# Frequently Asked Questions (FaQs)

## *EtherCAT Technology*

### EtherCAT is faster than my application requirements. Why should I use it?

Superior fieldbus performance never harms. Even with slow controls, it improves reaction times and reduces configuration effort, since default settings will do the job. Furthermore, shorter reaction times improve the performance of your application, since the transition waiting times are reduced (e.g. waiting for an input signal before the next process step is initiated). If you do not care so much about performance though, use EtherCAT for its other benefits: e.g. lower costs, more flexible topology or simply ease of use. Or, why use a slower system just before it is more expensive?

### Why does EtherCAT provide cost advantages?

For several reasons: Inexpensive slave controllers lead to lower slave device costs. No special master card required, the on-board Ethernet controller is sufficient. No switches or hubs required, therefore lower infrastructure costs. Use of standard cabling. Simple to implement, therefore lower implementation costs. Auto-configuration is supported, no manual address setting required, no network tuning required, therefore lower configuration costs.

### Is EtherCAT limited to Master/Slave Applications?

No. Like with every real time Industrial Ethernet system, one device (the master) has to be in charge of the network management and organize the Medium Access Control. With EtherCAT, Slave to Slave communication is supported in two ways: topology dependent within one communication cycle ("upstream" device talks to "downstream" device), topology independent within two cycles. Since EtherCAT is so much faster than competing systems, slave-to-slave communication using two cycles is faster, too.

### EtherCAT specifies several different physical layers – why?

EtherCAT uses standard 100BASE-TX ("Fast Ethernet") on standard CAT5+ cables. For applications that require longer distances, the fibre optics 100BASE-FX is an alternative. Since EtherCAT is also used as "backplane bus" for modular devices, an even lower cost physical layer from IEEE802.3ae was added for such applications: LVDS (also called: E-Bus). Outside such modular devices, the physical layer is changed back to 100BASE-TX or -FX.

### How is the interoperability of EtherCAT devices maintained?

Conformance and Interoperability are very important factors for the success of a communication technology. Therefore the EtherCAT Technology Group is taking these topics very seriously. The ETG organizes plug fests, where developers meet to test and improve the interoperability of their devices. A conformance test tool has been developed, and the ETG task force conformance testing is constantly enhancing the test cases for this tool. The first Conformance test labs has been established in Europe, and others will follow soon. Each device vendor signed the vendor-ID agreement and thus is bound by contract to maintain interoperability and prove conformance if necessary.

## *EtherCAT Technology Group*

### Do I have to be an ETG member to use EtherCAT?

No. However, you may want to consider joining the ETG in order to indicate your interest in and support for this technology to your suppliers and customers. As an ETG member, you are invited to attend the ETG meetings, you get access to technology information, draft specs and can influence the direction in which the technology moves.

### Do I have to be an ETG member to implement EtherCAT?

If you implement EtherCAT in your machine or machine line by using EtherCAT devices, you are considered an end user and do not have to join ETG, even though we would recommend it (see 2.3). Manufacturers of EtherCAT devices have to join ETG and need an EtherCAT vendor-ID (for details see: EtherCAT Vendor ID policy). Please keep in mind that membership is free of charge (see 2.4/2.5). .

### ETG Membership is free – why?

Access to an open technology should not be a question of annual membership fees or other significant costs. Therefore not only the ETG membership is free of charge, but protocol stacks, sample code, evaluation kits, implementation support and other services are either free or available for a nominal fee.

### And will this be changed?

There are no plans to charge for the ETG membership. If there is a need for membership fees in the future (e.g. to support additional services provided by the ETG), the membership assembly will have to take this decision.

### How do ETG members have an impact on the technology?

At the ETG meetings the EtherCAT technology is presented and discussed in detail. Members are encouraged to join the technical work groups and task forces and provide comments, propose enhancements and changes at any time. This feedback and the requirements of users, OEMs, system integrators and device manufacturers are both valuable and welcome and considered for implementation. The ETG history showed that this approach works very efficiently. Direct and personal contact between technology users and developers allow for in-depth exchange of know-how and technical information.

## *EtherCAT: open technology*

### EtherCAT is an open technology. What does this mean?

This means that everybody may use, implement and benefit from this technology. This also means that EtherCAT implementations have to be compatible, and nobody may change the technology in a way that prevents others to use it. EtherCAT is part of several IEC Standards (IEC61158, IEC 61784, IEC 61800), of ISO 15745, and is also a SEMI standard (E54.20).

### Are there any patents?

Yes, there are patents on the EtherCAT technology just like there are patents on every other fieldbus technology that is worth it. Technologies that provide unique features need patents and licenses to protect them from being copied or falsified.

### How about licenses?

The license for implementing an EtherCAT master is free of charge. For slave devices EtherCAT has adopted the CAN license model (CAN is an excellent example for a standardized open technology that is protected by patents): The small license fee is "embedded" in the Slave Controller Chip, so that device manufacturers, end users, system integrators, tool manufacturers etc. do not have to pay a license.

### How about Open Source?

EtherCAT Technology Group (ETG) and Beckhoff continue to support the application of EtherCAT within shared source or Open Source systems since introducing the technology. Backed by the standardization of EtherCAT by IEC, ISO and SEMI, access to EtherCAT Technology is available to everyone to non-discriminatory terms. Additionally, Master Licenses are free of royalties. The ETG ensures that maintenance and all further development of the technology is available to all users by membership within the ETG, the user group for EtherCAT technology.

### Are there multiple sources for the EtherCAT Slave Controller?

Yes. EtherCAT Slave Controller implementations are available from Beckhoff, Hilscher (netX), as well as from Altera and Xilinx (FPGAs). Further implementations will follow.

## *Implementation costs*

### How about the license for FPGAs?

When you purchase your FPGA from your preferred semiconductor distributor, the EtherCAT code is not already loaded. EtherCAT IP-core licenses are available both for Altera and Xilinx FPGAs. There are licenses available that entitle you to manufacture as many EtherCAT slave devices as you want. Alternatively, there are quantity based licenses available, too.

The IP-Cores provide freely configurable EtherCAT functionality, so that you can adapt the core-size to your requirements. You can also add application specific functions to the same FPGA, including soft-core processors. This further lowers the hardware costs for the EtherCAT slave device.

### How much is the FPGA?

ETG member companies are entitled to purchase the FPGA for a special price, which leads to lower costs for an EtherCAT interface than most legacy fieldbus interfaces.

### We want to implement an EtherCAT Slave device – what do we need?

A good starting point is the slave implementation guideline, available for download from the ETG website. EtherCAT Slave Implementation kits are available from several suppliers. One kit, for example, contains a slave device evaluation board with EtherCAT slave controller, the slave protocol stack in source code (optional for simple devices), reference hardware design information, evaluation license for EtherCAT master, manuals and cables.

### We want to implement an EtherCAT Master device – what to we need?

For a master device, you do not need a special hardware. Any Ethernet MAC will do. Since EtherCAT is very easy on resources, you do not need a dedicated communication processor, either. Master code is available from several suppliers, ranging from several free of charge open source projects via a sample code package to products that include the RTOS. Implementation services are also available from several suppliers. Please check out the product guide at the ETG website.

### Do we have to submit our EtherCAT device to a conformance test lab?

No. Performing the conformance test at an official EtherCAT Conformance Test Lab is optional - however, your customer may require a conformance certificate, which is only issued after passing the test at such a lab. You have to ensure conformance by applying the official test tool at your R&D facilities, though. Details can be found in the ETG Conformance Test Policy.

**For further info regarding EtherCAT,
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