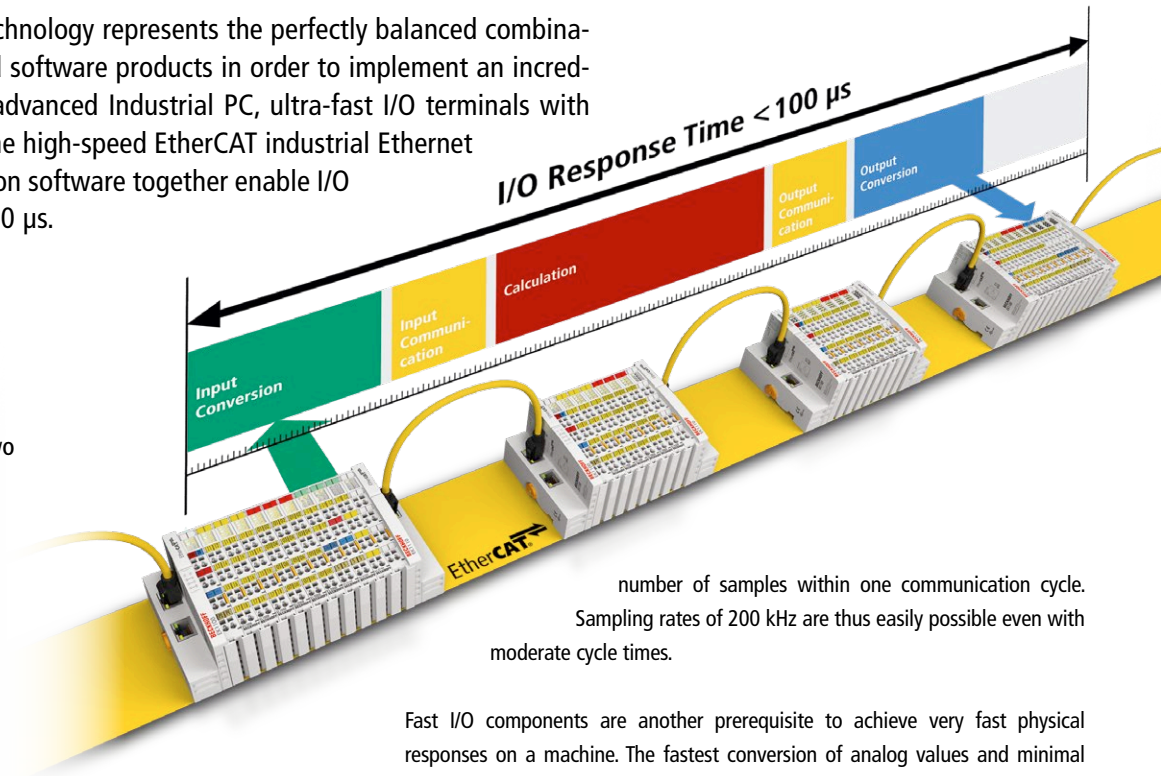


# Next level automation with eXtreme Fast Control, TwinCAT and powerful hardware

eXtreme Fast Control (XFC) technology represents the perfectly balanced combination of Beckhoff hardware and software products in order to implement an incredibly fast control solution. An advanced Industrial PC, ultra-fast I/O terminals with extended real-time features, the high-speed EtherCAT industrial Ethernet system and TwinCAT automation software together enable I/O response times of less than 100  $\mu$ s.

XFC technology from Beckhoff enables I/O response times of less than 100  $\mu$ s



number of samples within one communication cycle. Sampling rates of 200 kHz are thus easily possible even with moderate cycle times.

Whereas cycle times of 10 to 20 ms were state of the art not that long ago, this could be reduced to 1 ms and less years ago with PC-based control from Beckhoff. The prerequisites are a sufficiently powerful Industrial PC – i.e. the control system – a high-performance EtherCAT fieldbus with deterministic timing and I/O components with expanded functionality that can convert signals very quickly to make them available digitally. XFC opens up new possibilities to improve the quality of a machine and shorten response times. In addition, measurement tasks, such as for predictive maintenance or documentation of product quality, can be easily integrated into machine control without the need for additional, cost-intensive special hardware.

## Four basic principles of XFC

Distributed clocks are a foundational technology of XFC. Each EtherCAT device with distributed clocks has its own local clock, which is automatically synchronized with all other clocks within the EtherCAT network. Different communication delays are compensated for so that the maximum deviation is usually less than 100 ns.

Timestamps are another basic technology through which the temporal resolution and accuracy is no longer limited to the communication cycle. Timestamp data types contain a timestamp in addition to their user data. This enables much more precise information on the time reference of the process date. This way, for example, it is possible to transmit the precise time when an output is to be switched. The switching command is then executed independently of the bus cycle time.

With the oversampling data types, XFC enables multiple sampling of a process datum within one communication cycle. The oversampling factor describes the

Fast I/O components are another prerequisite to achieve very fast physical responses on a machine. The fastest conversion of analog values and minimal delay in digital terminals are necessary requirements for this capability, among other things.

## TwinCAT offers comprehensive XFC support

The real-time implementation of TwinCAT enables the support of multiple tasks with different cycle times. The EtherCAT implementation in TwinCAT makes full use of the communication system, enables the use of several independent time levels and of distributed clocks. In particular, the different time levels ensure the coexistence of XFC and “regular” control tasks in the same system without the XFC requirements becoming a bottleneck.

With XFC, the fastest response times can be achieved. The TwinCAT library Motion Control XFC (TF5065) enables users to leverage these capabilities in motion control applications, e.g., in touch probe applications or software cam controllers.

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systems and EtherCAT



More information:

[www.beckhoff.com/xfc](http://www.beckhoff.com/xfc)

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