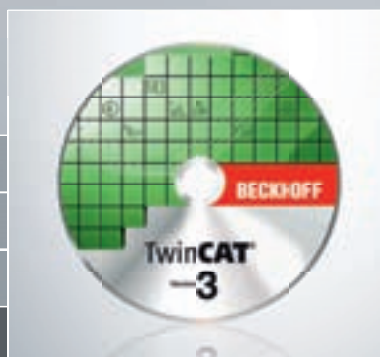


TwinCAT 3 | eXtended Automation (XA)



IPC
I/O
Motion
Automation



TwinCAT 3 – eXtended Automation Technology (XAT)

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. TwinCAT 3 is the systematic further development of TwinCAT 2, with which the world of automation technology is being redefined.

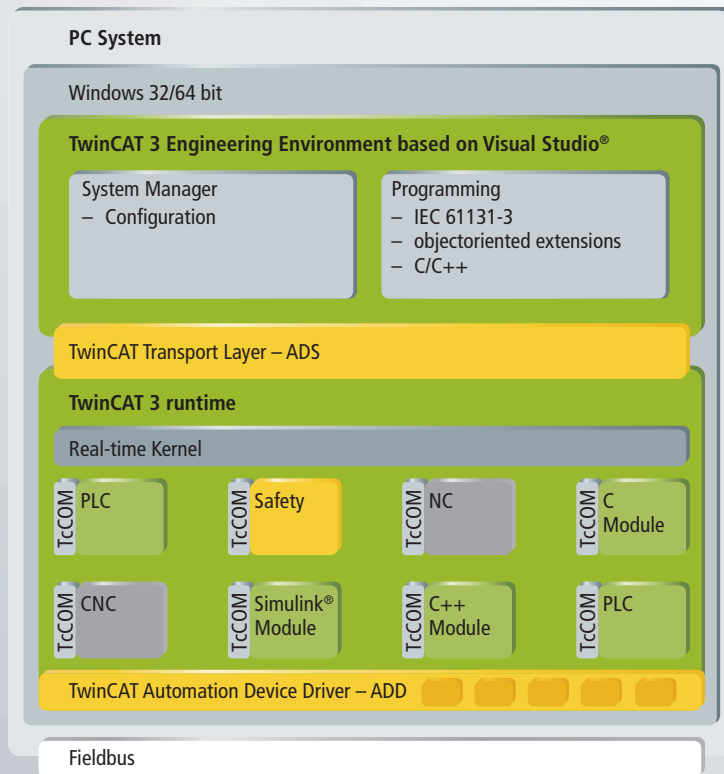
► www.beckhoff.com/TwinCAT3



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

TwinCAT 3 – eXtended Automation Architecture (XAA)



In addition to the possibilities of controller programming according to the 3rd edition of IEC 61131-3, the new 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 Technology – TwinCAT 3 extends the standard automation world

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

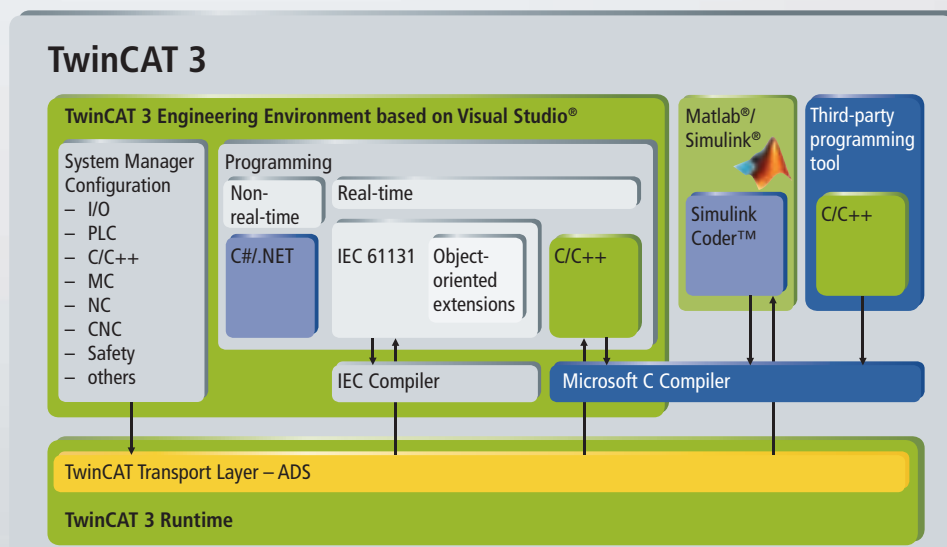
- link to Matlab®/Simulink®: worldwide standard in science
- expandable with other tools: editors, compilers
- TwinCAT 2 projects can be migrated.
- TwinCAT 3 modules:
standardised programming frames
- using the .NET programming languages for
non-real-time capable applications (e.g. HMI)

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

TwinCAT 3 – eXtended Automation Engineering (XAE)

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, parameterise, program and to diagnose automation devices.



Visual Studio® integration can be accomplished in two different ways. TwinCAT Standard only uses the basic framework of Visual Studio® with all its benefits in terms of handling, connection to source code control software, etc., while TwinCAT Integrated, as the name implies, integrates itself into Visual Studio®. In this version, the C/C++, C#, VB.NET programming languages and link to Matlab®/Simulink® are available.

Flexible use of programming languages

C and C++ programming languages

- standardised
- 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

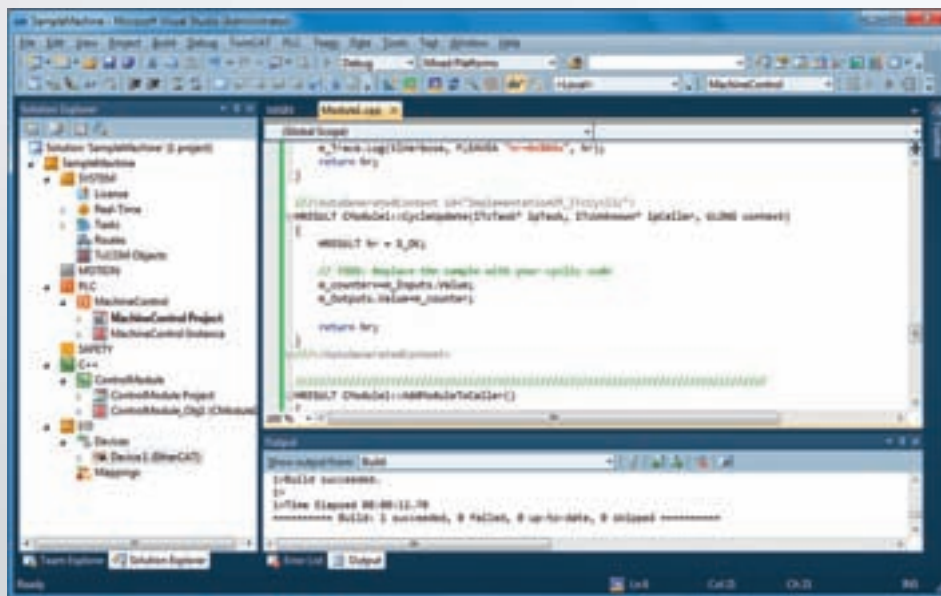
- used for non-real-time-programming (e.g.: HMI)
- source code management in the same project

Link to Matlab®/Simulink®

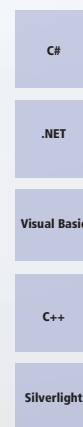
- great variety of toolboxes
- possibilities for use:
 - building of control circuits
 - in simulation
 - in optimisation
- automatic code generation
- debug interface between Matlab®/Simulink® and TwinCAT

TwinCAT 3 – eXtended Automation Language Support

Real-time



Non-real-time



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 visualisations 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

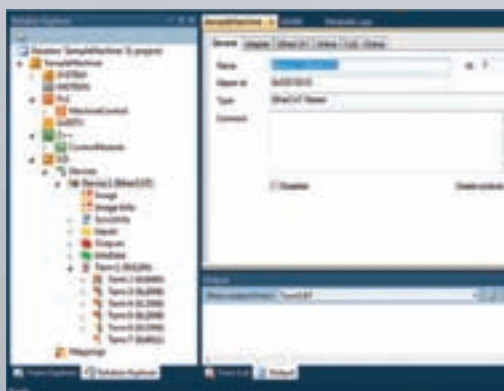


Open architecture

- extendable by plug-ins



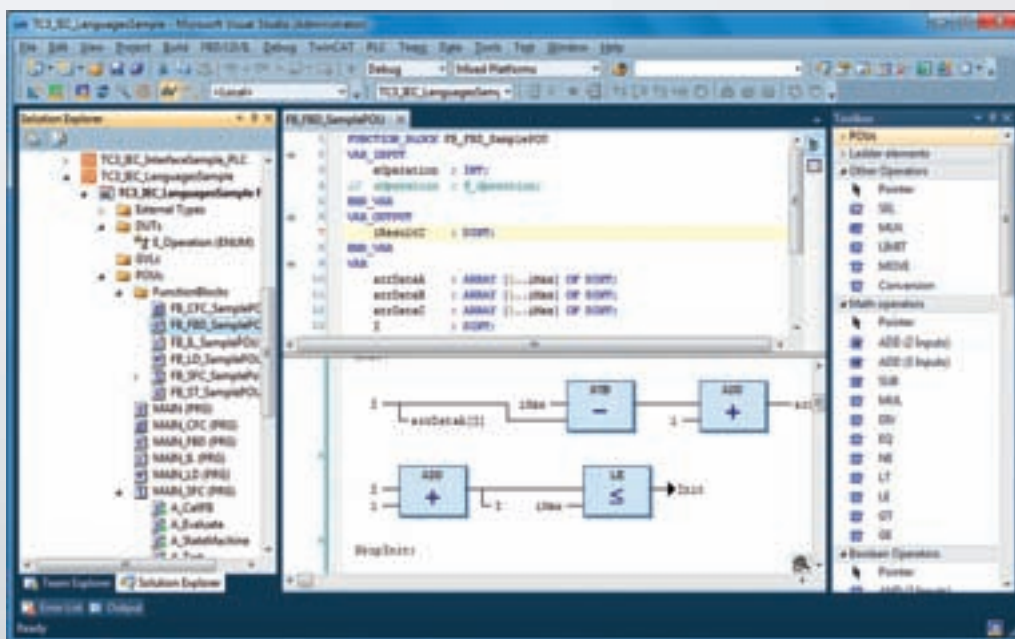
Parallel use of the C++ and FBD programming languages



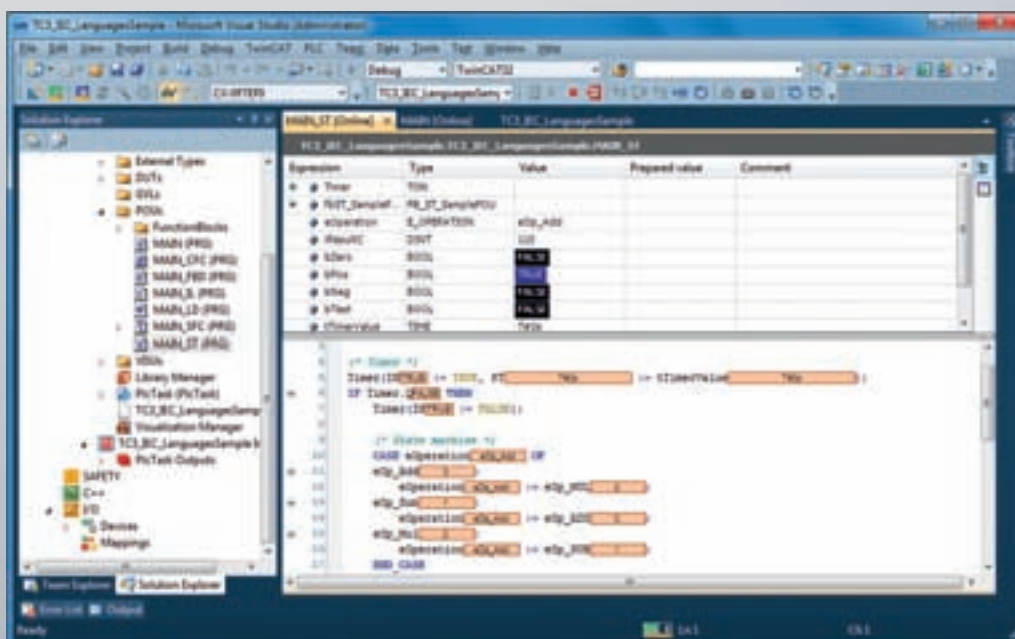
TwinCAT System Manager integrated into Visual Studio®

TwinCAT 3 – XA Language Support: IEC 61131-1

For more efficient programming of automation devices, the editors for IEC 61131-3 programming in TwinCAT have been significantly improved. The operability in particular has been improved and the debugging options have been extended. The new options include improved inline monitoring, conditional break points and more.

