

Industrial Ethernet



IXXAT[®]

Solutions for Industrial Automation

- PC interfaces & infrastructure components
- Protocol software & tools
- Controllers and PLC extensions
- Time synchronization

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Your expert in CAN and Industrial Ethernet



Pioneering CAN technology

For almost 30 years, HMS has been a reliable provider of data communications solutions in the field of industrial automation and automotive technology.

With the availability of the first CAN chip in 1988, engineers from HMS implemented CAN-based system solutions and developed analysis tools, interfaces, infrastructure components and CAN-based higher protocols. Cutting-edge system concepts and system solutions have been implemented in numerous customer-specific development projects for renowned national and international companies.

As a founding member of CAN-in-Automation, we are involved in all important committees of CiA and play a leading role in the development of the CANopen standard. We are also an active member of various other user organizations, like ODVA, PNO, EPSG and ETG.

Reliability and Quality

For many years, quality has been the foundation of our work and an incentive for continual development.

To ensure the high quality of our products and services, we have a quality management system according to ISO 9001 since 1996.

As a reliable partner, we build on a long-term availability of our products and provide continuous product support over the entire product life cycle.

With innovative solutions together into the future

With innovative, powerful and cost effective products as well as with high quality standards for our services and products, we want to establish long term partnerships with our customers. To this end we continually invest a considerable amount of our resources in the research and development of new technologies and products – e.g. the implementation of the new CAN FD standard into our products.

Our primary applications in the field of industrial communication systems involve solutions based on CAN, Industrial Ethernet and Safety.

You can rely on

- ✓ Long-term availability
- ✓ 100 % product testing
- ✓ Fast delivery from stock
- ✓ High quality standard
- ✓ Competent & fast support



IXXAT solutions for industrial automation from HMS – used in a variety of applications and industries...

Machine control

- Easy connection of PCs to various fieldbus and industrial Ethernet standards
- Embedded controller, easy to program, with unique multi-protocol support
- CANopen extension for SIMATIC® PLCs

Network infrastructure

- Cost savings through easier wiring and implementation of star/tree structures
- Coupling of different network standards and devices, including wireless
- Increase of the system reliability and protection against overvoltage

Connection of devices to CAN and Industrial Ethernet

- Protocol software, the highly flexible way for implementing higher layer protocols
- Network connection for PC-based applications using Windows/Linux

Troubleshooting and analysis

- Test and configuration of your devices and systems during development and commissioning
- Mobile or PC-based troubleshooting for CAN networks



Maintenance and service

- Mobile network analysis for service technicians and commissioning
- Wireless system access for easy diagnostics and configuration
- Autarkic long-term monitoring of networks

Data visualization and acquisition

- PC connection for process data visualization, e.g. in control rooms or machinery
- Data acquisition in test benches or test systems

Time synchronization of devices and systems

- Synchronize your devices and applications down to the nanosecond range

“
As a longtime CAN expert, we are a reliable partner when it comes to CAN technology and CAN products as well as products in the Industrial Ethernet area.
”

*Christian Schlegel,
Managing Director of the
HMS Technology Center
Ravensburg*



PC Interfaces

for CAN, CAN FD, CANopen, DeviceNet and SAE J1939



Sample: PC/CAN Interfaces for control and analysis

The IXXAT PC/CAN interfaces enable PC applications to access CAN networks with a unique variety of different PC interface standards. You can select the PC/CAN interface that suits your application, performance requirements or required unit costs.

Highlights

- ✓ Common driver interface for easy exchange of the PC interface type without any changes to your application
- ✓ Support of all standard PC interfaces
- ✓ Powerful driver packages
- ✓ High data throughput combined with low latency
- ✓ High quality standards

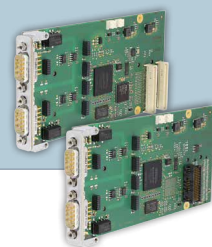
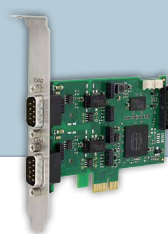
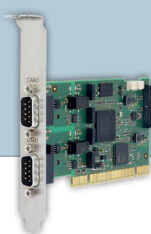
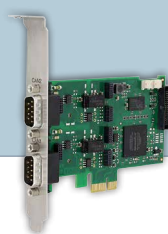
Various variants and interfaces

IXXAT CAN interfaces are – depending on the variant – modularly designed and can be equipped with up to four CAN high-speed channels. It can also be used for automotive with CAN low-speed and LIN channels. For fast networks, the CAN interfaces are also available with up to two CAN FD channels. In addition, the interfaces can be galvanically isolated to protect both the interface and the PC system.

