers galvanically isolated channels for applications with potential differences.

The EtherCAT Terminals of the EL3x7x and EL4x7x families thus offer versatile solutions for basic to demanding applications.

- ▶ www.beckhoff.com/el307x-el4x7x
- ▶ www.beckhoff.com/multi-io







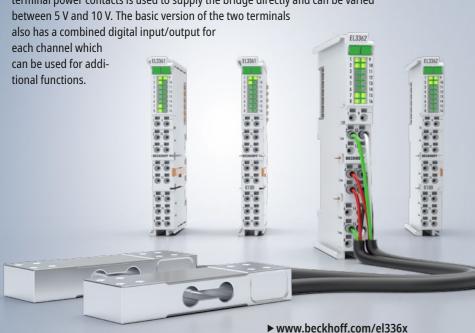
Basic identification and addressing with ID switch

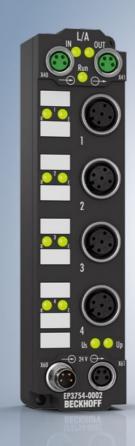
In modular, often dynamic systems such as hot connect groups, individual devices within a network must be uniquely addressed. Products with rotary selection switches make it quick and easy to assign addresses that identify the device within the system. The new EtherCAT Box and EtherCAT P Box modules feature three hexadecimal rotary addressing switches. This allows an individual address to be set from 0 to 4095, providing unique identification regardless of mounting position, as is required for some device profiles in certain industries such as the semiconductor industry.

- ▶ www.beckhoff.com/ep-id-switch
- ▶ www.beckhoff.com/epp-id-switch

Optimized weighing technology: Multi-channel measuring bridge detection with integrated power supply

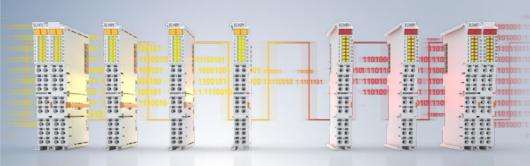
The EL336x and EL336x-0100 series of new weighing technology terminals can be used to directly connect resistance bridges (strain gages) or load cells. 24-bit resolution, a 10-ksps sampling rate, and full bridge support enable precise recording of weights, strains or torques. Integrated voltage generation from the terminal power contacts is used to supply the bridge directly and can be varied between 5 V and 10 V. The basic version of the two terminals





Multi-functional box for analog input signals: Combined functions in a sleek package The EP3754-0002 EtherCAT Box module combines the functionalities of various analog input modules in a single housing. With four inputs which are individually parameterizable via EtherCAT, this multibox module measures and forwards voltage, current, resistance, and temperature values in a 16-bit resolution. Both thermocouples and standard measuring resistors can be used for temperature measurement. In addition to galvanic isolation, adjustable input filters and automatic limit value monitoring, the EP3754-0002 promises flexible applicability and optimized storage thanks to the bundling of functions in the smallest possible space.

▶ www.beckhoff.com/ep3754-0002



Familiar features for maximum flexibility
The new EL14xx and EL24xx EtherCAT Terminals complement the digital

input and digital output portfolio and combine familiar functionality with an optimized circuit architecture. The use of advanced components, among other things, ensures future-proofing and guarantees long-term availability. These product families – now with up to 32 channels – offer maximum flexibility for standard applications with basic functionality.

- ▶ www.beckhoff.com/el1xxx
- ▶ www.beckhoff.com/el2xxx

The Motion Company

In combination with the motion control solutions offered by the company's TwinCAT automation software, Beckhoff Drive Technology provides an advanced, all-inclusive drive system. PC-based control technology from Beckhoff is ideally suited for single-and multi-axis positioning tasks with high dynamic requirements.

The AX5000 and AX8000 Servo Drive series with high-performance EtherCAT communication offer the best-possible performance and dynamics. Servomotors with One Cable Technology (OCT), combining power and feedback systems into one standard motor cable, reduce material and commissioning costs.

▶ www.beckhoff.com/motion

- scalable product range of servo drive technology
- integrated safety technology in compliance with safety performance level PL e, integrated into compact drive technology up to safety performance level PL d
- As the pioneer of One Cable Technology and the eXtended Transport System,
 Beckhoff specializes in manufacturing efficient, space-saving motion solutions.











