

Modbus-TCP



Industrial Ethernet Module

FPGA-based solution for cost-effective and universal connection to Industrial Ethernet systems

The Industrial Ethernet Module (IEM) based on ALTERA's Cyclone III FPGA provides customers with a universal interface for the integration of various Industrial Ethernet technologies into their products.

Wherever intelligent devices are to be equipped with Industrial Ethernet, the IXXAT IEM allows the integration of a flexible, extendable and powerful network interface while taking care of transparent costs. Some fields of application are e.g. frequency converters, IO-modules, valves, and many other components of automation technology.

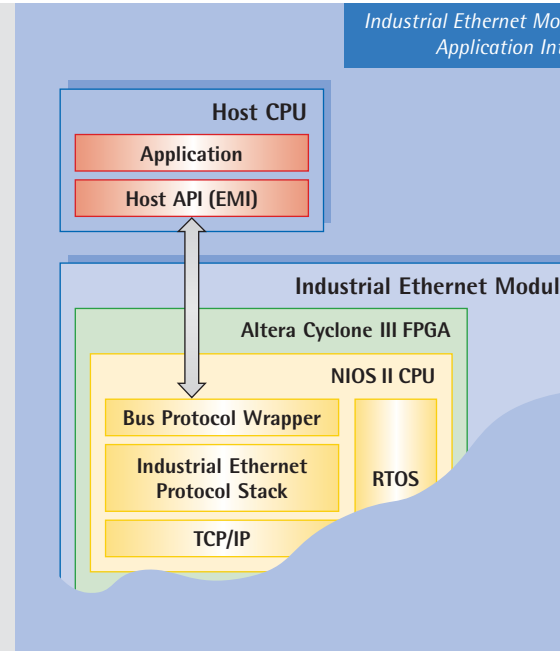
Flexible Approach for manifold requirements

Ethernet, which has become the defacto standard for communication in the business world for more than two decades, now becomes more and more important in industrial automation. More than 20 different variants of Industrial Ethernet protocols are competing in the rapidly growing market for industrial applications. While each of those technologies has its

advantages and disadvantages, most protocols are designed for very specialized applications.

For most applications in factory and process automation, PROFINET, EtherNet/IP, POWER-LINK, EtherCAT, SERCOS III and Modbus/TCP will play a leading role in future industrial communication systems. Each of these technologies pursues different approaches for adapting Ethernet into industrial environments depending on realtime and cost requirements. The only property they all have in common is the media Ethernet, but different strategies are used to deal with the problems of collision avoidance and realtime behaviour. They are not designed for compatibility or for comfortable transition from one protocol to another.

Covering all software and hardware requirements was a big challenge for IXXAT's developers who



managed to overcome these problems. IXXAT created a module which allows for easy and flexible integration of Ethernet based technologies into customer's hardware and provides a free choice from the most common Industrial Ethernet protocols. Changes in hardware are not necessary, and required adaptations in software are minimal when switching between the protocols.

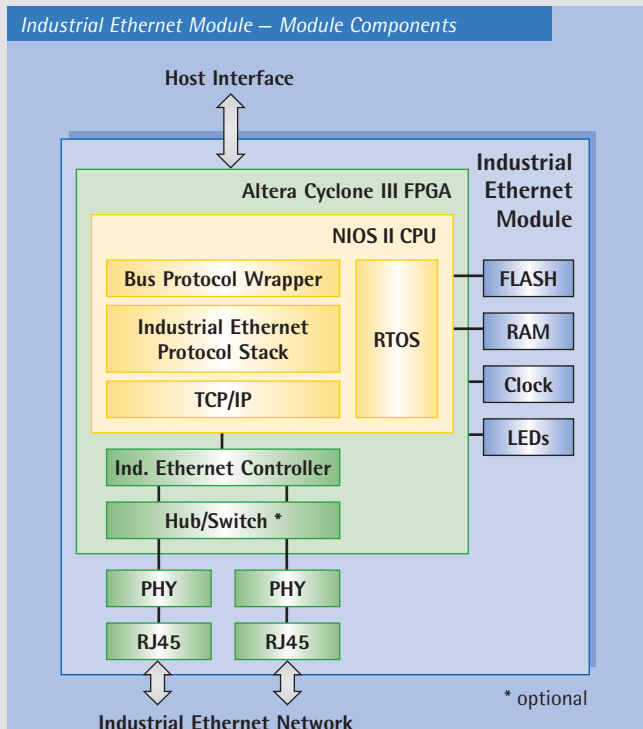
Using the integrated 3-port switch, customers can easily setup line topologies with the Industrial Ethernet Module.

