Beckhoff created a global standard for automation with the launch of PC-based control technology in 1986. On the software side, the TwinCAT (The Windows Control and Automation Technology) automation suite forms the core of the control system. The TwinCAT software system turns almost any PC-based system into a real-time control with multiple PLC, NC, CNC and/or robotics runtime systems.

www.beckhoff.com/TwinCAT3

TwinCAT 3 highlights

- only one software for programming and configuration
- Visual Studio® integration
- more freedom in selecting programming languages
- support for the object-oriented extension of IEC 61131-3
- use of C/C++ as the programming language for real-time applications
- link to MATLAB®/Simulink®
- open interfaces for expandability and adaptation to the tools landscape
- flexible runtime environment
- active support of multi-core and 64-bit systems
- migration of TwinCAT 2 projects
In addition to the possibilities of controller programming according to the 3rd edition of IEC 61131-3, the TwinCAT 3 architecture allows the use of C and C++ as the programming language. This opens up completely new application possibilities, as well as the expansion of or integration in existing systems. The link to MATLAB®/Simulink® is just one example of this new openness.

**eXtended Automation Architecture**

- supports all main fieldbuses
- supports IEC 61131, C/C++, MATLAB®/Simulink®
- supports motion control: from point-to-point to CNC
- supports TwinSAFE configuration
- supports Scientific Automation: robotics, measurement technology, condition monitoring

**eXtended Automation Engineering**

- one tool – Microsoft Visual Studio®
- integrated: IEC 61131 – worldwide standard in automation
- integrated: C/C++ – worldwide standard in IT
- integrated: TwinCAT System Manager – well-known configuration tool
- link to MATLAB®/Simulink®: worldwide standard in science
- expandable with other tools: editors, compilers
- TwinCAT 3 modules: standardized programming frames
- TwinCAT 2 projects can be migrated.
- integrated: TwinCAT 3 HMI

**eXtended Automation Runtime**

- IEC 61131, C/C++, MATLAB®/Simulink® objects in one runtime
- integrated TwinSAFE runtime
- extended real-time functionality: min. 50 μs cycle time and low jitter
- enhanced performance: support of multi-core CPUs
- future-proof: supports 64-bit operating systems
Integration in Microsoft Visual Studio® makes it possible to program automation objects in parallel with the aid of the 3rd edition of IEC 61131-3 and the C or C++ languages. The objects (modules) generated can exchange data with each other and call each other independently of the language they were written in. The TwinCAT System Manager has been integrated into the development environment. This way, only one software is required to configure, parameterize, program and to diagnose automation devices.

TwinCAT 3 integrates into both a Visual Studio® shell and a complete Visual Studio®.

Flexible use of programming languages

**C and C++ programming languages**
- standardized
- widely used programming languages
- very powerful programming languages
- run under the same runtime as PLC programs
- for the implementation of drivers

**Extended debugging of C++ programs**
- debugging of C++ programs that run in real-time
- use of breakpoints
- use of watch lists
- use of call stacks

**.NET programming languages**
- used for non-real-time programming (e.g.: HMI)
- source code management in the same project

**Link to MATLAB®/Simulink®**
- great variety of toolboxes
- possibilities for use:
  - building of control circuits
  - in simulation
  - in optimization
  - automatic code generation
  - debug interface between MATLAB®/Simulink® and TwinCAT
Integration of Visual Studio®:
Automation devices and application programming in one environment
- use of the most famous and best supported development suite
- future-proof
- editing of PLC programs and complex visualizations in one environment
- multi-language support
- modern look and feel
- context-sensitive online help
- automatic syntax checking
- IntelliSense
- syntax highlighting
- use of the well-known source code control tools
- open architecture
- extendable by plug-ins

Parallel use of the C++ and FBD programming languages
TwinCAT System Manager integrated into Visual Studio®
For more efficient programming of automation devices, the editors for IEC 61131-3 programming in TwinCAT have been significantly improved. The operability has been improved and the debugging options have been extended. The new options include improved inline monitoring, conditional break points and more.

TwinCAT 3 supports the extensions to the 3rd edition of the IEC 61131-3 standard. These enable among other things the use of object-oriented techniques such as single inheritance, interfaces, methods and attributes, which significantly increase both the reusability and the quality of the control code.