Economy servo drive for small to medium power ratings

With the AX1000, Beckhoff is expanding its servo drive portfolio with a particularly cost-efficient series in the rated current range from 1.65 to 6.9 A. The AX1000 is available in two different versions: in the low power range with a single-phase supply of 1 x 110 V AC...240 V AC from 1.65 to 6.9 A and in the higher power range with a three-phase supply of 3 x 208 V AC...480 V AC from 3.4 to 6.9 A. Both versions are available as single-axis and dual-axis versions. The devices support AM8000 series synchronous servomotors with One Cable Technology (OCT), as well as asynchronous and reluctance motors. Despite the compact design, power supply, DC link capacitors and ballast circuit are integrated. In addition, the servo drive generates its 24 V control voltage from the DC link, eliminating the need for a power supply.

The AX1000 is fully integrated into TwinCAT via EtherCAT and offers convenient design, commissioning, and diagnostics. Various feedback options enable high precision in demanding applications. All common tools available (Drive Manager 2, Autotuning, Bode Plot or cogning compensation) can be used



Economy variable frequency drive for the entry-level range

In the power range from 370 W to 3 kW, the new AF1000 series variable frequency drive complements the Beckhoff portfolio with particularly cost-efficient drive amplifiers. The compact, highly integrated devices are suitable for implementing drive axes with synchronous, asynchronous and reluctance motors without feedback system. The AF1000 is available in two different versions: with a single-phase supply of 1 x 110 V AC...240 V AC in the power range from 370 W to 1.5 kW and a three-phase supply of 3 x 208 V AC...480 V AC in the power range from 750 W to 3 kW. Both versions are available as single-axis and dual-axis versions. Despite the compact design, power supply, DC link capacitors and ballast circuit are integrated. In addition, the variable frequency drive generates its 24 V control voltage from the DC link, eliminating the need for a power supply.

The AF1000 is fully integrated into TwinCAT via EtherCAT and offers convenient design, commissioning, and diagnostics. As with all Beckhoff servo drives, TwinCAT 3 Drive Manager 2 serves as the commissioning tool.

▶ www.beckhoff.com/af1000



XTS EcoLine motor module: Proven benefits, full compatibility, lower costs

With the XTS EcoLine motor modules, the modular XTS system makes intelligent product handling even more economical. The new modules offer 95% of the technical properties of the proven motor modules with the same claim to reliability and robustness.

The 500 mm XTS EcoLine motor modules are a cost-effective alternative for processes that do not require minimum values for accuracy or product spacing. Thanks to their full compatibility, it is also possible to combine them with the high-precision motor modules of the known design, for example to implement pure transport lines without process stations.

- ▶ www.beckhoff.com/xts-ecoline
- ▶ www.beckhoff.com/at2200
- ▶ www.beckhoff.com/at2202

Standard motor module



systems and servomotors in real time with minimal effort. Precise measurement of vibration, humidity and temperature directly in the motor provides the basis for statistical evaluation with TwinCAT Analytics and effective predictive maintenance. This allows machine conditions and processes to be monitored and any necessary action to be taken in a timely manner to ensure efficient operation and maximum machine

B/SSD uses the proven One Cable Technology (OCT), which eliminates the need for additional sensors and sensor cables and significantly reduces wiring work.

We reserve the right to make technical changes.

Thanks to full integration in TwinCAT Analytics, live data and historical data can be recorded, clearly visualized and processed into valuable information with B/SSD for machine optimization. Vibration measurements can be performed as an average value (RMS), with peak values (Peak) or statistically (Kurtosis) up to 100q.

- ▶ www.beckhoff.com/b-ssd
- ▶ www.beckhoff.com/twincat-analytics

The Automation Company

Beckhoff offers comprehensive system solutions in numerous performance classes for all areas of automation. The control technology is exceptionally scalable – from high-performance Industrial PCs to mini-PLCs – and can be adapted precisely to application-specific requirements. TwinCAT automation software integrates real-time control with PLC, NC and CNC functions in a single feature-filled package.