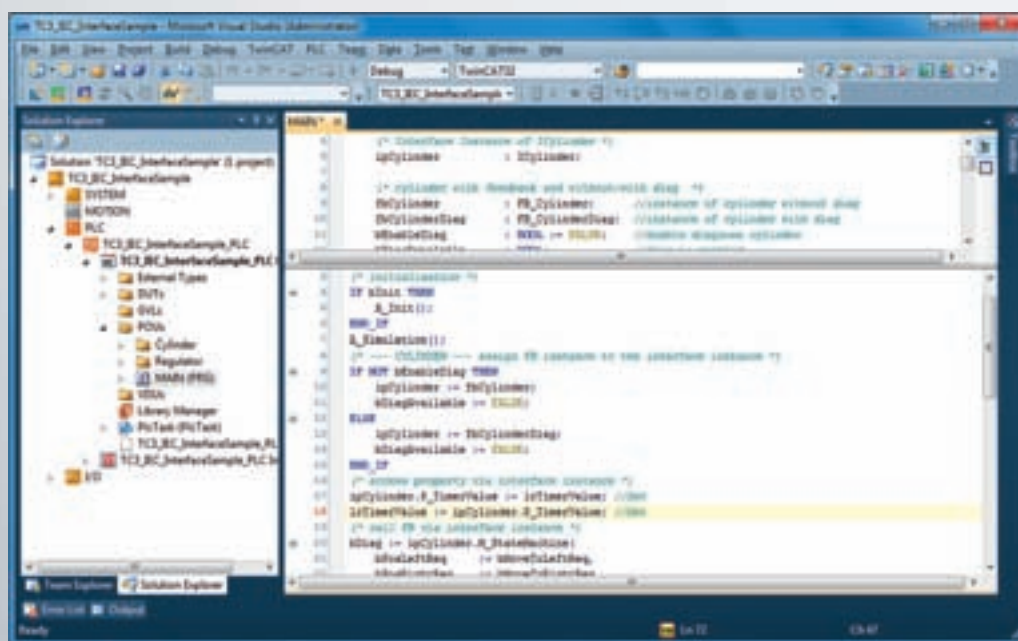


In TwinCAT 3, the editors of the IEC 61131-3 have been integrated seamlessly into the Visual Studio® environment. As a result, the editors use the original Visual Studio® toolbox for the graphical languages, for example.



Improved inline monitoring for the structured text (ST) programming language

TwinCAT 3 likewise supports the extensions to the 3rd edition of the IEC 61131-3 standard that have not yet been finally decided. 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.



Example of the use of polymorphism within an IEC 61131-3 POU (Program Organization Unit)

IEC 61131-3 programming

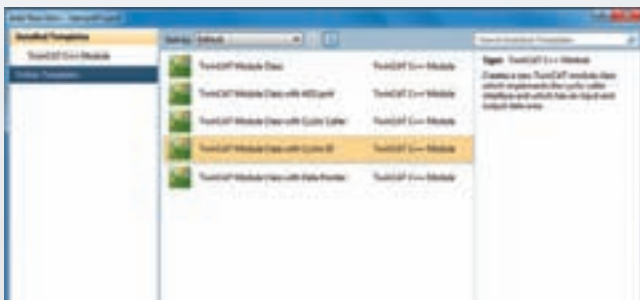
- supplier-independent programming standard
- PLCopen certification
- portable, reusable software
- five graphic and text-based programming languages:
 - Structured Text and Instruction List
 - Function Block Diagram and Ladder Diagram
 - Sequential Function Chart
- data encapsulation by user-defined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

Extended options in TwinCAT 3:

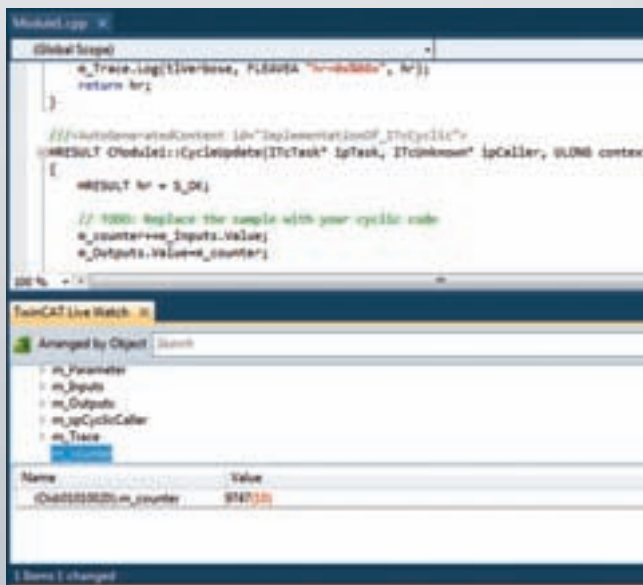
- improved ease of operation usability
 - auto-complete
 - marking of associated keywords
 - collapsing of programming structures
 - ...
- extended debugging
 - use of conditional break points
 - improved inline monitoring
 - ...
- object-oriented extensions
 - single inheritance
 - interfaces
 - methods
 - attributes

TwinCAT 3 – XA Language Support: C/C++

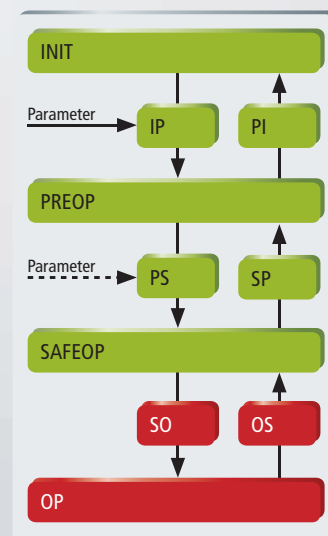
TwinCAT 3 offers the possibility to program TwinCAT runtime modules in C/C++ languages. If Visual Studio® 2010 in the version Professional, Premium or Ultimate is available on the engineering system, then TwinCAT 3 will integrate itself into the existing Visual Studio Shell® in order to use the programming language C or C++ in addition to I/O configuration and the IEC 61131-3 for real-time tasks.



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.



State machine with transitions for the TwinCAT modules

C/C++ as programming languages in automation technology

C and C++ programming languages

- powerful, widely used programming languages
- standardised, object-orientated 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

Extended debugging of C++ programs

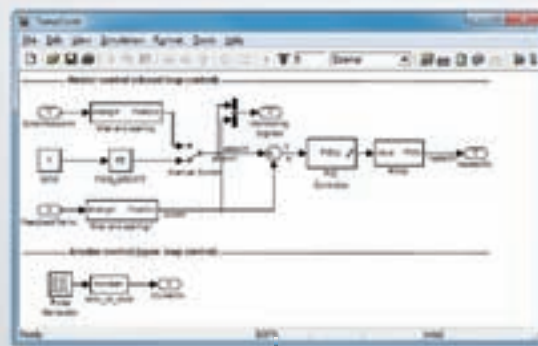
- debugging of C++ programs that run in real-time
- monitoring, watch lists also without the use of break points

.NET programming languages

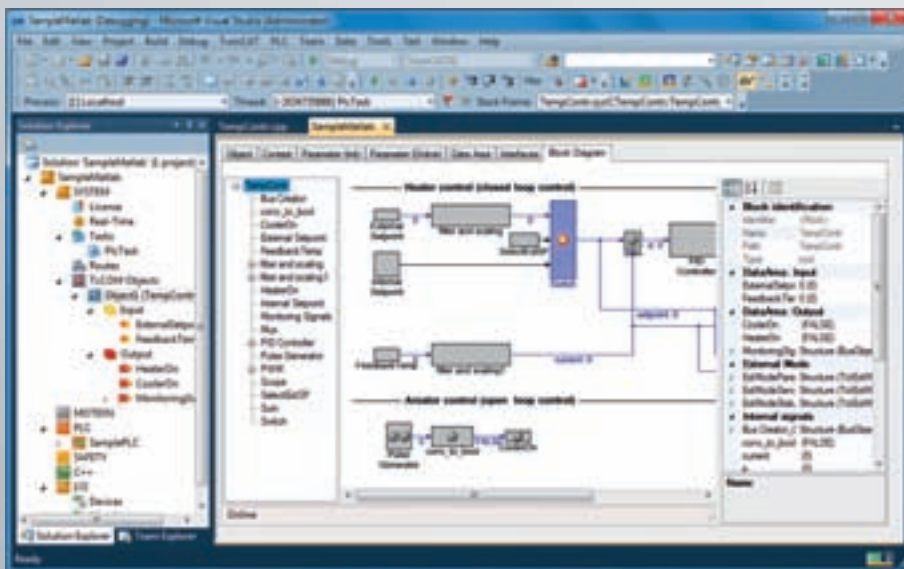
- used for non-real-time programming (e.g.: HMI)
- source control in the same project

TwinCAT 3 – XA Language Support: Matlab®/Simulink®

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.



Example for temperature controller in Matlab®/Simulink®



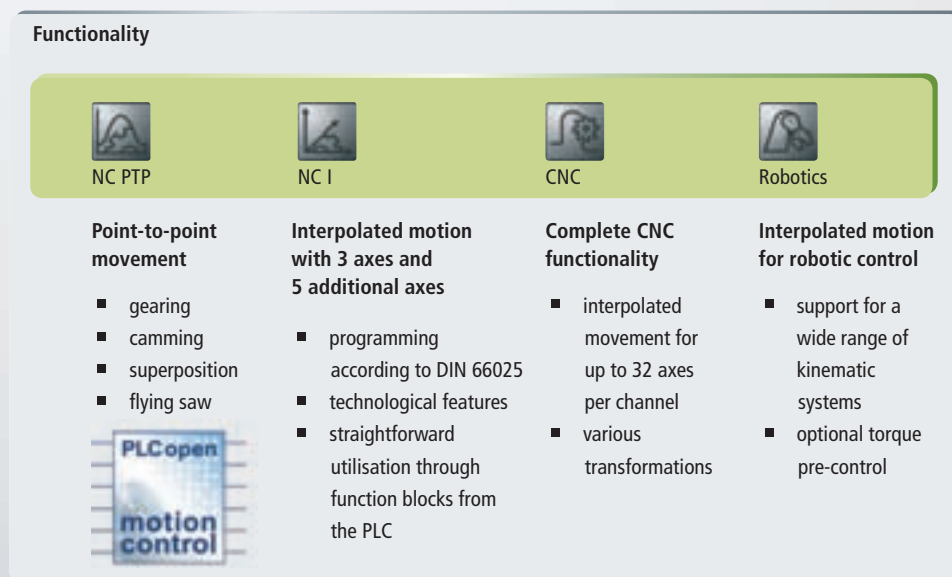
Parameter view of the generated module in TwinCAT

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 optimisation of complex control loops
- automatic code generation via Realtime Workshop
- debug interface between TwinCAT 3 and Simulink®
- parameterisation 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®

TwinCAT 3 – eXtended Motion Control

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.