In TwinCAT 3, the editors of the IEC 61131-3 have been integrated seamlessly into the Visual Studio® environment. As a result, the editors use the original Visual Studio® toolbox for the graphical languages, for example.
Example of the use of polymorphism within an IEC 61131-3 POU (Program Organization Unit)

IEC 61131-3 programming

- supplier-independent programming standard
- PLCopen certification
- portable, reusable software
- five graphic and text-based programming languages:
  - Structured Text and Instruction List
  - Function Block Diagram and Ladder Diagram
  - Sequential Function Chart
- data encapsulation by user-defined data types

Extended options in TwinCAT 3:

- improved ease of operation usability
- auto-complete
- marking of associated keywords
- collapsing of programming structures
- ...

- extended debugging
- use of conditional break points
- improved inline monitoring
- ...

- object-oriented extensions
- single inheritance
- interfaces
- methods
- attributes
TwinCAT 3 offers the possibility to program TwinCAT runtime modules in C/C++ languages. Code generation uses the C compiler included with Microsoft Visual Studio®. A Software Development Kit (SDK) provides functions for reading/writing files, starting threads, allocating memory, or communicating with a database, which is equivalent to the IEC 61131-3 mechanism for using libraries.

Wizards for the creation of basic projects, classes and I/O variables make rapid engineering possible.

The routine "CyclicUpdate" is cyclically processed. The internal variables are available for monitoring in the TwinCAT online watch window even without having to set a breakpoint.

C/C++ as programming languages in automation technology

- powerful, widely used programming languages
- standardized, object-oriented programming languages
- generation of efficient object code
- run under the same runtime as PLC programs
- for the implementation of drivers
- Beckhoff SDK for extended functionality in the real-time context
- online change of runtime modules (requires TC 3.1.4024 or higher)

Extended debugging of C++ programs

- debugging of C++ programs that run in real-time
- monitoring, watch lists also without the use of breakpoints
The integration of MATLAB®/Simulink® enables execution of TwinCAT modules that were generated as models in the Simulink® simulation environment. The chosen interfacing type displays the parameters and variables in the graphic interface of TwinCAT 3 and enables viewing and modification in the real-time environment at runtime.

### Integration with the simulation software MATLAB®/Simulink®

- standard tool in scientific and measuring applications
- wide range of toolboxes (e.g. Fuzzy Logic Toolbox)
- development, simulation and optimization of complex control loops
- automatic code generation via Realtime Workshop
- debug interface between TwinCAT 3 and Simulink®

- parameterization of the generated module in TwinCAT 3
- download and execution of the module in TwinCAT 3 runtime
- multiple module instantiation possible
- Modules can be used without MATLAB®/Simulink®.
- online change of runtime modules (requires TC 3.1.4024 or higher)
With eXtended Motion Control, TwinCAT automation software offers an integrated and scalable solution for Motion Control applications including simple point-to-point movements, CNC and robot control.

### Functionality

<table>
<thead>
<tr>
<th>Point-to-point movement</th>
<th>Interpolated motion with 3 axes and 5 additional axes</th>
<th>Complete CNC functionality</th>
<th>Interpolated motion for robotic control</th>
</tr>
</thead>
<tbody>
<tr>
<td>gearing</td>
<td>programming according to DIN 66025</td>
<td>interpolated movement for up to 32 axes per channel</td>
<td>support for a wide range of kinematic systems</td>
</tr>
<tr>
<td>camming</td>
<td>technological features</td>
<td>technological features</td>
<td>optional torque pre-control</td>
</tr>
<tr>
<td>superposition</td>
<td>straightforward utilization through function blocks from the PLC</td>
<td>various transformations</td>
<td></td>
</tr>
<tr>
<td>flying saw</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Interpolated motion for robotic control

**Advantages of the integration of robotic control in TwinCAT**
- configuration, parameterization, diagnostics and programming in TwinCAT
- optimum synergy between PLC, Motion Control and robot control system
- high performance and precision through direct interfaces

**Kinematic calculation process**
- forward transformation
- inverse transformation
- calculation of the dynamic model
The Safety Editor integrated in TwinCAT 3 allows the creation of a safety application in a graphical environment. The user can program the desired logic directly with function blocks. The logic can initially be developed independently of the hardware configuration, leading to increased flexibility and portability. Additionally, the editor can automatically generate documentation for the application, making both the act of documenting and commissioning significantly easier.