▶ www.beckhoff.com/automation

- efficient, universal engineering
- programming in different languages
- Open, hardware-independent control system gives freedom of choice in terms of automation and control components.
- scalable control platform from singleto multi-core CPUs
- all control functions on a single, centralized platform: PLC, motion control, robotics, measurement technology, a.o.









TwinCAT PLC++: Next generation PLC technology

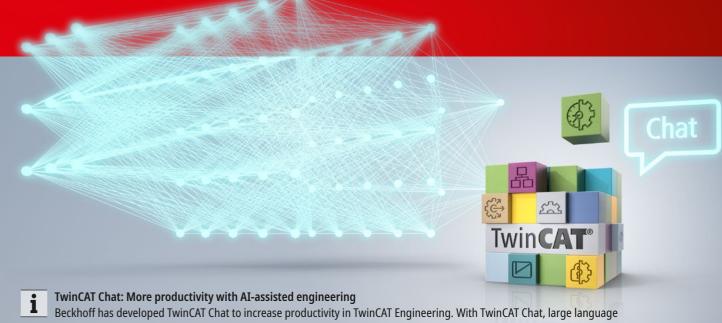


TwinCAT PLC++ is a completely new development from Beckhoff that integrates seamlessly into TwinCAT. TwinCAT PLC++ is based on the languages described in IEC 61131-3. Thanks to the advanced compiler technology and the new architecture used, a significant leap in engineering and runtime performance can be achieved.

This way, Beckhoff is consistently pursuing the principle of merging automation and IT. Although the company has retained familiar and proven features, it has redeveloped key components of the development environment such as editors and compilers based on IT models.

What's more, Beckhoff has placed particular emphasis on the possibility of using DevOps principles to implement continuous integration and continuous deployment, focusing on the specific needs of users. This results in a PLC that is not only technically extremely advanced, but also optimally tailored to practical requirements with increased user-friendliness and deep embedding in the TwinCAT world.

▶ www.beckhoff.com/twincat-plcpp



models (LLMs), such as ChatGPT by OpenAI, can be used to develop a TwinCAT project quickly and conveniently. Various tasks, from code creation to code revision/optimization to documentation, are performed efficiently. The code generated by the LLMs can also easily be integrated into existing engineering projects and used immediately. TwinCAT Chat also offers direct access to Beckhoff documentation and creates HMI controls independently. This plays a crucial role in designing and configuring user interfaces in the engineering process.

TwinCAT Chat thus reduces the time, costs, and resources needed and simplifies the engineering workflow.

▶ www.beckhoff.com/twincat-chat

i Product announcem

For availability status of the new products see Beckhoff website at: www.beckhoff.com



TwinCAT Machine Learning Creator: Fully automated from the data to the AI model

The TwinCAT 3 Machine Learning Creator automatically creates AI models based on data sets. These AI models can be optimized in terms of their accuracy and latency to ensure they run efficiently on Beckhoff Industrial PCs with TwinCAT products. The generated models can also still be used as standardized ONNX models beyond the Beckhoff product range. For use with TwinCAT products, a PLCopen XML with IEC 61131-3 code is created in addition to the ONNX file, which describes the complete AI pipeline and can be imported

seamlessly into TwinCAT.

The no-code development platform enables non-AI experts to efficiently develop highquality AI applications. The Creator automates time-consuming AI development processes, even for data scientists, standardizes the creation of AI models in the company, and uses state-of-the-art AI methods from the field of AutoML (Automated Machine Learning).

The development tool for AI applications provides extensive and transparent methods for displaying the behavior of the AI models created and comparing them with each other. The ability to generate automated reports supports auditing processes for AI model

- ▶ www.beckhoff.com/te3850
- ▶ www.beckhoff.com/machine-learning





Linux®-based real-time control with TwinCAT

With the TwinCAT Runtime for Linux®, Beckhoff is opening up new application possibilities for real-time control. In the future, several TwinCAT Runtimes will be able to be execute on one industrial PC for the first time, enabling users to combine different system parts on one large computer, for example. This simplifies both programming and diagnostics.