One Hardware Fits All

Why IXXAT is the ideal solution

Reduced component and development costs

When using IXXAT's Industrial Ethernet Module, the customer will not have to deal with the



details of the various software and hardware concepts of Industrial Ethernet protocols. It is no longer necessary to design a specific hardware and to invest time and money into each of the various Ethernet technologies.

One Industrial Ethernet Module for all Industrial Ethernet protocols reduces component costs and allows for unified handling and optimization of production processes. Moreover, engineers can focus on the support of one hardware and software platform, instead of dealing with multiple development tool chains.

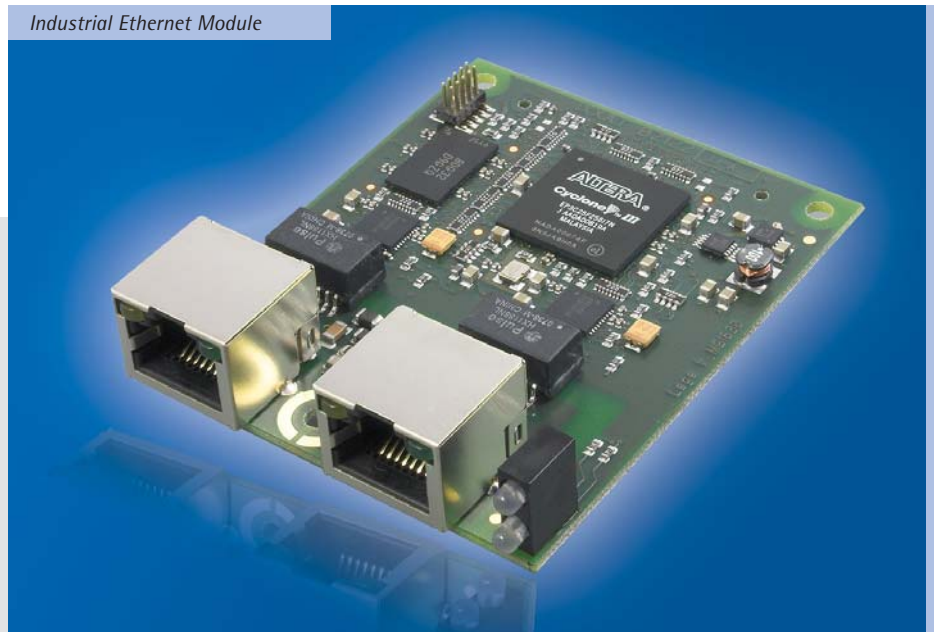
Compatibility

The module has been carefully tested with other network components and has proven full compatibility with all master and master stack solutions provided by IXXAT.

Short time to market

The Industrial Ethernet Module allows a fast set-up of development environments and prototypes. No matter if you plan volume production with the Industrial Ethernet Module or a Design-In, transition from development to production is easy. Both, module and design-in are built identically. IXXAT provides an optional evaluation kit and CPU-board adapters which allow a quick start into this technology.

Certification processes can be shortened as the IXXAT Industrial Ethernet Module is already pre-certified for all protocols offered. Thus the final certification will be passed easily.



Flexibility

Based on the FPGA-technology, changing the Industrial Ethernet protocol or adding future technologies are no longer a problem. The hardware and software interfaces on application side will stay the same, no matter which protocol is used.

Updating the module in the field is possible as long as upgrades can be covered by an adaptation of the internal hardware or software running in the FPGA.

Long-term availability

Since FPGAs are used not only in industrial applications but also in military, automotive and avionics systems, they have an extensive product life expectancy and long term availability is guaranteed. Additionally, FPGA manufacturers insure portability of their IP to newer product families with little effort.

Technical specifications of the Industrial Ethernet Module

FPGA	Altera Cyclone III
Network interface	2 x RJ45 socket with 10/100 Mbit/s Ethernet (10Base-T/100Base-T) according to IEEE 802.3
Host interface	Two-row 50-pin plug connector in 1.27 mm grid; access over SPI or memory mapped
Displays	1 x yellow and 1 x green LED installed in the RJ45 sockets for display of the Ethernet states; 2 x bi-colored (red/green) LEDs for display of the protocol-specific states
Power supply	3.3 V, approx. 1 W
Temperature range	0 °C to +70 °C (commercial temperature range) -40 °C to +85 °C (industrial temperature range)
Certificates	Conformity with the relevant Industrial Ethernet standards and CE
Protection class	IP20 with installation in corresponding housing
Dimensions	72.2 x 57.5 x 16 mm

Services

Besides the Industrial Ethernet Module and the Design-In offered as standard products, IXXAT provides further services to allow an easy integration of Ethernet connectivity into customers hardware.