Interpolated motion for robotic control

Advantages of the integration of robotic control in TwinCAT

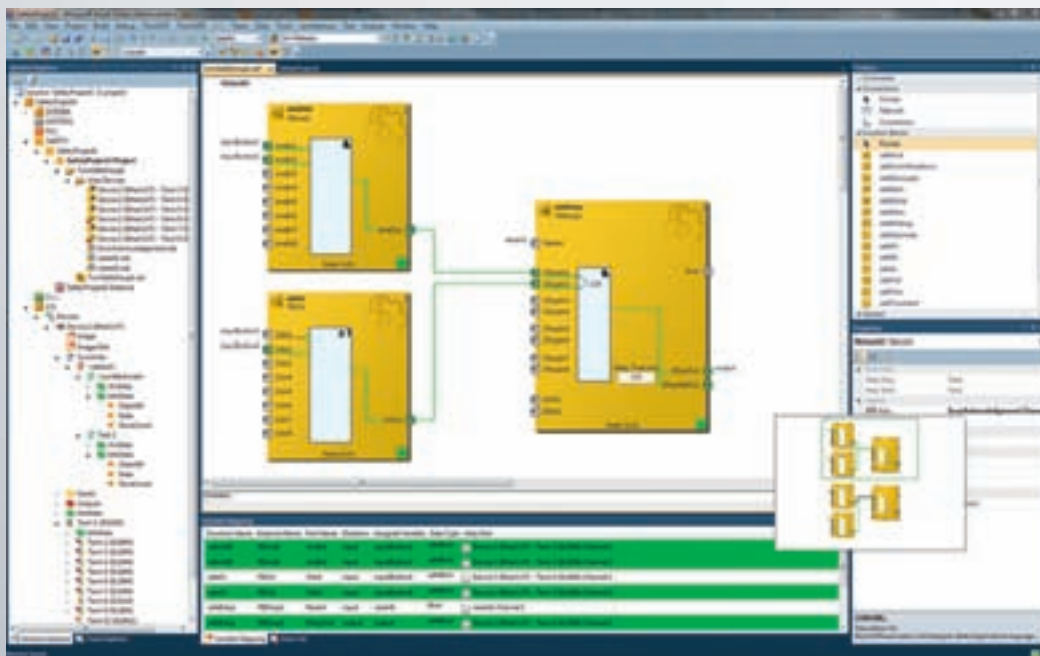
- configuration, parameterisation, diagnostics and programming in TwinCAT
- optimum synergy between PLC, Motion Control and robot control system
- high performance and precision through direct interfaces

Kinematic calculation process

- forward transformation
- inverse transformation
- calculation of the dynamic model

TwinCAT 3 – Safety-Editor

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.

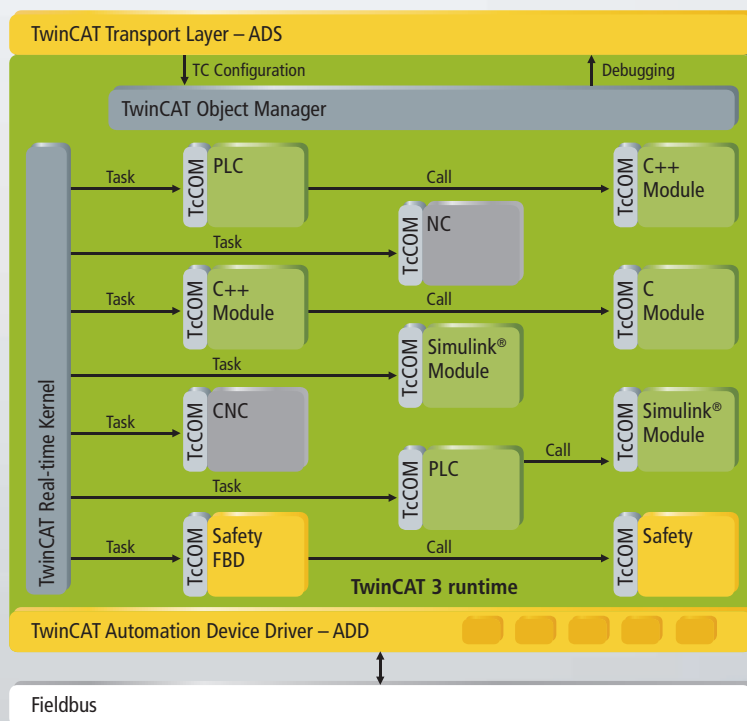


TwinCAT Safety Editor

- 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

TwinCAT 3 – eXtended Automation Runtime (XAR)

Standardised 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.



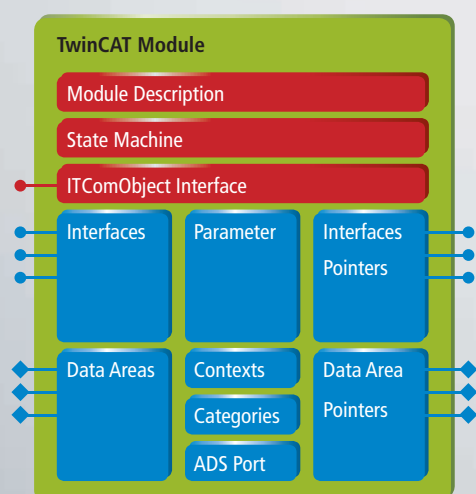
Modular TwinCAT 3 runtime

Modular design, openness, extendibility

Open runtime interface

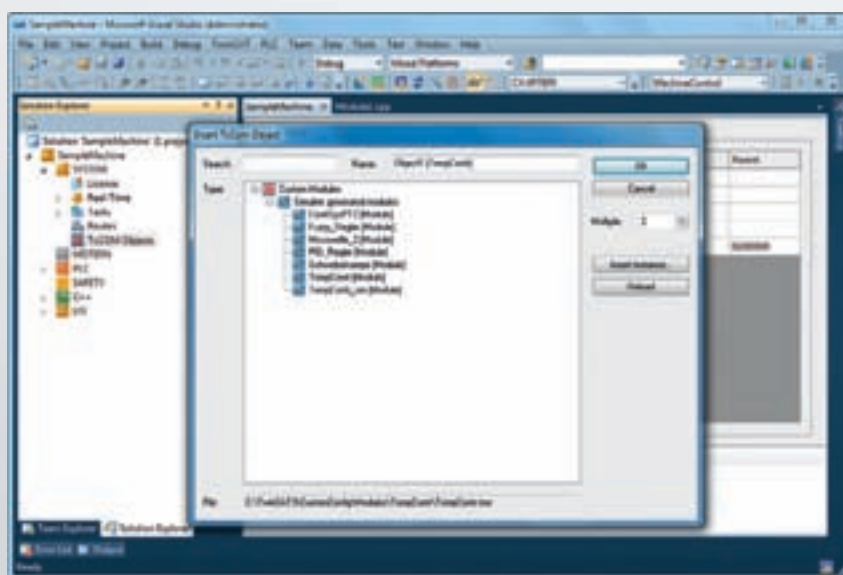
- separation of complete functionality into modules
- use of services from system modules (e.g. real-time)
- defined interfaces
- extension of the runtime by own modules (e.g. bus drivers)
- Scalability: modules can contain simple functions; complex algorithms and real-time tasks.

TwinCAT 3 modules consist of a range of formally defined attributes and interfaces. They enable general application of the modules with each other and externally. The predefined interfaces enable cyclic calling of the internal module logic, for example. Each module implements a state machine that controls the initialisation, parameterisation and linking of the respective module.



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.



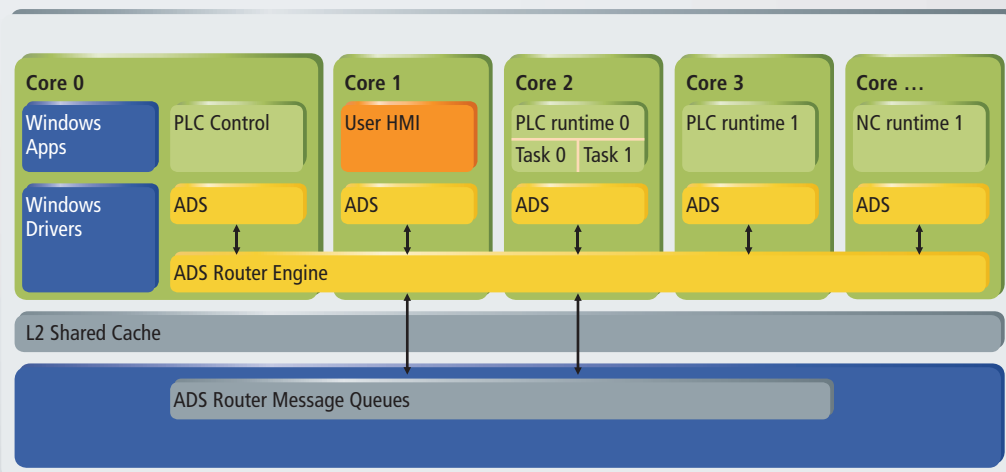
Selection and parameterisation of a Matlab®/Simulink® module

Fast communication, reusability

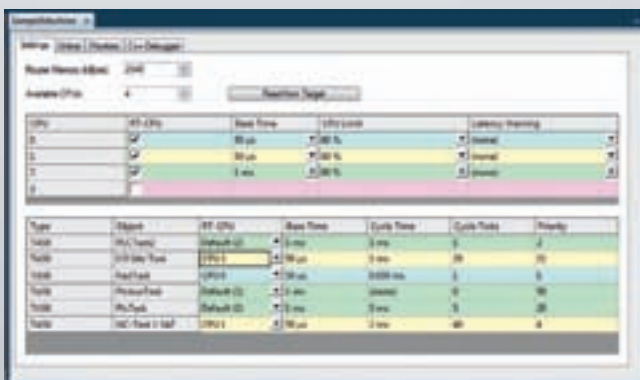
- Functionality of the modules is scalable.
- direct and therefore very fast communication between modules
- Modules are sealed.
- Modules can be developed, serviced and tested independent of each other.
- high reusability

TwinCAT 3 – eXtended Automation Performance

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

Multi-core and multi-tasking support

Support of multi-core systems

- distribution from applications to cores (e.g. PLC, NC and HMI can run on different cores)

Support of multi-tasking

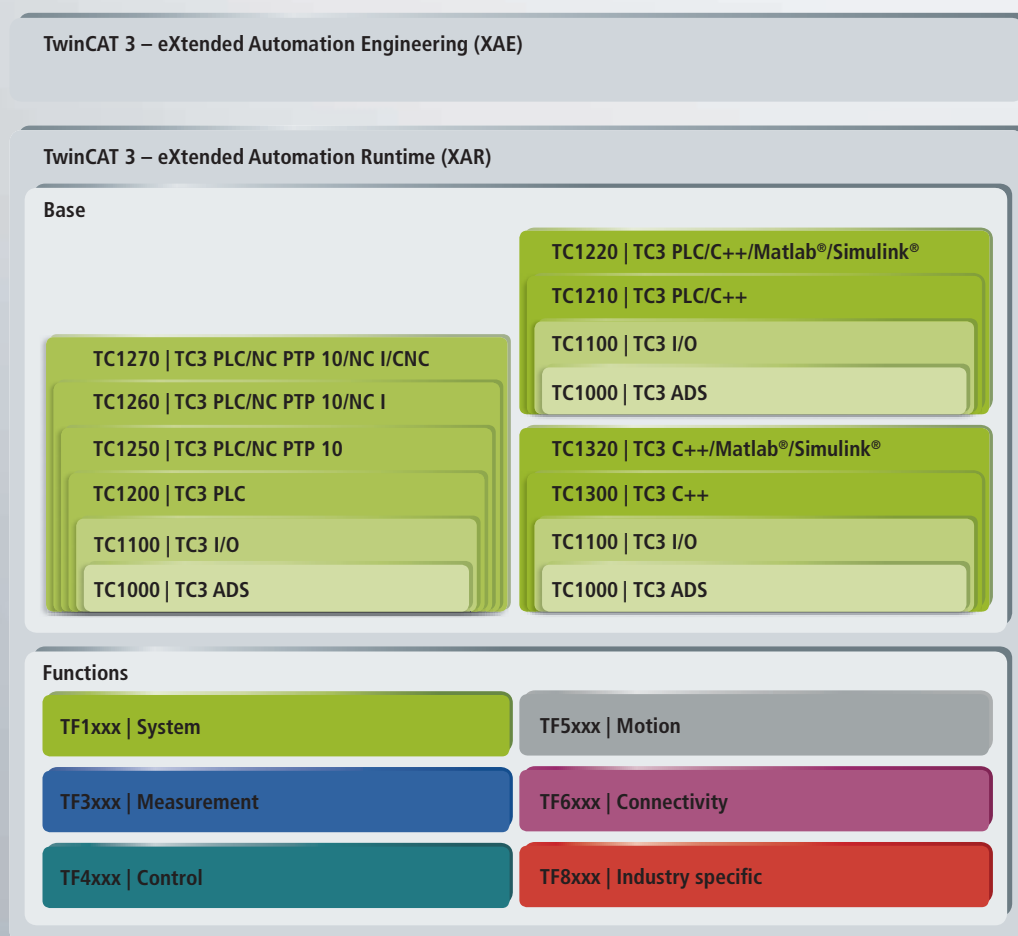
- preemptive multi-tasking
- parallel processing of tasks

