

EtherCAT to network the factory, machine and control levels

EtherCAT at I/O-level – many are already well-acquainted with that. EtherCAT for the networking of machines, system components and entire factories is also possible today – and indeed has been for a long time.

Since its introduction in 2003, EtherCAT has proven to be a particularly suitable technology for the networking of the controller(s) with sensors and actuators at field level. Special features of the fast fieldbus system include highly accurate and deterministic features with very short



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cycle times (down to $< 50 \mu\text{s}$), precise synchronization for drive and measurement applications and low connection/cabling costs to use the technology down to the I/O level. Beckhoff's product range already encompasses more than 250 different devices with an EtherCAT interface, which is not even counting those PC-based controllers with an Ethernet port that can easily be used as an EtherCAT master. In particular, the collection of input information and updating the output image at the field level are resolved effectively as a result.

The process control level requires additional (and sometimes different) communications functionality in order to operate a plant or a factory. Controllers must exchange information with each other with equal rights in order to interact with each other optimally. A master computer requires cyclic information from all controllers and provides them with new orders. Additionally, the visualization must have access to all user-relevant data.

EtherCAT also offers ideal solutions for this purpose. The associated protocols were introduced as early as 2002 in the Beckhoff TwinCAT software with the RT

Ethernet control communication. Using standard Ethernet connections via switches or routers, large amounts of data can be exchanged between the controllers in a plant with short cycle times (down to $\ll 1 \text{ ms}$). The exchange of process data is implemented in accordance with the Pushed principle. Each communication device thereby sends its data cyclically or in a multiple of its own cycle. The receiver can be configured to specify which data should be received from which sender.

Beckhoff has put RT Ethernet to use in thousands of plants: whether in automation systems installed on printing machines, tandem presses or photovoltaic production plants, in building automation systems for room or floor control and for heating, ventilation and air conditioning, or in wind farms for the networking of wind turbines.

This proven technology is part of EtherCAT and is available for use to the members of the EtherCAT Technology Group (ETG) – now numbering around 1200 members – and their customers. The protocol types of RT Ethernet for control communication were adopted into the EtherCAT standard as early as 2003. Within the ETG, the mechanisms are currently summarized under the name of EtherCAT Automation Protocol (EAP) (see article on page 48). Once again, this underlines the possibility to use EtherCAT to network an entire factory, from the field level to the control level.

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