PC-based Control for the Wood Industry
PC-based control, the open and high-performance control platform …

PC-based control from Beckhoff provides a highly efficient, highly flexible control solution for woodworking machine applications. Through inherent openness and reliability, PC-based control helps realise a wealth of technological and economic competitive advantages. 34 Beckhoff subsidiaries/representative offices and distributors in over 70 countries provide local technological support in all the required languages. The continuous economic expansion of Beckhoff, and resulting large production capacities, ensures delivery reliability and long-term availability. In addition, robust industry-proven components and the use of high-performance, future-proof IT and PC standards offer investment security and technological reserves.
... for highly-efficient and application-oriented woodworking.

Rapid availability – in combination with maximised customisation and high production efficiency – represent the main challenges facing the furniture industry and, therefore, the manufacturers of woodworking machines. The open and powerful PC- and EtherCAT-based automation technology from Beckhoff offers an ideal solution. With its modular design and precise scalability in terms of performance, the system is optimised for all requirements in the woodworking industry. An integrated hardware and software controls platform is ideal for controlling individual machines, as well as complete factory automation. Since all control functions are mapped in PC-based software, even unusual requirements can be implemented with little engineering effort, based on standardised processes.

www.beckhoff.com/wood
PC- and EtherCAT-based control, the all-in one platform . . .

PC Control is built on an integrated hardware and software platform that consists of an Industrial PC, EtherCAT as the high-performance industrial Ethernet system, as well as local I/Os and drives. Advanced TwinCAT automation software offers a universal platform for the engineering, processing, simulation, and diagnosis of all control functions. The open hardware and software interfaces provide high degrees of freedom in machine design, enabling machine manufacturers or furniture producers to respond flexibly to market requirements and customer needs. A wide range of devices – including those from third-party manufacturers – can be integrated with ease. Support for all common fieldbus systems and standard software protocols guarantees integrated communication from the IT level to the field level.
… guarantees your competitive advantage in the furniture industry.

PC- and EtherCAT-based control technology is the perfect match to meet the requirements of woodworking machinery in terms of communication, interfaces, handling large quantities of data, and performance reserves. Thanks to the high-performance offered by multi-core and many-core controllers, systems including PLC, motion control, safety technology, robotics, measurement technology, HMI and CAD/CAM can all run on the central Industrial PC (IPC) platform. This ensures efficient interaction of all system components and enables maximised productivity. Thanks to the consistent implementation of a wide range of features in the form of software modules, there is no need for special devices. This not only saves hardware costs, but also reduces the engineering, cabling, and warehousing overhead.

We reserve the right to make technical changes.
Profound technology and industry expertise …

The expertise acquired through decades of collaboration with machine manufacturers and end customers in the woodworking industry makes Beckhoff a reliable partner with exceptionally high solution competence. With PC-based control technology, we offer you complete automation solutions for plant and mechanical engineering. Strong industry management and engineering teams offer advice and support for the design, planning, and documentation of your machine through to PLC programming, visualisation and commissioning, as well as switchgear production and assembly – for new systems and for machine retrofits alike.
... from control cabinet construction to complete production lines.

You as the customer decide whether you engage Beckhoff as a component supplier or as provider of a complete system solution, including such benefits as application support and control cabinet construction. We employ specialists who are available to provide all necessary support for a wide range of machine and plant types, including special applications, master computer and MES integration, as well as integration into the enterprise infrastructure. The Beckhoff engineering division will configure your control cabinet exactly to your specifications and standards: from the components used and their location in the control cabinet, to air conditioning and ventilation, to equipment labelling and logistics.
The Beckhoff system helps create more efficient woodworking machines …

Beckhoff offers scalable control solutions in all performance classes and applications in the woodworking and furniture industries: from the compact Embedded PC with integrated I/O connection, up to a high-end IPC with the most powerful multi-core processors. A wide range of multi-touch panels offers advanced functionality and comfort for operators at the machine. Over 100 signal types and 1000 different Bus Terminals serve the entire range of sensors and actuators. TwinSAFE provides a universal safety concept that integrates safety functionalities into the standard control platform, including PLC, I/Os and drive technology. The drive technology product portfolio scales from compact servo terminals up to high-performance EtherCAT drives and highly dynamic servomotors with One Cable Technology. At the heart of the solution is TwinCAT software, the engineering and control platform providing open, flexible, and efficient operation for automated systems.
… for all types of applications and complete production lines.

With its open, modular, scalable control solution, Beckhoff meets the high demands of the woodworking industry, offering top performance, flexible operation, and cost-efficient implementation. Users can assemble a control solution to suit their machine type, dimensioned in accordance with the exact performance requirements. The modularity of the PC-based control platform and its openness with regard to a wide range of supported fieldbus systems and communication protocols also enables step-by-step system migration and extensions of existing machines and equipment.
PC-based control – The foundation technology for Industry 4.0

Communication
Secure horizontal and vertical communication
Fieldbus systems
- EtherCAT
- Ethernet TCP/IP
- PROFINET
- PROFINET
- ...