TwinCAT Runtime for Linux® is based on Beckhoff's own Linux® distribution, which expands the choice of operating systems in addition to Windows and TwinCAT/BSD. Initially, the new CX82x0 and CX9240 Arm®-based Embedded PCs will be offered with Linux® runtime. The Beckhoff Linux® distribution will then be successively rolled out for all new industrial and embedded PCs.

▶ www.beckhoff.com/linux

Virtual PLC with Beckhoff

In conjunction with the EK1000 EtherCAT Coupler, the TwinCAT Runtime for Linux® enables the implementation of a virtual PLC. Several TwinCAT runtimes can be operated as a container on a server PC in a data center in a resource-efficient and lightweight manner. Communication with the EtherCAT segments takes place via EtherCAT over Ethernet.

▶ www.beckhoff.com/virtualplc

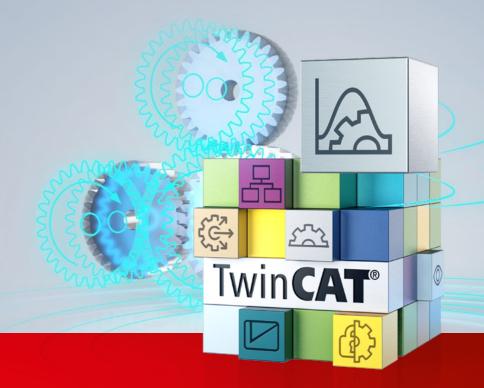
Next generation of motion control with TwinCAT MC3

Motion control is an established and essential component of TwinCAT and is successfully used in many projects across industries.

TwinCAT MC3 is the next generation of motion control. All the successful features of the previous TwinCAT NC2 motion control solution are also present in the latest generation of the TwinCAT MC3. TwinCAT MC3 is thus fully integrated into the TwinCAT system. Axes continue to be abstracted so that programming is independent of the hardware and axes can be simulated.

However, the new modular architecture of TwinCAT MC3 is a crucial advantage. This includes multi-core and multi-task support with the option to synchronize movement across all CPU cores. In addition, there is no longer a fixed limit on the number of axes in the new generation. These vital features make TwinCAT MC3 a high-performance tool in the motion software solution field.

▶ www.beckhoff.com/twincat-mc3





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High-performance CNC solutions for EDM and additive manufacturing

Beckhoff simplifies the specific specif Beckhoff simplifies the specific applicafield of electrical discharge machining (EDM) and additive manufacturing with two new functions and two additional technology packages:

TF5262 TwinCAT 3 CNC Online Adaption enables the implementation of customerspecific interpolation functions in C++ and their integration into the real-time stack of the TwinCAT CNC via TcCOM interfaces.

TF5263 TwinCAT 3 CNC Extended Interpolation allows two independent interpolation paths to be programmed within a CNC channel (twopath programming) and provides functions for synchronization and compensation of the paths.

The technology package TF5291 TwinCAT 3 CNC AM Plus extends TwinCAT CNC with functions for predictive control of external processes, as is usual in additive manufacturing.

TF5292 TwinCAT 3 CNC EDM Plus is a special technology package that combines the functions of TF5262, TF5263 and TF5291 and thus provides the optimum basis for PC-based control of sophisticated wire-cutting and die-sinking EDM machines.

- ▶ www.beckhoff.com/tf5200
- ▶ www.beckhoff.com/tf5262
- ▶ www.beckhoff.com/tf5263
- ▶ www.beckhoff.com/tf5291
- ▶ www.beckhoff.com/tf5292

The System Company

For the first time in machine and system engineering, the MX-System enables completely control cabinet-free automation solutions. By consistently combining, applying and further developing Beckhoff's expertise, a holistic, modular pluggable system has been created. The combination of MX-System baseplate and MX-System function modules resulting from the modular construction kit combines all tasks and features of a control cabinet: energy supply, fuse protection and distribution, generation and monitoring of auxiliary voltages, sequence control with the inputs and outputs, control of motors and actuators as well as the connection level for the field devices. The full system integration of all machine functionalities is achieved via freely selectable IPC, coupler, I/O, drive, relay and system modules, which can be configured and combined suitable for the specific application.

