

# TwinCAT Motion Control can adapt to any motion task

For motion control in manufacturing and assembly processes, building automation or the entertainment industry, engineers often must implement a comprehensive range of movements from simple to complex. The TwinCAT Motion Control product family, however, offers the ideal software solution for every task. TwinCAT Motion Control, just like TwinCAT in general, is composed of a large number of modules, from which the perfect solution can be put together for a specific task.



**NC PTP**

**Point-to-point motion**



**NC I**

**Interpolated motion**



**CNC**

**Complete CNC functionality**



**Robotics**

**Robot control**



**XTS**

**Linear product transport**



**XPlanar**

**Planar motor system**

TwinCAT Motion Control software offers comprehensive functionality from single and multi-axis applications to CNC.

The guiding principle for TwinCAT Motion Control is simplified motion. TwinCAT Point-to-Point (PTP) can be used to execute movements of individual axes or coupled axes. By representing axes in axis objects, a separation is made between physical and logical axes, so that rotary and linear, electrical and hydraulic drives can all be programmed in the same way. Programming is usually done in the PLC where a library of administrating and movement-initiating function blocks is available. In order to prevent every motion control manufacturer from defining different blocks for the same thing, these blocks have been standardized in PLCopen – with the active collaboration of Beckhoff.

In addition to the mere movement of an axis from an initial position to a target position, movements of two axes can also be operated in a gear coupling, referred to as gearing. A coordinated master-slave motion with nonlinear relationships is called cam plate coupling or camming. Corresponding libraries for these functions are available in the TwinCAT system. A special type of linear coupling is the flying saw. Here, a slave axis is coupled “flying” to a moving master axis at a specific position. As the name suggests, such coupling functions are often used when, for example, a board on a moving conveyor belt needs to be cut with a saw.

Interpolating path movements based on G-code are often used in machine tools (turning, milling, grinding, cutting) and 3D printers, but can also be used for robotic motion control. Depending on the required path axes, TwinCAT NC I or TwinCAT CNC (p. 28) can be used for implementing the above applications. Various serial, parallel and hybrid kinematic transformations – e.g., for robot or gantry motion control – are available with TwinCAT Kinematic Transformation (p. 27), with new transformations being implemented continuously. Since a large

part of the customer expertise is in the kinematics, users can realize and integrate their own transformations in C++. The movement positions are specified in Cartesian coordinates. The entire TwinCAT motion toolkit is available to the user for programming – from simple PTP functions to cam plates to interpolating movements in G-code. Articulated-arm robots with their own control systems can be integrated via the mxAutomation (KUKA) or uniVAL PLC (Stäubli) libraries in TwinCAT.

With XTS and XPlanar, Beckhoff has developed two sophisticated mechatronic systems in which a magnetically driven mover can move freely on a travel path or surface. System-specific software functionalities (configurators, track management, gap control, etc.) from the TwinCAT motion toolkit enable simple configuration and programming of these systems (p. 30). As a result, there is a powerful solution for almost every motion task in the TwinCAT Motion Control portfolio.

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More information:  
[www.beckhoff.com/motion-software](http://www.beckhoff.com/motion-software)