Support of 64-bit operating systems

- usage of more resources (memory)

TwinCAT 3 – Product overview

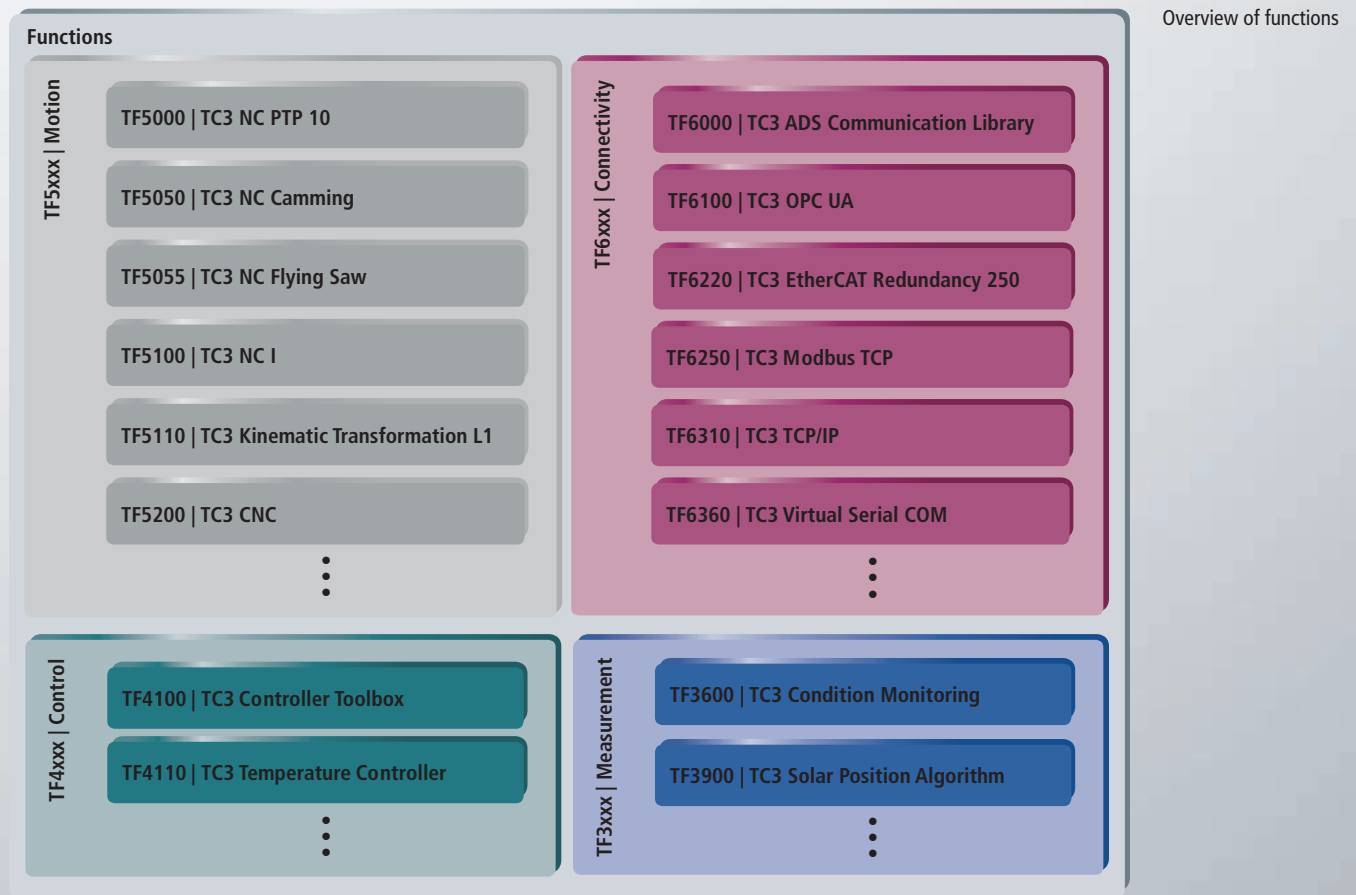
TwinCAT 3 is divided into components. The TwinCAT 3 engineering components enable the configuration, programming and debugging of applications. The TwinCAT 3 runtime consists of further components – basic components and functions. The basic components can be extended by functions.



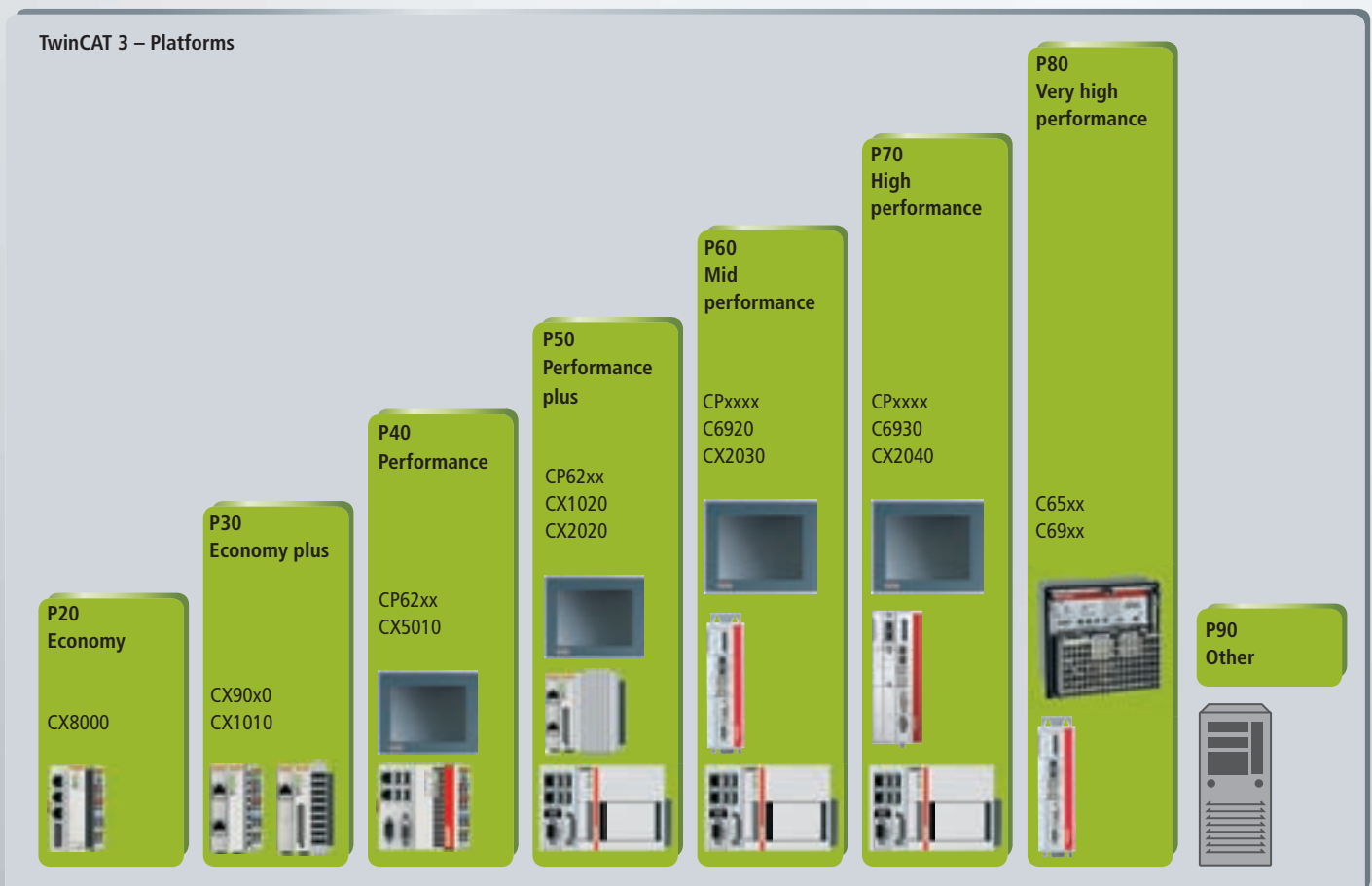
Basic components that build on each other and classification of the functions

TwinCAT 3 – Product overview

The basic components can be extended by functions. The functions are classified into various categories: Motion Control, measurement technology, control technology and communication.

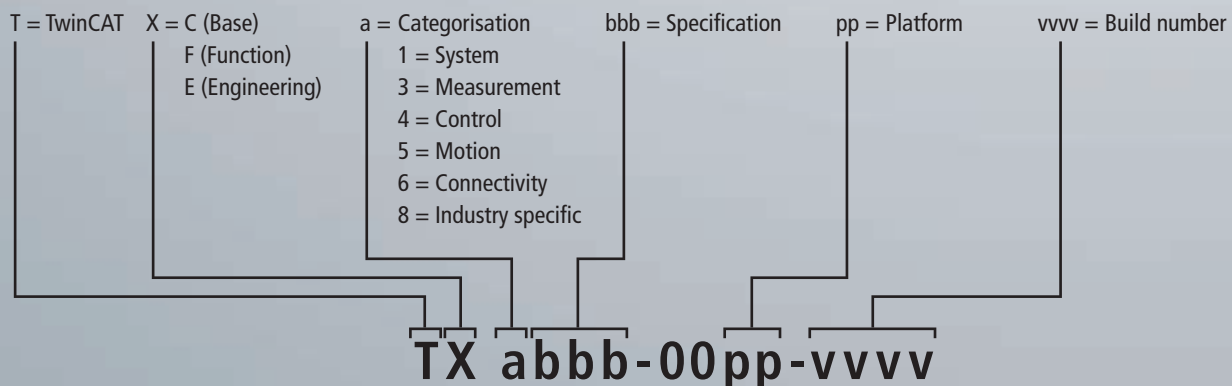


The TwinCAT 3 runtime components are available for different platforms.



The controllers integrated in the platform classifications are only example configurations.