- graphical programming
- fully integrated in TwinCAT 3
- convenient diagnostics through the direct display of online values in the graphical environment
- multi-level verification of the application for consistency
- automatic project download verification
**eXtended Automation Runtime (XAR)**

Standardized modules enable open and flexible design of the TwinCAT 3 runtime. It makes an environment available in which the TwinCAT 3 modules can run. Whether the modules are PLC, NC, CNC, RC (Robotic Control) or C code-based modules (e.g. created with MATLAB®/Simulink®) is irrelevant.

Fast communication, reusability

- Functionality of the modules is scalable.
- Direct and therefore very fast communication between modules.
- Modules are sealed.
- Modules can be developed, serviced and tested independent of each other.
- High reusability.

Modular design, openness, extendibility

**Open runtime interface**
- Separation of complete functionality into modules.
- Use of services from system modules (e.g. real-time).
- Defined interfaces.
- Extension of the runtime by own modules (e.g. bus drivers).
- Scalability: modules can contain simple functions, complex algorithms and real-time tasks.

**Structure of a TwinCAT 3 module**

In addition to user modules, a number of system modules are already available which provide basic runtime functionality (e.g. TwinCAT real-time). These modules have fixed object IDs and are therefore accessible from each module.

**Modular TwinCAT 3 runtime**

![Diagram of TwinCAT 3 runtime and system modules](image-url)
Current developments in computer technology, which offer CPUs with more and more cores, enable the distribution of tasks across different cores. The TwinCAT 3 runtime environment follows this concept. It can be used to distribute functional units such as HMI, PLC runtime or MC to dedicated cores. For each of the cores used by the runtime environment the maximum load as well as the base time and therefore the possible cycle times can be set separately.

Due to the use of multi-core systems, functional units (e.g. PLC and NC runtimes, HMI) are distributed to individual processor cores.

Dialog for the distribution of tasks to processor cores: in the so-called “core isolation” mode it is possible to make individual cores exclusively available for the use of TwinCAT. The context change between TwinCAT and the Windows operating system is avoided for these cores, which increases the attainable performance still further.

**Multi-core and multi-tasking support**

<table>
<thead>
<tr>
<th>Support of multi-core systems</th>
<th>Support of multi-tasking</th>
<th>Support of core isolation</th>
<th>Support of 64-bit operating systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>distribution from applications to cores (e.g. PLC, NC and HMI can run on different cores)</td>
<td>preemptive multi-tasking</td>
<td>no need to switch to host operating system</td>
<td>usage of more resources (memory)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TwinCAT receives the complete computing time on these cores.</td>
<td></td>
</tr>
</tbody>
</table>
TwinCAT HMI meets the demand for maximum flexibility as a web-based and platform-independent user interface with maximum adaptability. Whatever device or operating system: TwinCAT HMI automatically adapts to the technology at hand. Whichever preferred format, whether it is a tablet, smartphone or industrial panel, it can be used today or later on. TwinCAT HMI always acts responsively and adapts itself according to the resolution, screen size and orientation of each device. In addition to the free choice with regard to resolution, screen size and orientation, TwinCAT HMI Server can run on the most diverse device platforms, since CPU performance classes ranging from ARM to multi-core are supported. Security has top priority with all platforms. Data are first encrypted and then exchanged between client and server via secured connections.

www.beckhoff.com/twincat-hmi
Flexible and secure

- platform-independence
- web-based (HTML5, JavaScript)
- powerful architecture
- modular expandability
- high-level programming language integration
- one tool for PLC and HMI
TwinCAT Vision is directly integrated into the TwinCAT engineering environment. Cameras can be added and configured easily under the new Vision node, and can be calibrated there as well. It is also possible to capture a camera image stream and to feed in the recording instead of live camera images. Alternatively, images in a range of formats can be loaded. This means that, even without camera access, users can still develop and implement image processing procedures. The sequence of image processing is programmed directly in the PLC, in PLC programming languages and using the extensive library of image processing algorithms provided. Integrating image processing into the PLC means that the analysis chain executes in the TwinCAT runtime system, enabling communication with other processes running on the PLC, such as motion control, without latency. All debugging options known from PLC programming are available. Intermediate results can be displayed in the engineering environment or in TwinCAT HMI at any time.