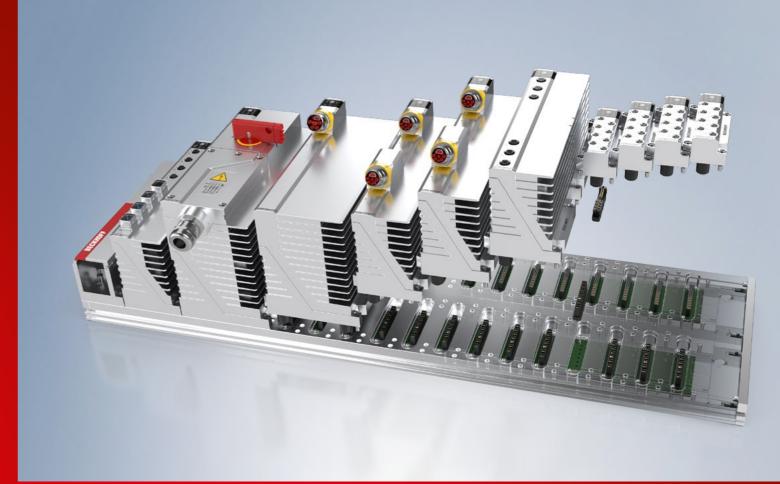
▶ www.beckhoff.com/mx-system

- distribution of voltage and EtherCAT via standardized connectors
- assembly and wiring in the shortest possible time thanks to the modular design principle
- flexible and precisely adaptable to application requirements
- quick and easy system diagnostics during operation via Bluetooth
- three sizes and performance classes can be freely combined











The Vision Company

As a specialist for PC-based control technology, Beckhoff consistently aims to integrate all machine functionalities into one control platform. With TwinCAT Vision, this has included image processing within software since 2017. The machine vision product spectrum is now complete thanks to the introduction of the comprehensive hardware range from Beckhoff. Machine builders and end users thus have a complete image processing system at their disposal that covers all the necessary components from software to illumination which, integrated into the system, provides users with significant competitive advantages.

▶ www.beckhoff.com/vision

- complete hardware portfolio for industrial image processing
- ultra-fast EtherCAT performance and robust design
- perfect synchronization with any process
- simple, direct integration into the control
- open and scalable machine vision system









Get started with machine vision right away with this unit

Four new area scan camera units have been added to the VUI2000 series
The Vision Unit Illuminated (VUI) is a compact unit comprising the camera, illumination,
and focusable optics complete with liquid lens technology. It significantly reduces installation and
commissioning work. Due to focus adjustment during runtime, the unit is particularly well-suited

commissioning work. Due to focus adjustment during runtime, the unit is particularly well-suited to alternating product heights, such as those found in logistics. What's more, all functional components are encased in an attractive anodized aluminum housing that offers IP65/67 protection. Beckhoff is expanding its area scan camera portfolio with four devices featuring color or monochrome image sensors with resolutions of 2.3 MP or 3.1 MP in a 16 mm focal length.

- ▶ www.beckhoff.com/vui2000-0216
- ▶ www.beckhoff.com/vui2001-0216
- ▶ www.beckhoff.com/vui2000-0316
- ▶ www.beckhoff.com/vui2001-0316





New functions in TwinCAT 3 Vision

The TwinCAT 3 Vision software portfolio has been expanded to include options for camera integration and image processing functions:

The TF7020 TwinCAT 3 Vision Beckhoff Camera Connector enables Beckhoff cameras to be integrated directly into the TwinCAT architecture. The connector establishes the basis for communication and provides up to 64 camera connections.

TF7255 TwinCAT 3 Vision Code Quality complements the basic package with functions for quality evaluation of various 1D and 2D codes. This assures high-quality code and problems in code creation are detected at an early stage.

TF7260 TwinCAT 3 Vision OCR adds optical character recognition to the basic package. Application examples include verification of best-before dates and batch numbers.

TF7810 TwinCAT 3 Vision Neural Network adds the option to use neural networks for data analysis to the basic package. With the help of these models, complex data analyses can be learned automatically. Application examples include object detection and segmentation, classification and anomaly detection for quality control, and process monitoring.