TwinCAT 3 designation system



TwinCAT 3 – Product overview

			Runtime							
			Economy	Economy Plus	Performance	Performance Plus	Mid Performance	High Performance	Very High Performance	Other
			pp=20	30	40	50	60	70	80	90
Engineering (Windows XP Windows 7)										
TE1000	TC3 Engineering	20	x	x	x	x	x	x	x	x
TE1110 ²⁾	TC3 Simulation Manager	20	x	x	x	x	x	x	x	x
TE1120 ²⁾	TC3 ECAD Import	20	x	x	x	x	x	x	x	x
TE1140 ²⁾	TC3 Management Server	21	x	x	x	x	x	x	x	x
TE1150 ²⁾	TC3 Backup	21	x	x	x	x	x	x	x	x
TE1400	TC3 Target for Matlab®/Simulink®	21	x	x	x	x	x	x	x	x
TE1500 ¹⁾	TC3 Valve Diagram Editor	21	x	x	x	x	x	x	x	x
TE1510 ¹⁾	TC3 CAM Design Tool	21	x	x	x	x	x	x	x	x
TwinCAT Base										
TC1000-00pp	TC3 ADS	22	x	x	x	x	x	x	x	x
TC1100-00pp	TC3 I/O	22	x	x	x	x	x	x	x	x
TC1200-00pp	TC3 PLC	23	x	x	x	x	x	x	x	x
TC1210-00pp	TC3 PLC/C++	23	–	x	x	x	x	x	x	x
TC1220-00pp	TC3 PLC/C++/Matlab®/Simulink®	24	–	x	x	x	x	x	x	x
TC1250-00pp	TC3 PLC/NC PTP 10	24	–	x	x	x	x	x	x	x
TC1260-00pp	TC3 PLC/NC PTP 10/NC I	25	–	–	x	x	x	x	x	x
TC1270-00pp ¹⁾	TC3 PLC/NC PTP 10/NC I/CNC	25	–	–	–	x	x	x	x	x
TC1300-00pp	TC3 C++	25	–	x	x	x	x	x	x	x
TC1320-00pp	TC3 C++/Matlab®/Simulink®	25	–	x	x	x	x	x	x	x
Functions										
System										
TF1800-00pp ²⁾	TC3 PLC-HMI	–	–	x	x	x	x	x	x	x
TF1810-00pp ²⁾	TC3 PLC-HMI-Web	–	x	x	x	x	x	x	x	x
TF1140-00pp ²⁾	TC3 Management Server	–	–	x	x	x	x	x	x	x
Measurement										
TF3600-00pp ²⁾	TC3 Condition Monitoring Level 1	26	–	–	x	x	x	x	x	x
TF3601-00pp ²⁾	TC3 Condition Monitoring Level 2	26	–	–	x	x	x	x	x	x
TF3602-00pp ²⁾	TC3 Condition Monitoring Level 3	26	–	–	x	x	x	x	x	x
TF3900-00pp ²⁾	TC3 Solar Position Algorithm	27	x	x	x	x	x	x	x	x
Controller										
TF4100-00pp ¹⁾	TC3 Controller Toolbox	27	x	x	x	x	x	x	x	x
TF4110-00pp ¹⁾	TC3 Temperature Controller	27	–	x	x	x	x	x	x	x
Motion										
TF5000-00pp	TC3 NC PTP 10 Axes	28	–	x	x	x	x	x	x	x
TF5010-00pp	TC3 NC PTP 25 Axes	28	–	–	x	x	x	x	x	x
TF5020-00pp	TC3 NC PTP 25+ Axes	28	–	–	x	x	x	x	x	x
TF5050-00pp ¹⁾	TC3 NC Camming	29	–	–	x	x	x	x	x	x
TF5055-00pp ¹⁾	TC3 NC Flying Saw	29	–	–	x	x	x	x	x	x

			Runtime								
			Page	Economy	Economy Plus	Performance	Performance Plus	Mid Performance	High Performance	Very High Performance	Other
				pp=20	30	40	50	60	70	80	90
Functions											
TF5060-00pp ¹⁾	TC3 NC FIFO Axes	29	—	—	x	x	x	x	x	x	
TF5065-00pp ¹⁾	TC3 Motion Control XFC	29	—	—	x	x	x	x	x	x	
TF5070-00pp ¹⁾	TC3 PackAL	—	—	—	x	x	x	x	x	x	
TF5100-00pp	TC3 NC I	30	—	—	x	x	x	x	x	x	
TF5110-00pp ¹⁾	TC3 Kinematic Transformation L1	30	—	—	x	x	x	x	x	x	
TF5111-00pp ¹⁾	TC3 Kinematic Transformation L2	31	—	—	x	x	x	x	x	x	
TF5112-00pp ¹⁾	TC3 Kinematic Transformation L3	31	—	—	x	x	x	x	x	x	
TF5200-00pp ¹⁾	TC3 CNC	32	—	—	—	x	x	x	x	x	
TF5210-00pp ¹⁾	TC3 CNC E	32	—	—	—	x	x	x	x	x	
TF5220-00pp ¹⁾	TC3 CNC Axes Pack	33	—	—	—	x	x	x	x	x	
TF5230-00pp ¹⁾	TC3 CNC Channel Pack	33	—	—	—	x	x	x	x	x	
TF5240-00pp ¹⁾	TC3 CNC Transformation	33	—	—	—	x	x	x	x	x	
TF5250-00pp ¹⁾	TC3 CNC HSC Pack	33	—	—	—	x	x	x	x	x	
TF5260-00pp ¹⁾	TC3 CNC Spline Interpolation	34	—	—	—	x	x	x	x	x	
TF5270-00pp ¹⁾	TC3 CNC Virtual NCK Basis	34	—	—	—	x	x	x	x	x	
TF5271-00pp ¹⁾	TC3 CNC Virtual NCK Options	34	—	—	—	x	x	x	x	x	
TF5800-00pp ¹⁾	TC3 Digital Cam Server	31	—	—	x	x	x	x	x	x	
TF5810-00pp ¹⁾	TC3 Hydraulic Positioning	31	—	—	x	x	x	x	x	x	
Connectivity											
TF6000-00pp	TC3 ADS Communication Library	35	—	—	x	x	x	x	x	x	
TF6100-00pp	TC3 OPC UA	35	x	x	x	x	x	x	x	x	
TF6120-00pp ¹⁾	TC3 OPC DA	35	—	x	x	x	x	x	x	x	
TF6250-00pp	TC3 Modbus TCP	36	x	x	x	x	x	x	x	x	
TF6310-00pp	TC3 TCP/IP	37	x	x	x	x	x	x	x	x	
TF6220-00pp ¹⁾	TC3 EtherCAT Redundancy 250	36	—	—	x	x	x	x	x	x	
TF6221-00pp ¹⁾	TC3 EtherCAT Redundancy 250+	36	—	—	x	x	x	x	x	x	
TF6255-00pp ¹⁾	TC3 Modbus RTU	36	x	x	x	x	x	x	x	x	
TF6270-00pp ¹⁾	TC3 PROFINET IO Device	—	—	x	x	x	x	x	x	x	
TF6300-00pp ¹⁾	TC3 FTP Client	37	x	x	x	x	x	x	x	x	
TF6340-00pp ¹⁾	TC3 Serial Communication	37	x	x	x	x	x	x	x	x	
TF6350-00pp ¹⁾	TC3 SMS/SMTP	37	x	x	x	x	x	x	x	x	
TF6360-00pp ¹⁾	TC3 Virtual Serial COM	38	—	x	x	x	x	x	x	x	
TF6420-00pp ¹⁾	TC3 Database Server	38	x	x	x	x	x	x	x	x	
TF6421-00pp ¹⁾	TC3 XML Server	—	x	x	x	x	x	x	x	x	
TF6500-00pp ¹⁾	TC3 IEC 60870-5-10x	38	—	x	x	x	x	x	x	x	
TF6510-00pp ¹⁾	TC3 IEC 61850/IEC 61400-25	39	—	x	x	x	x	x	x	x	
TF6600-00pp ¹⁾	TC3 RFID Reader Communication	39	x	x	x	x	x	x	x	x	
TF6610-00pp ¹⁾	TC3 S5/S7 Communication	39	x	x	x	x	x	x	x	x	

¹⁾ estimated market release 2nd quarter 2012

²⁾ estimated market release 4th quarter 2012

TE1xxx | TwinCAT Engineering



	TC3 Engineering	TC3 Simulation Manager	TC3 ECAD Import
Technical data	TE1000	TE1110	TE1120
	<p>TwinCAT Engineering contains the engineering environment of the TwinCAT 3 control software:</p> <ul style="list-style-type: none"> ■ integration into Visual Studio® 2010 (if available) ■ support for the native Visual Studio® interfaces (e.g. connection to source code management systems) ■ IEC 61131-3 (IL, FB, LD, AS, ST) and CFC editors ■ compiler for the IEC 61131-3 languages ■ integrated system manager for the configuration of the target system ■ instancing of several system manager projects in one solution ■ instancing and parameterisation of TwinCAT modules ■ integrated TwinCAT C++ debugger ■ integrated user interface for the parameterisation of modules generated by Matlab®/Simulink® ■ if integrated into Visual Studio®, instancing of .NET projects in the same solution (e.g. for HMI) 	<p>The TwinCAT Simulation Manager is a tool for simplified configuration of a simulation environment, which integrates into the TwinCAT system environment. It supports the creation of a "virtual machine", which corresponds to a real one in its runtime performance.</p>	<p>The TwinCAT ECAD import function serves the purpose of importing already existing engineering results from an ECAD program. It enables the import of information about the structure of the I/Os and their links to PLC variables, which is exported from the ECAD tool by means of XML description. On the basis of this information a system manager configuration and a basic PLC program with the I/O variables used are generated. The generation of NC devices is also possible.</p>
Required			
Target systems	Windows XP, Windows 7	Windows XP, Windows 7	Windows XP, Windows 7
Available	Yes	4 th quarter 2012	4 th quarter 2012
Further information	www.beckhoff.com/TE1000	www.beckhoff.com/TE1110	www.beckhoff.com/TE1120

	TC3 Management Server	TC3 Backup	TC3 Target for Matlab®/Simulink®	TC3 Valve Diagram Editor	TC3 CAM Design Tool
	TE1140	TE1150	TE1400	TE1500	TE1510
	<p>The TwinCAT Management Server enables the central administration of Beckhoff-CE controllers. Software updates, for example, can thus be loaded onto controllers in the network from a central location. Besides operating system updates, device-specific components (PLC boot projects) can also be loaded. By the option of separating known network devices into groups, individual actions can be defined for each group.</p>	<p>Files, directories, OS-specific information, settings and TwinCAT configurations can be backed up and restored using the TwinCAT Backup Server. This can be carried out on all connected media and also via the network.</p>	<p>The TwinCAT Matlab®/Simulink® Target offers System Target Files for the use of the Matlab®/Simulink® coder. It enables the generation of TwinCAT 3 runtime modules, which can be instantiated and parameterised in the TwinCAT 3 engineering environment.</p>	<p>The TwinCAT Valve Diagram Editor enables the linearisation of non-linear curves of hydraulic valves with the aid of a graphical editor. On the basis of a few base points, straight lines or 5th degree polynomials can be determined that connect the points. The characteristic linearisation curve thus determined can be loaded into the TwinCAT NC real-time and taken into account when the voltages are output in the drive.</p>	<p>The TwinCAT CAM Design Editor enables the generation and modification of cam plates with the aid of a graphical editor. These are composed of sections of laws of motion such as modified sine waves, harmonic combinations, or of various polynomial functions. Velocity, acceleration and jerk are displayed in addition to the slave position. The generated cam plates can be transferred to the NC as tables with specified step size or as so-called motion functions.</p>
	Windows XP, Windows 7	Windows XP, Windows 7	Windows XP, Windows 7	Windows XP, Windows 7	Windows XP, Windows 7
	4 th quarter 2012	4 th quarter 2012	Yes	2 nd quarter 2012	2 nd quarter 2012
	www.beckhoff.com/TE1140	www.beckhoff.com/TE1150	www.beckhoff.com/TE1400	www.beckhoff.com/TE1500	www.beckhoff.com/TE1510

TC1xxx | TwinCAT Base



	TC3 ADS				TC3 I/O			
Technical data	TC1000-00pp				TC1100-00pp			
	<p>The TwinCAT Automation Device Specification (ADS) is the medium-independent protocol for the reading and writing of data and for instruction transmission within TwinCAT. An ADS router is made available for communication links. ADS clients can be connected to TwinCAT controllers in the network via ADS.</p>				<p>Using TwinCAT I/O, cyclic data can be collected by different fieldbuses in process images. Cyclic tasks drive the corresponding fieldbuses. Various fieldbuses can be operated with different cycle times on one CPU. Applications can directly access the process image. The fieldbuses and the process images are configured in TwinCAT Engineering.</p> <ul style="list-style-type: none"> provides variable-oriented linkage of I/O devices to tasks tasks are variable-oriented among each other the smallest unit is one bit supports both synchronous and asynchronous relationships consistent exchange of data areas and process images online display in the directory tree online watch window 'Force and Write' for commissioning and for testing task variables and I/O devices supported fieldbuses: <ul style="list-style-type: none"> EtherCAT Lightbus PROFIBUS DP (Master and Slave) Interbus CANopen SERCOS interface DeviceNet Ethernet USB SMB (System Management Bus) 			
Required								
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
Performance class (pp)	20	30	40	50	20	30	40	50
	x	x	x	x	x	x	x	x
	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x
Available	Yes				Yes			
Further information	www.beckhoff.com/TC1000				www.beckhoff.com/TC1100			