www.beckhoff.com/twincat-vision
Simplified engineering, optimized runtime performance:
- easy camera configuration
- engineering in PLC programming languages
- analysis chain fully contained in the PLC
- processing without latency
- connection of GigE Vision cameras
**Extended features and functions**

**General features**
- Integration of Visual Studio 2017 Shell (TcXaeShell)
- New home page, including new RSS feed with TwinCAT information

**Time synchronization**
- Corrected time stamps for data records, e.g. via NTP protocol

**Properties in the I/O configuration**
- Improved overview in the mapping dialog
- ‘Go To Definition’ from the PLC process image to the PLC code

**PLC features**
- Improvements in the cross-reference list (new filter, performance enhancements)
- Keyword: ABSTRACT for abstract FB/method/property definition
- Improved monitoring of interface variables
- Small icons in the solution tree show access modifiers.
- ENUMs now also available as strings in the PLC
- Exception handling via TRY-CATCH
- Simplified commenting function in the PLC

**PLC HMI features**
- Automatic local start of the PLC HMI client at runtime
- Dynamic scaling for the operating elements of the measuring equipment category
- Offline rotation of elements
- Performance improvements during opening of dialogs
- Automatic transfer of scaling options of the TargetVisu object to the Tc3PlcHmi.ini file

**C++ properties**
- Exchange of TcCOM modules while the machine is running
- Repository for versioned C++ projects
- New way of signing TcCOM modules

‘Released’ flag is used during library creation.
Conditional compilation also available in the declaration section (in addition to implementation part)
Multi-line support in pragma declarations
Optional Base64 memory format for graphical PLC objects
Multi-user PLC capability

- Several programmers can work on the same PLC project simultaneously.
- Integrated workflow.
- Reduced commissioning time.
- High traceability.

Variant management

- Simple configuration of machine options.
- Version-specific deactivation/activation of components.
- Version-specific parameterization.
- Mapped through 'conditional compilation' in the PLC.

MATLAB®/Simulink® properties

- Exchange of TcCOM modules while the machine is running.
- New way of signing TcCOM modules.

AML data exchange

- Based on the AutomationML format.
- Bidirectional exchange of I/O topologies with ECAD tools.
- Incremental import of I/O topologies.
- Fully integrated in TwinCAT.

Safety-related features

- User-defined function blocks can be created and instantiated as often as required (including GoToDefinition, Online View, nesting up to 2 levels).
- Multiple use of variables.
- Global variables.
- Auto-completion when entering variables.
- Improved overview in variable mapping.
- Improved commenting functions.

ADS features

- "Secure ADS" Extension (uses tcp port 8016): encrypted ADS communication.

Scope features

- Project wizard facilitates Scope configuration.
- New single bar and digital charts.
- Dynamic style for dynamic display switching, depending on variables.
- Shapes: display of geometric shapes in x/y plots.
- Vision trigger: inserts images with time stamp into the Scope data stream.
- Headless mode: allows the view to be disconnected from the server during recording.
- Marker: with docking function on the x-axis and label feature.
- Integrated dictionary with physical units.
- Clear display option for clearing the chart after the display time has elapsed.
The TwinCAT 3 runtime components are available for different platforms. The platform levels correspond to the various TwinCAT 3 performance classes of the Beckhoff PCs. The TwinCAT 3 performance class of a Beckhoff PC depends on the configuration and the technical data of the PC (including the processor). The following overview shows the various TwinCAT 3 platforms. The controllers integrated in the platform classifications represent sample configurations. The TwinCAT 3 performance class required for a TwinCAT 3 Runtime component can be found in the product description of the respective Beckhoff PC.

