

PLC and Motion Control on one PC – is it possible?



→ Beckhoff's answer to this question is a clear and almost unconditional YES. How do we justify this statement? First and foremost, it is based on our experience from thousands of applications involving thousands upon thousands of axes. What is our technology based on? And why is it so successful?

The first requirement is a CPU with sufficient computing power to be able to deal with position control calculations with short cycle times and comprehensive algorithms for axis synchronization and interpolation. Fortunately, such a CPU is easy to find. A standard PC meets this requirement very well, i.e. it offers high processor clock frequencies, combined with a floating point arithmetic unit that avoids the need for elaborate standardization.

However, a PC from the electronics store wouldn't be able to move a single axis. What is missing? Control applications require a very stable, jitter-free real-time base. A PC from the electronics store will generally come with Windows XP. However, Windows XP and its predecessor versions, i.e. Windows NT and Windows 2000, do not offer real-time functionality. TwinCAT software from Beckhoff ensures stable real-time from a base time of 50 μ s with simultaneous, safe Windows operation. This stable real-time is the basis for the position control task and the block preparation task.

In conjunction with TwinCAT, the PC provides a system for high-precision Motion Control task calls. But this still doesn't give us a system that is suitable for our customers. Pure point-to-point motion is rarely adequate. Applications generally require further functions such as coupling or interpolation of several axes. The TwinCAT NC PTP version of the software offers linear gear coupling, nonlinear cam plate coupling, and position-synchronous coupling. TwinCAT NC I and CNC extend TwinCAT with the option of operating interpolating axes.

Another important feature is the engineering tool, which enables simple and convenient integration of all Motion Control system components. The TwinCAT System Manager can be used for axis configuration, parameterization and diagnosis. Operation is the same for all axis types. TwinCAT also offers a standardized

interface for PLC programmers. All axis types for all fieldbuses are described through a simple interface in the PLC. The function blocks are based on the PLCopen standard and are available in the form of a library.

On the software side, our system now meets almost all requirements for Motion Control. The only other feature needed is an interface for the physical axes. A wide range of options are available, e.g. the SERCOS fieldbus system, the ProfiDrive PROFIBUS extension, or CANopen. EtherCAT as a fieldbus offering maximum performance and a distributed clock option is ideally suitable for Motion Control applications. A fast fieldbus such as EtherCAT, advanced, high-performance drives such as the new AX5000 Servo Drive from Beckhoff, and full integration of fieldbus and drives via TwinCAT are an ideal combination. Integration of "small" drives – such as Stepper Motors or DC axes with the KL2531/2541 or KL2532/2542 Bus Terminals – is easy to realize. Also, TwinCAT offers interfaces for almost any fieldbus system. Even I/O with safety functions can be integrated seamlessly via the TwinSAFE Bus Terminals and the TwinSAFE module in the AX5000.

What can we conclude from this? Of course it is possible: PLC and Motion Control on one PC! The Beckhoff system is characterized by a combination of powerful CPUs, guaranteed real-time function, comprehensive and proven TwinCAT software, and an open hardware platform. This enables straightforward configuration, commissioning and operation of a large number of (different) axes in different bus systems. High-performance Motion Control applications can be realized with the PC-based trio of EtherCAT, AX5000 and TwinCAT.

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