TC3 PLC					TC3 PLC/C++			
TC1200-00pp					TC1210-00pp			
<p>TwinCAT PLC realises one or more PLCs with the international standard IEC 61131-3 3rd edition on one CPU. All programming languages described in the standard can be used for programming. Various convenient debugging options facilitate fault-finding and commissioning. Program modifications can be carried out at any times and in any size on-line, i.e. when the PLC is running. All variables are available symbolically by ADS and can be read and written in appropriate clients.</p> <ul style="list-style-type: none"> process image size, flag range, program size, POU size and number of variables are limited only by size of RAM cycle times from 50 µs link time: typically 1 µs (Intel® Core™2 Duo) IEC 61131-3: IL, FBD, LD, SFC, ST, CFC online changes in programs and variables, online monitor, execution control, breakpoints, write, force, step, data trace, remote debugging via TCP/IP online connection with PLC runtime system worldwide via TCP/IP or fieldbus online monitoring of variables in variable lists, watch windows, editors online status and powerflow (accumulator contents) of programs and instances triggering, forcing and setting variables powerful debugging with single cycle, break points, step in, step over, display of the current call stack, watchlist shows selection of variable, trace functions online management of all variable names and structures across the whole system remanent and persistent data, UPS supported storage on hard disk, storage in NOVDRAM as option variable reading and writing access via ADS, OPC certified in accordance with PLCopen base level (IL/ST) structured programming with modular program management source code is stored in the target system convenient library management powerful compiler with incremental compilation all common data types, structures, arrays, including multi-dimensional arrays convenient creation of programs with: autoformat, autodeclare, cross-reference, search/replace, project comparison simple linking to source code administration tools by embedding in Microsoft Visual Studio® 					<p>Extension of the TwinCAT PLC TC1200 with additional C++ functionalities:</p> <ul style="list-style-type: none"> online connection to PLC/C++ runtime system locally or worldwide via TCP/IP or via fieldbus online monitoring of variables in variable lists, watch windows and editors without setting break points online setting of variables 			
Windows XP, Windows 7, Windows CE					Windows XP, Windows 7			
20	30	40	50		20	30	40	50
x	x	x	x		—	x	x	x
60	70	80	90		60	70	80	90
x	x	x	x		x	x	x	x
Yes					Yes			
www.beckhoff.com/TC1200					www.beckhoff.com/TC1210			

TC1xxx | TwinCAT Base



	TC3 PLC/C++/Matlab®/Simulink®				TC3 PLC/NC PTP 10			
Technical data	TC1220-00pp				TC1250-00pp			
	<p>Extension of the TwinCAT PLC/C++ TC1300 by the possibility to execute modules generated by Matlab®/Simulink®:</p> <ul style="list-style-type: none"> ■ contains the TwinCAT 3 PLC and C++ runtime ■ allows the execution of modules generated by Matlab®/Simulink® ■ multiple instancing of modules ■ parameterisation of these modules at runtime ■ online access to all parameters (can be deactivated) ■ generic modules (no hardware connection necessary within the models) ■ connection to the external mode of Simulink® ■ connection to the TwinCAT C++ debugger, with graphical representation of the blocks ■ modules can be called from other modules or directly by tasks 				<p>Extension of the TwinCAT PLC TC1200 by the possibility to realise point-to-point movements in software (TwinCAT Motion Control PTP 10). The axes are represented by axis objects and provide a cyclic interface, e.g. for the PLC. This axis object is then linked to a corresponding physical axis. In this way the most diverse axis types with the most diverse fieldbus interfaces can be connected abstractly with the axis objects, which always offer an identical configuration interface. The control of the axes can be configured in various constellations (position or velocity interface) and various controllers.</p> <p>The axes are configured in TwinCAT Engineering.</p> <ul style="list-style-type: none"> ■ up to a maximum of 255 axes on one CPU ■ supports electrical and hydraulic Servo Drives, frequency converter drives, stepper motor drives, DC drives, switched drives (fast/slow axes), simulation axes and encoder axes ■ supports various encoders such as incremental encoder, absolute encoder, digital interface to the drives such as EtherCAT, SERCOS, SSI, Lightbus, PROFIBUS DP/MC, pulse train ■ standard axis functions such as start/stop/reset/reference, velocity override, master/slave couplings, electronic gearbox, online distance compensation Programming is carried out via PLCopen-compliant IEC 61131-3 function blocks ■ convenient axis commissioning options ■ online monitoring of all axis state variables such as actual/set values, releases, control values ■ online axis tuning ■ forcing of axis variables ■ configuration of all axis parameters, such as measuring system, drive parameters and position controller ■ configurable controller structures: P control, PID control, PID with velocity pre-control, PID with velocity and acceleration pre-control ■ online master/slave and slave/master conversion ■ flying saw (diagonal saw (optional)) ■ cam plates (support by TC3 Cam Design Tool (optional)) ■ FIFO axes (optional) ■ external set value generators ■ multi-master coupling (optional) 			
Required								
Target systems	Windows XP, Windows 7				Windows XP, Windows 7			
Performance class (pp)	20	30	40	50	20	30	40	50
	—	x	x	x	—	x	x	x
	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x
Available	Yes				Yes			
Further information	www.beckhoff.com/TC1220				www.beckhoff.com/TC1250			


	TC3 PLC/NC PTP 10, NC I				TC3 PLC/NC PTP 10, NC I, CNC				TC3 C++				TC3 C++/Matlab®/Simulink®			
	TC1260-00pp				TC1270-00pp				TC1300-00pp				TC1320-00pp			
	<p>Extension of the TwinCAT PLC/NC PTP 10 by the possibility to realise movements with up to three interpolating and up to five auxiliary axes. Various axis types with various fieldbus interfaces are supported. The movement is usually programmed in DIN 66025, but it can also alternatively be carried out via PLC function blocks.</p> <ul style="list-style-type: none"> max. 3 path axes and up to 5 auxiliary axes per group 1 group per channel, max. 31 channels supports electric servo axes, stepper motor drives interpreter functions such as subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions geometry functions: straight lines and circles in 3D space, circles at all main levels, helices with base circles at all main levels, linear, circular and helical interpolation at the main levels and freely definable levels, Bezier splines, look-ahead function online reconfiguration of axes in groups, path override, slave coupling to path axes, auxiliary axes, axis error and sag compensation, measuring functions programming in DIN 66025 access alternatively via function blocks according to IEC 61131-3 operation of automatic mode, manual mode (jog/inch), single block mode, referencing, handwheel mode (movement/overlay) convenient debugging with online monitoring of current set/actual position (position lag of all axes), NC program line currently being processed, NC program line currently being interpreted, channel status 				<p>Extension of the TwinCAT PLC/NC PTP 10 by the possibility to realise an interpolation with up to five simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according to DIN 66025. The axes and channels are configured in TwinCAT Engineering.</p> <ul style="list-style-type: none"> maximum 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels supports electric servo axes, stepper motor drives subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, zero point shifts, tool functions geometry functions linear, circular and helical interpolation at the main levels and freely definable levels, max. 32 interpolating path axes per channel, look-ahead function axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions programming in DIN 66025 with high-level language extension access via function blocks from TwinCAT PLC according to IEC 61131-3 operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) convenient debugging with online monitoring of all states 				<p>The TwinCAT 3 C++ runtime environment enables the execution of real-time modules written in C++.</p> <p>The following functions are supported, among others:</p> <ul style="list-style-type: none"> online connection to C++ runtime system locally or worldwide via TCP/IP or via fieldbus online monitoring of variables in variable lists, watch windows and editors without setting break points online setting of variables 				<p>Extension of the TC1300 by the possibility to execute modules generated by Matlab®/Simulink®.</p> <ul style="list-style-type: none"> contains the TwinCAT 3 C++ runtime allows the execution of modules generated by Matlab®/Simulink® multiple instancing of modules parameterisation of these modules at runtime online access to all parameters (can be deactivated) generic modules (no hardware connection necessary within the models) connection to the external mode of Simulink® connection to the TwinCAT C++ debugger, with graphical representation of the blocks modules can be called from other modules or directly by tasks 			
	Windows XP, Windows 7				Windows XP, Windows 7				Windows XP, Windows 7				Windows XP, Windows 7			
	20	30	40	50	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	x	x	–	–	–	x	–	x	x	x	–	x	x	x
	60	70	80	90	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Yes				2 nd quarter 2012				Yes				Yes			
	www.beckhoff.com/TC1260				www.beckhoff.com/TC1270				www.beckhoff.com/TC1300				www.beckhoff.com/TC1320			

TF3xxx | TwinCAT Measurement



	TC3 Condition Monitoring Level 1				TC3 Condition Monitoring Level 2				TC3 Condition Monitoring Level 3			
Technical data	TF3600-00pp				TF3601-00pp				TF3602-00pp			
	<p>In order to implement Condition Monitoring for machines and plants, the TwinCAT Condition Monitoring library offers a modular construction kit of mathematical algorithms with which measured values can be analysed. The user can serve himself from this construction kit, depending upon the application background, and he has so the option to develop a scalable solution on different platforms. The library's functions are primarily relevant to analysis, statistics and classification. In addition to spectral analysis via FFT or using, for instance, an envelope spectrum, it is possible to calculate key statistical values such as the kurtosis or the crest factor. Combining these algorithms with limit value monitoring is, for instance, ideally suited to monitoring roller bearings.</p> <p>Level 1 contains the following algorithms:</p> <ul style="list-style-type: none"> Frequency Analysis Fast Fourier Transform Power Spectrum Envelope Welch Method Window Functions Time-Frequency Representations Power Spectrogram Statistics Multi-Channel Histogram Mean, Standard Deviation, Skew, Kurtosis Crest Factor Auto Correlation Function Cross Correlation Function Pattern Recognition / Machine Learning Threshold Monitoring Discrete Classification 				<p>In addition to the Level 1 functions, TwinCAT Condition Monitoring Level 2 contains the following algorithms:</p> <ul style="list-style-type: none"> Frequency Analysis Hilbert Transform Analytic Signal Instantaneous Phase Overlap Add Synthesis Statistics Statistics of Frequency Spectra Quantities and Percentiles Homomorphic Signal Processing Power Cepstrum Instantaneous Frequency Pattern Recognition/ Machine Learning Bayesian Classification 				<p>In addition to the Level 2 functions, TwinCAT Condition Monitoring Level 3 contains the following algorithms:</p> <ul style="list-style-type: none"> Homomorphic Signal Processing Complex Cepstrum Robust Phase unwrapping 			
Required	TC1100				TC1100				TC1100			
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
Performance class (pp)	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	x	x	–	–	x	x	–	–	x	x
	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x
Available	4 th quarter 2012				4 th quarter 2012				4 th quarter 2012			
Further information	www.beckhoff.com/TF3600				www.beckhoff.com/TF3601				www.beckhoff.com/TF3602			

TF4xxx | TwinCAT Controller

TC3 Solar Position Algorithm						TC3 Controller Toolbox				TC3 Temperature Controller						
TF3900-00pp						TF4100-00pp				TF4110-00pp						
<p>With the TwinCAT Solar Position Algorithm it is possible to determine the sun angle using the date, time, geographical longitude and latitude as well as further parameters (depending on the desired accuracy). The function block works with a maximum inaccuracy of $\pm 0.001^\circ$.</p>					<p>Technical data</p>				<p>The TwinCAT Controller Toolbox covers all essential blocks for control applications.</p> <ul style="list-style-type: none">■ controllers satisfy industrial requirements such as anti-reset windup■ simple basic controllers (P, I, D)■ complex controllers (PI, PID, switching controllers)■ filter blocks■ control value generators (limiters, PWM)■ ramp and signal generator blocks				<p>Temperature controllers can be simply implemented using TwinCAT Temperature Controller. Simple commissioning through self-adjustment of the controller (auto-tuning) is included.</p> <ul style="list-style-type: none">■ automatic and manual operation with shock-free set up■ control value analog or pulse-width modulated signal■ tolerance monitoring, absolute value monitoring■ scalable reaction to sensor error and heating power faults■ limitation of set and control values■ optional ramping of the set value■ optional start-up phase for the setpoint variables■ an industrial PID controller is the base control algorithm inside the temperature controller			
TC1200					Required				TC1200				TC1200			
Windows XP, Windows 7, Windows CE					Target systems				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
20304050					Performance class (pp)				20304050				20304050			
x x x x					x x x x				— x x x				x x x x			
60708090					60708090				60708090				60708090			
x x x x					x x x x				x x x x				x x x x			
4 th quarter 2012					Available				2 nd quarter 2012				2 nd quarter 2012			
www.beckhoff.com/TF3900					Further information				www.beckhoff.com/TF4100				www.beckhoff.com/TF4110			