Connectivity
- ADS
- OPC UA
- Database Server

Big Data
Central cyber-physical data acquisition, analysis and evaluation
- Data acquisition
- Distribution and data mining
- Condition Monitoring
- Power management

Engineering
Consistent and integrated engineering over the entire product life cycle
- IEC 61131-3, C/C++, MATLAB®/Simulink®
- Object orientation, software modularisation
- Data exchange between engineering tools

Automation
- PC-based control
- PLC
- NC, CNC
- Robotic
- Safety
- ...

Scientific Automation
- Measurement technology
- Condition Monitoring
- Power monitoring
- Vision

Sensors/Actors
- I/Os
- Drives
- Valves (pneumatic)

Identification
- QR code
- Bar code
- RFID
- Camera

The human being
Human operators at the central point of control in a networked production

Internet of Things/Services
Cloud
Big Data

Smart Factory
Furniture manufacturing
Smart Factory
Fittings

ERP

MES

Loading
Strip saw
Edge processing

PC-based control – The foundation technology for Industry 4.0

We reserve the right to make technical changes.
In the furniture industry, customer demands in terms of colours, shapes, haptic properties, and materials are becoming more and more individualised. This presents major challenges for manufacturers, particularly in high-wage countries: growing variety, small batch sizes, and short lead times have to be managed competitively, i.e. at costs that are comparable to mass production and with rapid availability, while at the same time focusing on optimised resource and energy efficiency.

The solution is provided by networked, intelligent production processes with a high degree of automation, needing a control concept that leverages the increasing convergence of information and automation technology and supports integrated communication.

Industry 4.0 increases the flexibility, efficiency, and sustainability of production through networking of products, production resources, and facilities along the global value creation chain. PC-based control technology from Beckhoff is a key enabler: With PC-based control, it is already possible to seamlessly integrate production systems and production modules into existing and new production systems and to securely communicate with them, enabling high-level production planning and control levels. In this way, changes in order planning or in the production process can be implemented on the fly. TwinCAT provides the necessary modularity, object orientation and integrated engineering throughout the whole product life cycle.

www.beckhoff.com/industry40
TwinCAT, the universal solution for woodworking …

TwinCAT automation software consists of runtime systems for real-time execution of PLC, NC, CNC and robotics applications and provides the ideal engineering environment for programming, diagnostics and configuration. All relevant IEC 61131-3 programming languages are available for real-time applications. C/C++ and MATLAB®/Simulink® modules can be integrated into the IEC context via existing interfaces or operated independently in the TwinCAT real-time environment. Moreover, open interfaces as well as the use of the latest technological standards based on Windows operating systems open up a wide range of options for the user, such as integration in existing visualisation, control, and database systems. Extensive software function modules and libraries for typical industry requirements facilitate improved engineering processes.

► www.beckhoff.com/TwinCAT
... enables high reusability of software.

TwinCAT supports the multi- and many-core technology of modern processors and thus enables full utilisation of the processor cores. Computationally intensive tasks such as robotics or measuring technology applications can be executed on the central CPU. The object-oriented extensions of IEC 61131-3 enable the modularisation of programming code, the software encapsulation of machine functions and, in conjunction with that, improved structuring, simpler maintenance, re-usability and expandability of the software. The TwinCAT Automation Interface supports the user with automatic code generation for machine orders; programming thus becomes a simple parameterisation task.
EtherCAT, the standard network for woodworking …

EtherCAT is now regarded as the standard in the woodworking industry, thanks to its outstanding performance and topology features: the real-time fieldbus takes care of the entire process communication, providing I/O, safety, and the drive bus system in a single streamlined package. Beckhoff offers a comprehensive product range for EtherCAT, from the controller all the way to the safe servo drive. The high reaction speed of EtherCAT leads to better control quality, and more precise synchronisation of I/Os and drives, improving product quality and throughput. The flexibility of EtherCAT with regard to the control topology allows the user to define the ideal communication architecture for the application. High-precision data acquisition and output is possible with EtherCAT system functions such as Distributed Clocks.
... increases the precision and efficiency of your production.

Resource efficiency as a result of fast and precise production processes is a key critical factor to secure a competitive edge. With eXtreme Fast Control Technology (XFC) developed by Beckhoff, the customer has the optimal solution at hand. XFC refers to a control and communication architecture that consists of a high-performance IPC, ultra-fast EtherCAT I/O Terminals, EtherCAT as the communication system, and TwinCAT automation software. With these perfectly matched components, it is possible to realize I/O response times of less than 100 µs, and to log events with a temporal resolution of less than 100 ns. This opens up completely new possibilities for process optimization and resource efficiency. Specifically, it means that XFC-based, fast control technology enables furniture production with higher precision and fewer resources.