OEM Products

Based on the sophisticated Industrial Ethernet Module, IXXAT can develop and manufacture customer specific products in all production volumes.

Consultation

IXXAT has long-term extensive experience with industrial communication systems. In close collaboration with our customers we are analysing the system requirements and specifications and show up the best solutions for their application.

Specification

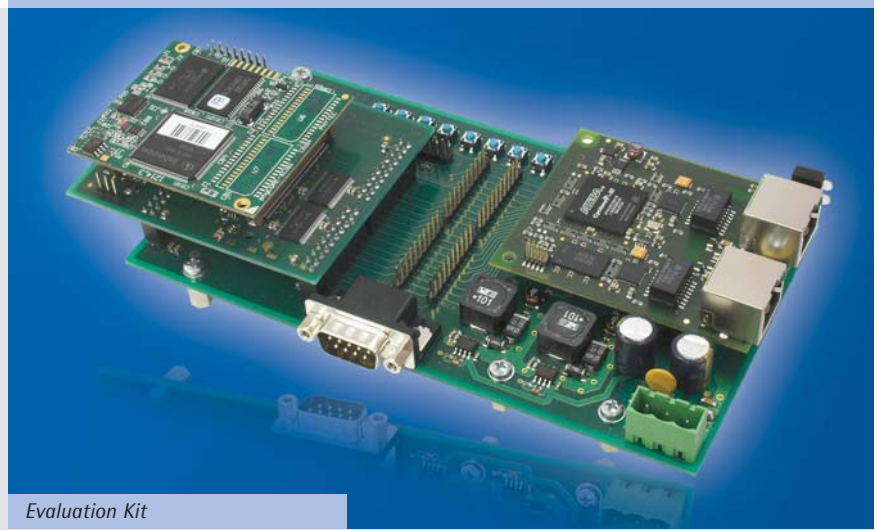
Defining the product requirements is a major step of the specification process. IXXAT can support customers to specify their device in order to get a best-in-class product.

Hardware and Software Development

Our experienced and motivated engineers are familiar with all major Industrial Ethernet technologies as well as with all aspects of software and hardware development. Thus there are many possibilities in assisting our customers, starting from basic integration and implementation support during development, up to comprehensive development projects including hardware and software development and system testing. Moreover IXXAT offers series production handling and maintenance of customer products.

System Test and Certification

IXXAT can provide knowledge in setting up test systems and preparing the product for certification tests. We closely work together with the various organizations and their labs to ensure that customer's product will pass certification tests.



Evaluation Kit

Products

Industrial Ethernet Module

IXXAT's Industrial Ethernet Module represents the easiest way to include Industrial Ethernet into your hardware. It is a ready to mount all in one package available for all protocols, already programmed and including all licenses. Therefore it is the perfect solution for development, prototyping and volume production.

Design-In

IXXAT's Industrial Ethernet Module architecture can also be fully integrated into customer's hardware. The development license contains all components necessary for the development and prototyping such as schematics, design guidelines, FPGA bitstream, API source code and examples. When starting the production, IXXAT offers inexpensive volume-based royalties.

Customer specific solutions

Both, the Industrial Ethernet Module and the Design-In offer various possibilities for customer specific modifications, starting from changing the form factor up to an integration of additional functionalities and interfaces. Further

services offered by IXXAT are development, production and handling of customer's products.

Evaluation and Prototyping

IXXAT's evaluation kit for the Industrial Ethernet Module provides customers a quick start opportunity.

The **carrier board** for the Industrial Ethernet Module provides all electrical signals of the module on standard connectors. 8 digital inputs (buttons) and 8 digital outputs (LEDs) allow a simple implementation of test applications. The voltages for the supply of the Industrial Ethernet Module (3.3 V) and of the CPU module (3.3 V and 5 V) are generated on the evaluation board from a 9 – 32 V DC input voltage.

Various CPU modules can be connected to the carrier board via individual **adapter boards**. Customers also have the possibility to create their own adapter boards or cables to connect their development environment to the module.

The evaluation kit consists of the following components:

- Industrial Ethernet Module with one protocol of your choice
- Carrier board
- CPU-board (Phytec phyCORE-XC161)
- Adapter board for CPU-board
- Software and Documentation