TwinCAT 3 – Platforms

Example of a TwinCAT 3 performance class:
C6920 | Control cabinet Industrial PC with Intel® Core™ i3, 2 cores, processor
TwinCAT 3 performance class: (TC3: 60), corresponds to the TwinCAT 3 platform P60 Mid Performance
The controllers integrated in the platform categorization are only example configurations.
The TwinCAT 3 engineering components enable the configuration, programming and debugging of applications.

The TwinCAT 3 runtime consists of further components – basic components and functions. The basic components can be extended by functions.

The functions are classified in different categories: System, HMI, Measurement, Controller, Motion, Connectivity, Vision and Industry specific.
## TwinCAT 3 | Functions

### System

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF1800</td>
<td>TC3 PLC HMI</td>
</tr>
<tr>
<td>TF1810</td>
<td>TC3 PLC HMI Web</td>
</tr>
<tr>
<td>TF1910</td>
<td>TC3 UML</td>
</tr>
</tbody>
</table>

TF1800: stand-alone tool for displaying visualizations from the PLC development environment

TF1810: display of visualizations from the PLC development environment in a web browser

TF1910: UML (Unified Modeling Language) for modeling of PLC software

### Measurement

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF3300</td>
<td>TC3 Scope Server</td>
</tr>
<tr>
<td>TF3500</td>
<td>TC3 Analytics Logger</td>
</tr>
<tr>
<td>TF3510</td>
<td>TC3 Analytics Library</td>
</tr>
<tr>
<td>TF3520</td>
<td>TC3 Analytics Storage Provider</td>
</tr>
<tr>
<td>TF3550</td>
<td>TC3 Analytics Runtime</td>
</tr>
<tr>
<td>TF356x</td>
<td>TC3 Analytics Controller Packs</td>
</tr>
<tr>
<td>TF3600</td>
<td>TC3 Condition Monitoring Level 1</td>
</tr>
<tr>
<td>TF3601</td>
<td>TC3 Condition Monitoring Level 2</td>
</tr>
<tr>
<td>TF3650</td>
<td>TC3 Power Monitoring</td>
</tr>
<tr>
<td>TF3680</td>
<td>TC3 Filter</td>
</tr>
<tr>
<td>TF3800</td>
<td>TC3 Machine Learning Inference Engine</td>
</tr>
<tr>
<td>TF3810</td>
<td>TC3 Neural Network Inference Engine</td>
</tr>
<tr>
<td>TF3900</td>
<td>TC3 Solar Position Algorithm</td>
</tr>
</tbody>
</table>

TF3300: data preparation for visual display in the TwinCAT 3 Scope View

TF3500: The TwinCAT Analytics Logger enables the cyclic archiving of the process image.

TF3510: PLC library used for online or offline analysis in the PLC runtime of the TwinCAT Analytics Workbench

TF3520: IoT client: interface to one or more storage facilities for raw and analysis data from various sources

TF3550: runtime "container" for the Analytics application, which was configured and developed in the Analytics Workbench

TF356x: extension of the TC3 Analytics Workbench for the analysis of up to 128 additional controllers

TF3600: PLC library for the implementation of Condition Monitoring for machines

TF3601: expanded PLC library for the implementation of Condition Monitoring for machines

TF3650: TwinCAT Power Monitoring PLC library

TF3680: PLC library for implementing digital filters

TF3800: execution module of trained classical machine learning algorithms

TF3810: execution module of trained neural networks

TF3900: precise calculation of the sun’s position
### TwinCAT 3 | Functions

#### Controller

| TF4100 | TC3 Controller Toolbox | basic controllers (P, I, D), complex controllers (PI, PID), pulse width modulation, ramps, signal generators and filters |
| TF4110 | TC3 Temperature Controller | temperature control for monitoring and controlling different temperature ranges |
| TF4500 | TC3 TwinCAT Speech | enables the multilingual input and output of queries or information implemented in an industrially compatible way |