TF5xxx | TwinCAT Motion Control



	TC3 NC PTP 10 Axes				TC3 NC PTP 25 Axes				TC3 NC PTP 25+ Axes			
Technical data	TF5000-00pp				TF5010-00pp				TF5020-00pp			
	<p>TwinCAT Motion Control PTP implements Motion Control for point-to-point movements in software. The axes are represented by axis objects and provide a cyclic interface, e.g. for the PLC. This axis object is then linked to a corresponding physical axis. In this way the most diverse axis types with the most diverse fieldbus interfaces can be connected abstractly with the axis objects, which always offer an identical configuration interface. The control of the axes can be configured in various conformations (position or velocity interface) and various controllers. The axes are configured in TwinCAT Engineering.</p> <ul style="list-style-type: none"> up to 10 axes on a maximum of 255 axes included developable supports electrical and hydraulic Servo Drives, frequency converter drives, stepper motor drives, DC drives, switched drives (fast/slow axes), simulation axes and encoder axes supports various encoders such as incremental encoder, absolute encoder, digital interface to the drives such as EtherCAT, SERCOS, SSI, Lightbus, PROFIBUS DP/MC, pulse train standard axis functions such as start/stop/reset/reference, velocity override, master/slave couplings, electronic gearbox, online distance compensation programming is carried out via PLCopen-compliant IEC 61131-3 function blocks convenient axis commissioning options online monitoring of all axis state variables such as actual/setpoint values, releases, control values, online axis tuning forcing of axis variables configuration of all axis parameters, such as measuring system, drive parameters and position controller configurable controller structures: P control, PID control, PID with velocity pre-control, PID with velocity and acceleration pre-control online master/slave and slave/master conversion flying saw (diagonal saw) cam plates (support by TC3 Cam Design Editor) FIFO axes external set point value generators multi-master coupling 				Extension of TC3 NC PTP 10 up to a maximum of 25 axes.				Extension of TC3 NC PTP 10 up to a maximum of 255 axes.			
Required												
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
Performance class (pp)	20	30	40	50	20	30	40	50	20	30	40	50
	–	x	x	x	–	–	x	x	–	–	x	x
	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x
Available	Yes				Yes				Yes			
Further information	www.beckhoff.com/TF5000				www.beckhoff.com/TF5010				www.beckhoff.com/TF5020			

	TC3 NC Camming				TC3 NC Flying Saw				TC3 NC FIFO Axes				TC3 Motion Control XFC			
	TF5050-00pp				TF5055-00pp				TF5060-00pp				TF5065-00pp			
	<p>TwinCAT NC Camming (cam plate) is a non-linear relationship between a master and a slave axis. The camming package offers various options for the storage of cam plates. Convenient PLC blocks enable the loading, coupling and uncoupling of cam plates. It is possible to load new cam plates or to modify cam plates during operation. The TwinCAT CAM Design Editor offers support for the creation of the cam plates.</p> <ul style="list-style-type: none"> position tables with master interpolations points and corresponding slaves positions; interpolation between the points is done linearly or by splines motion function table describing a cam plate via motion laws according to VDI guideline 2143. cyclic or linear processing cam plate with offset and scale, can be modified on the master or slave side high flexibility through online change of the motion functions 				<p>TwinCAT NC Flying Saw implements the coupling of a slave axis to a master axis in a certain synchronous position (flying saw). PLC function blocks enable coupling and uncoupling as well as parameterisation.</p> <ul style="list-style-type: none"> The master axis can be a real axis, a virtual axis, or some other external source of actual values. synchronisation of the slave axis from any motion situation (stop, forward or reverse travel) with the master in motion simple synchronisation with the master velocity precise position synchronisation with the master axis (velocity and position) synchronous velocity can be set via a coupling factor optional return prevention as additional safety function superimposed section compensation during the synchronous phase for dynamic position correction 				<p>Using TwinCAT NC FIFO Axes, externally generated set position values can be output to the axes in the form of a velocity pre-control. The set value generation is designed in such a way that both the set position and the set velocity are determined as the FIFO inputs are worked through in sequence. It is also possible, if necessary, to interpolate between two neighbouring FIFO inputs.</p>				<p>eXtreme Fast Control (XFC) is the technique that enables very fast, temporally high-precision reactions using EtherCAT, special I/O terminals and TwinCAT on the PC. Using EtherCAT Distributed Clocks (DC) and appropriate terminals, distributed latches or cam controllers can be implemented simply in this way.</p> <ul style="list-style-type: none"> function blocks for the high-precision acquisition and switching of digital signals related to axis positions EtherCAT Distributed Clocks with the timestamp-based EtherCAT EL1252, EL2252 or EL2262 input and output terminals blocks for the conversion of DC time to position and vice versa convenient PLCopen-compliant TouchProbe block digital cam controller as PLCopen-compliant block 			
	TC1250				TC1250				TC1250				TC1250			
	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
	20	30	40	50	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	x	x	–	–	x	x	–	–	x	x	–	–	x	x
	60	70	80	90	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012			
	www.beckhoff.com/TF5050				www.beckhoff.com/TF5055				www.beckhoff.com/TF5060				www.beckhoff.com/TF5065			

TF5xxx | TwinCAT Motion Control



	TC3 NC I				TC3 Kinematic Transformation L1			
Technical data	TF5100-00pp				TF5110-00pp			
	<p>Using TwinCAT NC I, movements can be implemented with up to three interpolating and up to five auxiliary axes in the interpolation package. Various axis types with various fieldbus interfaces are supported. The movement is usually programmed in DIN 66025, but it can also alternatively be carried out via PLC function blocks.</p> <ul style="list-style-type: none"> max. 3 path axes and up to 5 auxiliary axes per group 1 group per channel, max. 31 channels supports electric servo axes, stepper motor drives interpreter functions such as subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions geometry functions: straight lines and circles in 3D space, circles at all main levels, helices with base circles at all main levels, linear, circular and helical interpolation at the main levels and freely definable levels, Bezier splines, look-ahead function online reconfiguration of axes in groups, path override, slave coupling to path axes, auxiliary axes, axis error and sag compensation, measuring functions programming in DIN 66025 access alternatively via function blocks according to IEC 61131-3 operation of automatic mode, manual mode (jog/inch), single block mode, referencing, handwheel mode (movement/overlay) convenient debugging with online monitoring of current setpoint/actual position (position lag of all axes), NC program line currently being processed, NC program line currently being interpreted, channel status 				<p>Various robot types kinematics can be realised using TwinCAT Kinematic Transformation. The programming of the robot movements takes place in Cartesian coordinates using either DIN 66025 instructions or the PLCopen-compliant blocks from the PLC. An integrated dynamic pre-control ensures high precision of the movement even at high accelerations and speeds. Configuration takes place in TwinCAT Engineering.</p> <ul style="list-style-type: none"> TwinCAT supports various parallel and also serial kinematics. supports the programming of interpolating movements in G-code (DIN 66025) alternatively, standard PTP and cam plate applications can be realised simple programming in the Cartesian coordinate system the inverse kinematic for the relevant motor positions is automatically calculated. kinematics configured in TwinCAT 3 Engineering. In addition to the type (e.g. delta), the bar lengths and offsets must also be parameterised. mass and mass inertia values can be specified for dynamic pre-control tracking with the aid of 'flying saw' and 'cam plates' for synchronisation (e.g. to conveyor belts) optimised for the Beckhoff Servo Drives from the AX5000 series workspace monitoring basic package integrating the following kinematics: cartesian portals 			
Required	TC1250				TC1260			
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
Performance class (pp)	20	30	40	50	20	30	40	50
	—	—	x	x	—	—	x	x
	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x
Available	Yes				2 nd quarter 2012			
Further information	www.beckhoff.com/TF5100				www.beckhoff.com/TF5110			

	TC3 Kinematic Transformation L2				TC3 Kinematic Transformation L3				TC3 Digital Cam Server				TC3 Hydraulic Positioning			
	TF5111-00pp				TF5112-00pp				TF5800-00pp				TF5810-00pp			
	<p>Extension of the TwinCAT Kinematic Transformation L1 and additional kinematics:</p> <ul style="list-style-type: none"> 2-D parallel kinematics shear kinematics crane and roll kinematics 				<p>Extension of the TwinCAT Kinematic Transformation L1/L2 and additional kinematics:</p> <ul style="list-style-type: none"> 3-D Delta SCARA 				<p>The TwinCAT Digital Cam Server is a fast cam controller with monitoring for various fieldbuses. The cams are configured in TwinCAT Engineering.</p> <ul style="list-style-type: none"> high-performance fieldbus-independent cam controller with many functions up to 320 outputs up to 180 cams per output path-path cams, path-time cams, brake cams dynamic speed correction measurement and monitoring of rotary speed 				<p>Algorithms for the control and positioning of hydraulic axes are combined in TwinCAT Hydraulic Positioning and are available as PLCopen-compliant PLC blocks.</p> <ul style="list-style-type: none"> for the positioning and control of hydraulic axes functions for the conversion of sensor signals to actual positions and of control values to output data. point-to-point movements, alternatively with time or displacement-controlled ramps. position control, pressure output with the correct sign, automatic repositioning. optimisation and monitoring of the behaviour with further functions (e.g. dead time compensation, limit value monitoring) 			
	TC1260				TC1260				TC1200				TC1200			
	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
	20	30	40	50	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	x	x	–	–	x	x	–	–	x	x	–	–	x	x
	60	70	80	90	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012			
	www.beckhoff.com/TF5111				www.beckhoff.com/TF5112				www.beckhoff.com/TF5800				www.beckhoff.com/TF5810			

TF5xxx | TwinCAT Motion Control



	TC3 CNC				TC3 CNC E			
Technical data	TF5200-00pp				TF5210-00pp			
	<p>TwinCAT CNC offers the option to implement interpolation with up to five simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according DIN 66025. The axes and channels are configured in TwinCAT Engineering.</p> <ul style="list-style-type: none"> ■ maximum 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels ■ supports electric servo axes, stepper motor drives ■ subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, zero point shifts, tool functions ■ geometry functions linear, circular and helical interpolation at the main levels and freely definable levels, max. 32 interpolating path axes per channel, look-ahead function ■ axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions ■ programming in DIN 66025 with high-level language extension ■ access via function blocks from TwinCAT PLC according to IEC 61131-3 ■ operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) ■ convenient debugging with online monitoring of all states 				<p>TwinCAT CNC in the export version (E-version) offers the option to implement an interpolation with up to four simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according DIN 66025. The axes and channels are configured in TwinCAT Engineering.</p> <ul style="list-style-type: none"> ■ maximum 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels ■ maximum 4 interpolating path axes ■ supports electric servo axes, stepper motor drives ■ subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, zero point shifts, tool functions ■ geometry functions linear, circular and helical interpolation at the main levels and freely definable levels, max. 64 path axes per channel, look-ahead function ■ axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions ■ programming in DIN 66025 with high-level language extension ■ access via function blocks from TwinCAT PLC according to IEC 61131-3 ■ operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) ■ convenient debugging with online monitoring of all states 			
Required	TC1260				TC1260			
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7			
Performance class (pp)	20	30	40	50	20	30	40	50
	—	—	—	x	—	—	—	x
	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x
Available	2 nd quarter 2012				2 nd quarter 2012			
Further information	www.beckhoff.com/TF5200				www.beckhoff.com/TF5210			