- ▶ www.beckhoff.com/tf7020
- ▶ www.beckhoff.com/tf7255
- ➤ www.beckhoff.com/tf7260
- ▶ www.beckhoff.com/tf7810

New Automation Technology



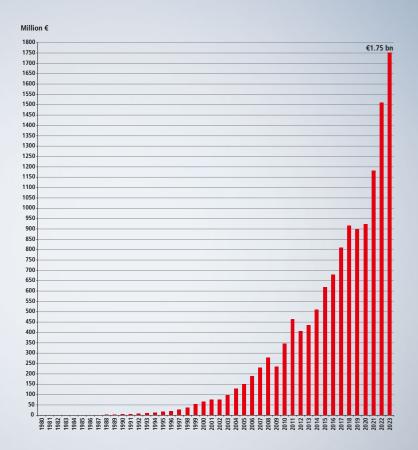
Beckhoff implements open automation systems using proven PC-based control technology. The main areas that the product range covers are industrial PCs, I/O and fieldbus components, drive technology, automation software, control cabinet-free automation, and hardware for machine vision. Product ranges that can be used as separate components or integrated into a complete and mutually compatible control system are available for all sectors. Our New Automation Technology stands for universal and industry-independent control and automation solutions that are used worldwide in a large variety of different applications, ranging from CNC-controlled machine tools to intelligent building control.

Since Beckhoff's foundation in 1980, the development of innovative products and solutions on the basis of PC-based control technology has been the foundation of the company's continued success. We recognized many standards in automation technology that are taken for granted today at an early stage and successfully introduced to the market as innovations. Beckhoff's philosophy of PC-based control as well as the invention of the Lightbus system and TwinCAT automation software are milestones in automation technology and have proven themselves as powerful alternatives to traditional control technology. EtherCAT, the real-time Ethernet solution, provides a powerful and future-oriented technology for a new generation of control concepts.

Beckhoff Automation at a glance

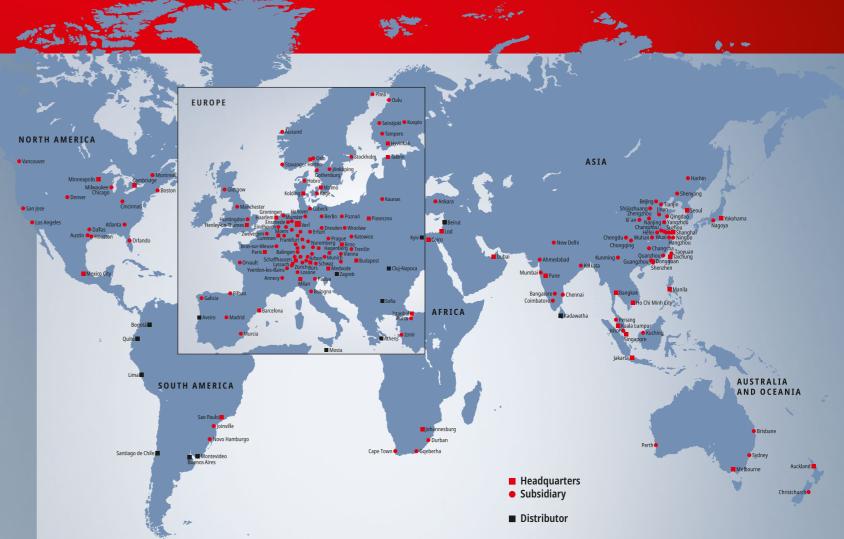
- 2023 global sales: €1.75 billion (+16%)
- Headquarters: Verl, Germany
- Managing owner: Hans Beckhoff
- Employees worldwide: 5,500
- Engineers: 2,000
- Subsidiaries/representative offices worldwide: 41
- Sales offices in Germany: 23
- Representatives worldwide: > 75

Beckhoff Automation



Sales from 1980 through 2023. Status: March 2024





2



More about Beckhoff



Company



Global presence



Events & dates



lobs



Products



Industries



Suppor

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