#### Motion

| TF5000 | TC3 NC PTP 10 Axes | NC PTP (point-to-point movements) for up to 10 axes |
| TF5010 | TC3 NC PTP Axes Pack 25 | extension of TwinCAT 3 NC PTP to up to 25 axes |
| TF5020 | TC3 NC PTP Axes Pack unlimited | extension of TwinCAT 3 NC PTP to over 25 axes |
| TF5050 | TC3 NC Camming | using the TwinCAT NC cam plate functionality (table coupling) |
| TF5055 | TC3 NC Flying Saw | implementing flying saw functionality |
| TF5060 | TC3 NC FIFO Axes | implementation of a pre-defined user setpoint generator for an NC axis |
| TF5065 | TC3 Motion Control XFC | high-precision logging and switching of digital signals in relation to axis positions |
| TF5100 | TC3 NC I | NC I with 3 interpolating axes and 5 additional axes |
| TF5110 | TC3 Kinematic Transformation L1 | realization of different kinematic transformations Level 1 |
| TF5111 | TC3 Kinematic Transformation L2 | realization of different kinematic transformations Level 2 |
| TF5112 | TC3 Kinematic Transformation L3 | realization of different kinematic transformations Level 3 |
| TF5113 | TC3 Kinematic Transformation L4 | realization of different kinematic transformations Level 4 |
| TF5120 | TC3 Robotics mxAutomation | direct communication between the PLC and the KUKA KR C4 robot control |
| TF5130 | TC3 Robotics uniVAL PLC | direct communication between the PLC and the CSBC robotics controller from Stäubli |
| TF5200 | TC3 CNC | CNC path control software |
| TF5210 | TC3 CNC E | CNC path control software export version |
| TF5220 | TC3 CNC Axes Pack | extension to up to a total of 64 axes/controlled spindles, of which a maximum of 32 can be path axes and a maximum of 12 can be controlled spindles |
| TF5225 | TC3 CNC Measurement | optional package of CNC cycles that supports the measurement of tools or workpieces directly on the machine |
| TF5230 | TC3 CNC Channel Pack | further CNC channel, extension to a maximum of 12 channels, channel synchronization, axis transfer between channels |
| TF5240 | TC3 CNC Transformation | transformation functionality (5-axis functionality) |
| TF5245 | TC3 CNC Kinematic Optimization | optional CNC package that optimizes the determination of kinematic parameters for rotary axes in 5-axis kinematics |
| TF5250 | TC3 CNC HSC Pack | extending the CNC with HSC technology (high-speed cutting) |
| TF5260 | TC3 CNC Spline Interpolation | path programming via splines with programmable spline type, Akima-spline, B-spline |
| TF5270 | TC3 CNC Virtual NCK Basis | virtual TwinCAT CNC for simulation in a Windows environment |
| TF5271 | TC3 CNC Virtual NCK Options | virtual TwinCAT CNC for simulation in a Windows environment |
| TF5280 | TC3 CNC Volumetric Compensation | extension for compensating geometric machine errors based on an ISO-standardized parametric model |
| TF5290 | TC3 CNC Cutting Plus | technology package for extending the CNC functionality for cutting operations |
| TF5410 | TC3 Motion Collision Avoidance | collision avoidance and controlled accumulation when operating a number of linearly and/or translationally dependent axes with TC3 NC PTP |
| TF5420 | TC3 Motion Pick-and-Place | for handling tasks carried out by gantry robots and other kinematics |
| TF5800 | TC3 Digital Cam Server | fast cam controller with monitoring for various fieldbuses |
| TF5810 | TC3 Hydraulic Positioning | algorithms for control and positioning of hydraulic axes |
| TF5850 | TC3 XTS Extension | decouples servo algorithms from the hardware and calculates them centrally |
| TF5890 | TC3 XPlanar | calculation of the mover position, precise position control, as well as monitoring and diagnostics |
## TwinCAT 3 | Functions