XFC – eXtreme Fast Control
- fastest possible reaction times of less than 100 µs
- high-precision synchronisation by Distributed Clocks, resulting in the elimination of controller and bus propagation delays
- oversampling for high frequency sampling of measuring signals

XFC in the woodworking machine with
- drives synchronised with extreme precision
- extremely fast cam controllers
- high-precision linear path control for continuous processing machines
TwinSAFE, the scalable safety solution in software and hardware …

TwinSAFE from Beckhoff provides a universal safety concept that integrates safety functionalities into the standard control platform: from PLC and I/Os to drive technology. All safety functions such as emergency stop, safety door monitoring, two-hand operation, safety mat evaluation and muting, safe position, and safely limited speed can be programmed and configured on the integrated TwinCAT engineering platform. Safety technology is seamlessly installed with the I/O terminal system via the TwinSAFE I/O modules, whereby safe signals can be mixed with standard signals as required. This reduces the costs for project engineering, installation and material – maintenance is also simplified by faster diagnostics and the service and support of only a few system-integrated components.
Typical safety functions can be programmed and configured on the EL6900/EL6910 TwinSAFE Logic or the compact EK1960 safety controller, based on standard safety function blocks according to individual safety requirements. All safety controllers are suitable for applications up to SIL 3 according to IEC 61508 and performance level e of ISO 13849-1. The EL6910 and also the EK1960 safety controllers support complex and safe analog evaluations, e.g. for safe limitation of process parameters such as pressure, temperature, and the speed of frequency-controlled drives. Integrated measurement functions of the automation platform, such as temperature and energy consumption measurement or condition monitoring, increase the availability and efficiency of the machine. Measuring terminals incorporated in the I/O system sample, for example, vibrations of the machine, which are then analysed via the TwinCAT Condition Monitoring Library. In this way, faults can be detected proactively to prevent machine downtime.

... ensures safety for humans and machines.
EtherCAT drives for highly dynamic positioning tasks …

The scalable drive solutions from Beckhoff cover a broad range of applications: from compact servo terminals to AX8000 or AX5000 EtherCAT Servo Drives. The integrated, fast control technology of the AX series supports fast and highly dynamic positioning tasks. EtherCAT offers the ideal link to PC-based control technology, and supports coupling to other communication systems. The extensive range of linear and rotary servomotors is optimally matched to the Servo Drives. The AM8000 motor series is characterised by One Cable Technology (OCT), where power and feedback systems are combined in a single standard cable. The servo terminals represent an inexpensive and compact alternative in the lower performance range.
Woodworking requires a high degree of precision: milling and sawing, gluing, drilling and plugging, as well as various assembly processes must be carried out with great precision in order to produce high-quality furniture. Any deviation has an impact on quality and may necessitate costly reworking, causing a negative effect on throughput and the logistics chain. In combination with TwinCAT Motion Control software, the Beckhoff drive system covers the high requirements of the wood and furniture industry. Simple positioning drives play an increasingly important part as the degree of automation increases. Beckhoff offers a full range of drives, as well, including stepper motors, DC motors, or compact servomotors.
Transport, feeding, de-stacking

Scalable hardware and software components support all drive technologies, independent of the manufacturer: from simple roller tracks to powerful portal solutions, and from three-phase asynchronous motors and servomotors to the smallest positioning motors. The integrated TwinSAFE safety solution ensures universal safety up to SIL 3 (IEC 61508) and PLe (EN ISO 13849-1) – from the I/Os through to the drive level.

Edge processing

High-performance Industrial PCs and fast EtherCAT bus system adequately meet growing requirements for computing power and bandwidth, ensuring integrated communication between the controller and the sensor/actuator level. A heterogeneous infrastructure, in the shape of different fieldbuses, can all be replaced by EtherCAT. This also applies to the safety technology, which integrates seamlessly with the bus system.
**CNC machining centre**

Modern Industrial PCs and TwinCAT automation software from Beckhoff offer sufficient resources to execute PLC and CNC on a single controller. Integrated networking with EtherCAT and optimal integration of the servo drive technology simplify the control topology even further.

**Surface machining**

The performance-related scalability of the control platform, as well as support for different fieldbus systems while using the same programming and project engineering tools, provides a means for universal, economical, and flexible plant planning. The difficulties related to the integration of numerous third-party control units are consigned to the past.
Beckhoff – New Automation Technology

Beckhoff implements open automation systems on the principle of PC-based control technology. The product range covers the main areas of Industrial PCs, I/O and fieldbus components, drive technology, and automation software. Product ranges are available for all industries which function as individual components or in a group – as a complete, coordinated control system. “New Automation Technology” from Beckhoff stands for universal control and automation solutions for all industries that are used worldwide in a large variety of applications, ranging from CNC-controlled machine tools to wind turbines to intelligent building control.

Beckhoff at a glance

- Headquarters: Verl, Germany
- Sales 2014: 510 million € (+17 %)
- Staff worldwide: 2,800
- Branch Offices Germany: 11
- Subsidiaries/Branch Offices worldwide: 34
- Distributors worldwide: in more than 70 countries (as of 4/2015)

www.beckhoff.com
Further information

The Beckhoff webpage, "PC-based control for the woodworking industry" contains additional information and solutions.

All Beckhoff catalogs and flyers are available for download from our website.

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Worldwide presence on all continents

With local presence in more than 70 countries, Beckhoff ensures fast service worldwide and technical support in the local language for globally operating customers. In addition, Beckhoff sees close geographic proximity to the customer as a prerequisite for a profound understanding of the technical challenges facing customers.

We reserve the right to make technical changes.