TC3 CNC Axes Pack					TC3 CNC Channel Pack				TC3 CNC Transformation				TC3 CNC HSC Pack			
TF5220-00pp					TF5230-00pp				TF5240-00pp				TF5250-00pp			
<p>Using the TwinCAT CNC Axes Pack, extension is possible 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</p>					<p>Using TwinCAT CNC Channel Pack, a further CNC channel can be extended to a maximum of 12 channels.</p> <ul style="list-style-type: none"> channel synchronisation axis transfer between channels 				<p>TwinCAT CNC Transformation is an optional function for the TwinCAT CNC.</p> <ul style="list-style-type: none"> transformation functionality (5-axis functionality) kinematics selection from the kinematics library RTCP function TLC function definition of different coordinate systems, linking/transition of coordinate systems 				<p>TwinCAT CNC HSC Pack is an optional high-speed cutting solution for the TwinCAT CNC:</p> <ul style="list-style-type: none"> cross-block velocity and acceleration control for optimal utilisation of the axis dynamics and thus higher path speeds high surface quality through smoothed dynamics and associated reduction of vibrational excitation of the machine effective control of specified contour tolerances path programming via splines with programmable spline type (Akima spline, B-spline) for reduction of NC blocks for free-form surfaces 			
TC1270					TC1270				TC1270				TC1270			
Windows XP, Windows 7					Windows XP, Windows 7				Windows XP, Windows 7				Windows XP, Windows 7			
20	30	40	50		20	30	40	50	20	30	40	50	20	30	40	50
–	–	–	x		–	–	–	x	–	–	–	x	–	–	–	x
60	70	80	90		60	70	80	90	60	70	80	90	60	70	80	90
x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
2 nd quarter 2012					2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012			
www.beckhoff.com/TF5220					www.beckhoff.com/TF5230				www.beckhoff.com/TF5240				www.beckhoff.com/TF5250			

TF5xxx | TwinCAT Motion Control



	TC3 CNC Spline Interpolation				TC3 CNC Virtual NCK Basis				TC3 CNC Virtual NCK Options			
Technical data	TF5260-00pp				TF5270-00pp				TF5271-00pp			
	TwinCAT CNC Spline Interpolation is an optional package for the TwinCAT CNC for path programming via splines with programmable spline type, Akima-spline, B-spline.				TwinCAT CNC Virtual NCK Basis is a virtual TwinCAT CNC for simulation in a Windows environment as an option for the TwinCAT CNC.				TwinCAT CNC Virtual NCK Options is a virtual TwinCAT CNC for simulation in a Windows environment as a further option package for the TwinCAT CNC and TwinCAT CNC Virtual NCK Basis.			
Required	TC1270				TC1270				TC1270			
Target systems	Windows XP, Windows 7				Windows XP, Windows 7				Windows XP, Windows 7			
Performance class (pp)	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	–	x	–	–	–	x	–	–	–	x
	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x
Available	2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012			
Further information	www.beckhoff.com/TF5260				www.beckhoff.com/TF5270				www.beckhoff.com/TF5271			

TF6xxx | TwinCAT Connectivity



	TC3 ADS Communication				TC3 OPC UA				TC3 OPC DA			
Technical data	TF6000-00pp				TF6100-00pp				TF6120-00pp			
	<p>The TwinCAT ADS Communication function is useful for the organisation of data exchange between TwinCAT 3 and Windows programs and includes the search for variables, the access by variable name, timing synchronisation with the operating system, adaptation of different data types, generation of data blocks and lists and as well as the guarantee of data consistency for access with the synchronous/asynchronous and cyclical/on-change access methods.</p>				<p>OPC Unified Architecture (IEC 62541) is the new technology generation of the OPC Foundation for the secure, reliable and manufacturer-neutral transport of raw data and pre-processed information from the manufacturing level into the production planning or ERP system. With OPC UA, all desired information is available to every authorised application and every authorised person at any time and in any place.</p> <p>TwinCAT OPC UA Server</p> <ul style="list-style-type: none"> certified in the OPC Laboratory, Europe functions: DataAccess/ HistoricalAccess/ Alarm&Condition PLC blocks for diagnosis and restart intermediate storage of data on the server: interruption of the communication connection does not lead to loss of data <p>TwinCAT OPC UA Client</p> <ul style="list-style-type: none"> PLC function blocks for UA-DataAccess configurator for setting up the optional security Demo UA client for diagnostic purposes 				<p>OPC is the standard for supplier-independent communication in automation technology. OPC (Data Access) is based on the Microsoft COM/DCOM standard.</p> <p>TwinCAT OPC DA Server</p> <ul style="list-style-type: none"> specifications OPC-DA2x and OPC-XML-DA configurator for the set-up Demo DA client for diagnostic purposes and the loading of recipes 			
Required					TC1000				TC1000			
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7			
Performance class (pp)	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	x	x	x	x	x	x	–	x	x	x
	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x
Available	Yes				Yes				2 nd quarter 2012			
Further information	www.beckhoff.com/TF6000				www.beckhoff.com/TF6100				www.beckhoff.com/TF6120			

TF6xxx | TwinCAT Connectivity



	TC3 EtherCAT Redundancy 250				TC3 EtherCAT Redundancy 250+				TC3 Modbus TCP				TC3 Modbus RTU			
Technical data	TF6220-00pp				TF6221-00pp				TF6250-00pp				TF6255-00pp			
	TwinCAT EtherCAT Redundancy 250 extends the TwinCAT EtherCAT Master by the possibility to implement cable redundancy for up to 250 EtherCAT devices: from the last logical device a cable is returned back to the master. Configuration and diagnosis take place in the TwinCAT 3 engineering environment.				TwinCAT EtherCAT Redundancy 250+ extends the TwinCAT EtherCAT Master by the possibility to implement cable redundancy for more than 250 EtherCAT devices: from the last logical device a cable is returned back to the master. Configuration and diagnosis take place in the TwinCAT 3 engineering environment.				The TwinCAT Modbus Function represents a simple gateway between Modbus TCP and TwinCAT ADS devices. Both server and client modes are possible. In server mode, TwinCAT memory areas are mapped directly to Modbus memory areas. In client mode, a number of PLC blocks are available that can be used to read inputs and input registers and to write coils and registers.				The TwinCAT Modbus RTU Function implements Modbus RTU communication via a serial RS232, RS422 or RS485 interface and is thus suitable both for the PC/CX interfaces and for operation with the KL6xxx serial Bus Terminals. It contains function blocks for master and slave operating mode with simple configuration.			
Required	TC1100				TC1100				TC1100				TC1200			
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
Performance class (pp)	20	30	40	50	20	30	40	50	20	30	40	50	20	30	40	50
	—	—	x	x	—	—	x	x	x	x	x	x	x	x	x	x
	60	70	80	90	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Available	2 nd quarter 2012				2 nd quarter 2012				Yes				2 nd quarter 2012			
Further information	www.beckhoff.com/TF6220				www.beckhoff.com/TF6221				www.beckhoff.com/TF6250				www.beckhoff.com/TF6255			

TC3 FTP Client					TC3 TCP/IP				TC3 Serial Communication				TC3 SMS/SMTP			
TF6300-00pp					TF6310-00pp				TF6340-00pp				TF6350-00pp			
<p>The TwinCAT FTP Function enables simple access from the PLC to several FTP servers with the aid of various function blocks. Hence, files can be loaded to or from a server after the establishment of a connection (optional with authentication). Additional function blocks allow files or directories to be searched for, created, deleted and renamed.</p>					<p>The TwinCAT TCP/IP function enables the implementation and realisation of one or several TCP/IP server/clients within the TwinCAT 3 PLC. Corresponding blocks exist for the establishment/disconnection of communication as well as for the pure exchange of data (send and receive).</p>				<p>The TwinCAT Serial Communication Function implements communication with serial devices such as printers, bar code scanners etc. The serial interface of the PC and the Beckhoff serial EtherCAT Terminals (EL6xxx) and Bus Terminals (KL6xxx) are supported.</p>				<p>The TwinCAT SMS/SMTP Function enables the transmission of SMS messages or e-mails using PLC function blocks. The latter also allows the transmission of file attachments, HTML texts and the setting of message priorities.</p>			
TC1200					TC1200				TC1200				TC1200			
Windows XP, Windows 7, Windows CE					Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
20	30	40	50		20	30	40	50	20	30	40	50	20	30	40	50
x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
60	70	80	90		60	70	80	90	60	70	80	90	60	70	80	90
x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
2 nd quarter 2012					Yes				2 nd quarter 2012				2 nd quarter 2012			
www.beckhoff.com/TF6300					www.beckhoff.com/TF6310				www.beckhoff.com/TF6340				www.beckhoff.com/TF6350			

TF6xxx | TwinCAT Connectivity



	TC3 Virtual Serial COM				TC3 Database Server			
Technical data	TF6360-00pp				TF6420-00pp			
	<p>The TwinCAT Virtual Serial COM Function allows the EL60xx EtherCAT Terminals or EP6002 EtherCAT Box modules to be integrated into Windows CE or Windows XP as normal serial interfaces. The computer on which a serial interface is to be generated for it is defined individually for each EL60xx/EP6002. Access to the device connected to the terminal takes place via Windows API for serial interfaces.</p>				<p>The TwinCAT Database Server Function enables the exchange of data between databases and the TwinCAT system. PLC variables or direct values of the EtherCAT I/Os can be logged cyclically when changes occur or event-controlled by means of PLC function blocks.</p>			
Required	TC1100				TC1200			
Target systems	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
Performance class (pp)	20	30	40	50	20	30	40	50
	—	x	x	x	x	x	x	x
	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x
Available	2 nd quarter 2012				2 nd quarter 2012			
Further information	www.beckhoff.com/TF6360				www.beckhoff.com/TF6420			

	TC3 IEC 60870-5-10x				TC3 IEC 61850/IEC 61400-25				TC3 RFID Reader Communication				TC3 S5/S7 Communication			
	TF6500-00pp				TF6510-00pp				TF6600-00pp				TF6610-00pp			
	<p>The TwinCAT IEC-60870-5-10x Function enables communication according to the IEC standard 60870-5-10x from the PLC. Both server and client operating modes are possible.</p> <p>PLC library for the realisation of masters</p> <ul style="list-style-type: none"> IEC 60870-101 IEC 60870-102 IEC 60870-103 IEC 60870-104 <p>PLC library for the realisation of slaves for</p> <ul style="list-style-type: none"> IEC 60870-101 IEC 60870-104 				<p>For the standard-compliant communication between client and server, corresponding servers can be realised directly in the TwinCAT PLC with the IEC 61850/IEC 61400-25 Telecontrol function in TwinCAT 3. IEC 61850 provides data models for substation communication. IEC 61400-25 is based on IEC 61850 and offers specific extensions of the data model for wind farm communication. The respective server is configured using the TwinCAT telecontrol configurator. This decouples the configuration work from the programming work in the PLC and generates the corresponding PLC code. The PLC code can be imported into new or existing PLC projects.</p>				<p>The RFID Reader Communication Function allows various RFID readers to be addressed via a serial interface. The new TwinCAT RFID reader library offers a general, abstract interface that can be used for all readers. The configuration can easily be adapted to a specific reader.</p>				<p>The TwinCAT S5/S7 Communication Function enables the simple connection of TwinCAT to an S5 or S7 controller. The data blocks, flags, inputs, outputs, counters and timers of an S5 or S7 controller can be accessed using function blocks. The communication takes place using TCP/IP.</p>			
	TC1200				TC1200				TC1200				TC1200			
	Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE				Windows XP, Windows 7, Windows CE			
	20	30	40	50	20	30	40	50	20	30	40	50	20	30	40	50
	—	x	x	x	—	x	x	x	x	x	x	x	x	x	x	x
	60	70	80	90	60	70	80	90	60	70	80	90	60	70	80	90
	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012				2 nd quarter 2012			
	www.beckhoff.com/TF6500				www.beckhoff.com/TF6510				www.beckhoff.com/TF6600				www.beckhoff.com/TF6610			

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