### Connectivity

<table>
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<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
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<td>TF6010</td>
<td>TC3 ADS Monitor</td>
</tr>
<tr>
<td>TF6020</td>
<td>TC3 JSON Data Interface</td>
</tr>
<tr>
<td>TF6100</td>
<td>TC3 OPC UA</td>
</tr>
<tr>
<td>TF6120</td>
<td>TC3 OPC DA</td>
</tr>
<tr>
<td>TF6220</td>
<td>TC3 EtherCAT Redundancy 250</td>
</tr>
<tr>
<td>TF6221</td>
<td>TC3 EtherCAT Redundancy 250+</td>
</tr>
<tr>
<td>TF6225</td>
<td>TC3 EtherCAT External Sync</td>
</tr>
<tr>
<td>TF6250</td>
<td>TC3 Modbus TCP</td>
</tr>
<tr>
<td>TF6255</td>
<td>TC3 Modbus RTU</td>
</tr>
<tr>
<td>TF6270</td>
<td>TC3 PROFINET RT Device</td>
</tr>
<tr>
<td>TF6271</td>
<td>TC3 PROFINET RT Controller</td>
</tr>
<tr>
<td>TF6280</td>
<td>TC3 Ethernet/IP Slave</td>
</tr>
<tr>
<td>TF6281</td>
<td>TC3 Ethernet/IP Master</td>
</tr>
<tr>
<td>TF6300</td>
<td>TC3 FTP</td>
</tr>
<tr>
<td>TF6311</td>
<td>TC3 TCP/UDP Realtime</td>
</tr>
<tr>
<td>TF6340</td>
<td>TC3 Serial Communication</td>
</tr>
<tr>
<td>TF6350</td>
<td>TC3 SMS/SMTP</td>
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<tr>
<td>TF6360</td>
<td>TC3 Virtual Serial COM</td>
</tr>
<tr>
<td>TF6420</td>
<td>TC3 Database Server</td>
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<td>TF6421</td>
<td>TC3 XML Server</td>
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<td>TF6500</td>
<td>TC3 IEC 60870-5-10x</td>
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<tr>
<td>TF6510</td>
<td>TC3 IEC 61850/IEC 61400-25</td>
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<tr>
<td>TF6600</td>
<td>TC3 RFID Reader Communication</td>
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<td>TF6610</td>
<td>TC3 S5/S7 Communication</td>
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<td>TF6650</td>
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<td>TF6710</td>
<td>TC3 IoT Functions</td>
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<td>TF6720</td>
<td>TC3 IoT Data Agent</td>
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<tr>
<td>TF672x</td>
<td>TC3 IoT Data Agent Packs</td>
</tr>
<tr>
<td>TF6730</td>
<td>TC3 IoT Communicator</td>
</tr>
</tbody>
</table>

**Description:**
- **TF6010 | TC3 ADS Monitor:** Recording and diagnostics functions for the communication of TwinCAT systems.
- **TF6020 | TC3 JSON Data Interface:** Interface for the exchange of data in JSON format between the TwinCAT system and custom applications.
- **TF6100 | TC3 OPC UA:** Access to TwinCAT in accordance with OPC UA with UA server (DA/HA/AC) and UA client (DA).
- **TF6120 | TC3 OPC DA:** Access to TwinCAT variables, in accordance with OPC DA and OPC XML DA specification.
- **TF6220 | TC3 EtherCAT Redundancy 250:** Extension of the TwinCAT EtherCAT master with cable redundancy capability for up to 250 slaves.
- **TF6221 | TC3 EtherCAT Redundancy 250+:** Extension of the TwinCAT EtherCAT master with cable redundancy capability for more than 250 slaves.
- **TF6225 | TC3 EtherCAT External Sync:** Extension of the TwinCAT EtherCAT master with an option to synchronize the Beckhoff real-time communication with external signals.
- **TF6250 | TC3 Modbus TCP:** Communication with Modbus TCP devices (server and client functionality).
- **TF6255 | TC3 Modbus RTU:** Serial communication with Modbus end devices.
- **TF6270 | TC3 PROFINET RT Device:** Communication via PROFINET (PROFINET slave).
- **TF6271 | TC3 PROFINET RT Controller:** Communication via PROFINET (PROFINET master).
- **TF6280 | TC3 Ethernet/IP Slave:** Communication via Ethernet/IP (Ethernet/IP slave).
- **TF6281 | TC3 Ethernet/IP Master:** Communication via Ethernet/IP (Ethernet/IP master).
- **TF6300 | TC3 FTP:** Easy access from TwinCAT PLC to FTP server.
- **TF6311 | TC3 TCP/UDP Realtime:** Direct access from real-time to Ethernet communication.
- **TF6340 | TC3 Serial Communication:** Communication via serial Bus Terminals or PC COM ports with the 3964R and RK512 protocol.
- **TF6350 | TC3 SMS/SMTP:** Sending SMS and e-mails from the PLC.
- **TF6360 | TC3 Virtual Serial COM:** Virtual serial COM driver for Windows platforms.
- **TF6420 | TC3 Database Server:** Accessing databases from the PLC.
- **TF6421 | TC3 XML Server:** Read and write access to XML files from the PLC.
- **TF6500 | TC3 IEC 60870-5-10x:** Communication according to IEC 60870-101,-102,-103,-104.
- **TF6510 | TC3 IEC 61850/IEC 61400-25:** Communication according to IEC 61850 and IEC 61400-25.
- **TF6600 | TC3 RFID Reader Communication:** Connection of RFID readers to the TwinCAT PLC.
- **TF6610 | TC3 S5/S7 Communication:** Communication with S5/S7 controllers.
- **TF6650 | TC3 DBC File Import for CAN:** Reading of DBC file formats.
- **TF6700 | TC3 IoT Communication (MQTT):** Provides basic publisher/subscriber-based data connectivity via MQTT.
- **TF6710 | TC3 IoT Functions:** Provides connectivity for cloud-based communication services.
- **TF6720 | TC3 IoT Data Agent:** Gateway application for data connectivity between TwinCAT runtime and IoT services.
- **TF672x | TC3 IoT Data Agent Packs:** Extension of the TC3 IoT Data Agent for up to 256 additional ADS target runtimes or OPC UA namespaces.
- **TF6730 | TC3 IoT Communicator:** Sends process data and push notifications from TwinCAT to smartphones and tablets through a messaging service.
### TwinCAT 3 | Functions

#### Connectivity

<table>
<thead>
<tr>
<th>Part Number</th>
<th>TC3 Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF6735</td>
<td>TC3 IoT Communicator App</td>
</tr>
<tr>
<td>TF6760</td>
<td>TC3 IoT HTTPS/REST</td>
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</table>

#### Vision

<table>
<thead>
<tr>
<th>Part Number</th>
<th>TC3 Functionality</th>
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</thead>
<tbody>
<tr>
<td>TF700x</td>
<td>TC3 GigE Vision Connector</td>
</tr>
<tr>
<td>TF7100</td>
<td>TC3 Vision Base</td>
</tr>
<tr>
<td>TF7200</td>
<td>TC3 Vision Matching 2D</td>
</tr>
<tr>
<td>TF7250</td>
<td>TC3 Vision Code Reading</td>
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<tr>
<td>TF7300</td>
<td>TC3 Vision Metrology 2D</td>
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</tbody>
</table>

#### Industry specific

<table>
<thead>
<tr>
<th>Part Number</th>
<th>TC3 Functionality</th>
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<tbody>
<tr>
<td>TF8000</td>
<td>TC3 HVAC</td>
</tr>
<tr>
<td>TF8010</td>
<td>TC3 Building Automation Basic</td>
</tr>
<tr>
<td>TF8020</td>
<td>TC3 BACnet</td>
</tr>
<tr>
<td>TF8040</td>
<td>TC3 Building Automation</td>
</tr>
<tr>
<td>TF8310</td>
<td>TC3 Wind Framework</td>
</tr>
<tr>
<td>TF8810</td>
<td>TC3 AES70 (OCA)</td>
</tr>
</tbody>
</table>
New Automation Technology
Beckhoff implements open automation systems using PC-based control technology. The product portfolio comprises these main areas: Industrial PCs, I/O and fieldbus components, drive technology and automation software. Product lines are available for all areas and can be used as individual components or as a complete system. The New Automation Technology philosophy from Beckhoff represents innovative and open control and automation solutions that are used worldwide in a variety of applications ranging from CNC machine tools to intelligent building automation.

Worldwide presence on all continents
With local presence in 75 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 customers as a prerequisite for a profound understanding of the technical challenges facing customers.
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- headquarters: Verl, Germany
- 2018 sales: € 916 million (+13%)
- employees worldwide: 4300
- offices in Germany: 22
- subsidiaries/representative offices worldwide: 38
- distributors worldwide: in 75 countries

(as of 04/2019)

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