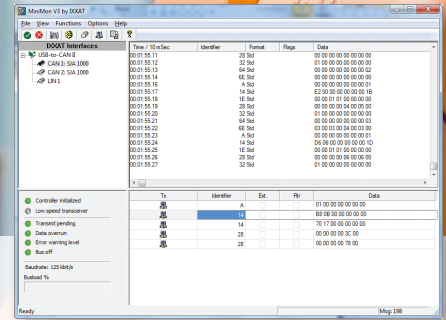
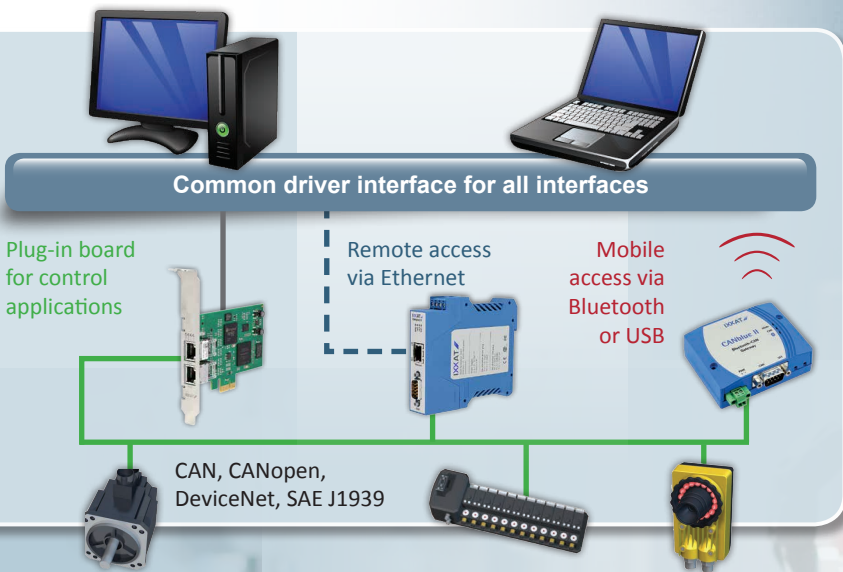
The PC interfaces are available in low-cost passive or active variants with powerful on-board controllers. Active

PC interfaces allow usage within applications with high demands on data pre-processing, such as high-precision time stamps or active filtering of messages to be sent or received directly on the interface.

In addition to custom applications, the CAN interfaces are also basis for our extensive tool chain – consisting of analysis and configuration tools – as well as configuration software from a wide variety of equipment manufacturers.



Technical Specifications	CAN-IB100 /PCIe		CAN-IB200 /PCIe		CAN-IB300 /PCI		CAN-IB400 /PCI		CAN-IB600 /PCIe		CAN-IB120/ PCIe Mini		CAN-IB 410/PMC CAN-IB 210/XMC	
Product	CAN-IB100 /PCIe		CAN-IB200 /PCIe		CAN-IB300 /PCI		CAN-IB400 /PCI		CAN-IB600 /PCIe		CAN-IB120/ PCIe Mini		CAN-IB 410/PMC CAN-IB 210/XMC	
PC interface	PCI express				PCI				PCI express		PCIe Mini Card		PMC / XMC	
Microcontroller	-		32 Bit		-		32 Bit		32 Bit		-		32 Bit	
Fieldbus interfaces	1-4 x CAN		1-4 x CAN 1-4 x LIN optional		1-4 x CAN		1-4 x CAN 1-4 x LIN optional		1-2 x CAN		1 / 2 x CAN		1-4 x CAN 1-4 x LIN optional	
CAN interface	CAN 2.0 A/B				CAN 2.0 A/B				CAN FD and CAN 2.0 A/B		CAN 2.0 A/B		CAN 2.0 A/B	
CAN bus interface	ISO 11898-2; optional switchable to ISO 11898-3				ISO 11898-2; optional switchable to ISO 11898-3				ISO 11898-2		ISO 11898-2		ISO 11898-2 / 11898-3 switchable	
CAN connection	Sub D9 plug according to CiA 303-1				Sub D9 plug according to CiA 303-1				Sub D9 plug according to CiA 303-1		Connection cable with open ends		Sub D9 plug according to CiA 303-1	
Galv. isolation	optional				optional				1 kV, 1 sec.		optional		1 kV, 1 sec.	



The CAN bus monitor „miniMon“ is part of the VCI driver package and enables transmission and reception of CAN messages.

Powerful driver packages with common application interface

Despite the variety of different PC/CAN interfaces, all interfaces can be operated with the hardware-independent drivers for Windows (VCI) and real-time operating systems (ECI) by using a uniform programming interface. Switching between the PC/CAN interfaces type is very easy and can be made without changes to your application. Thus, you are already well prepared for future technologies.

Windows

The “Virtual Communication Interface” (VCI) is designed as a system server and allows simultaneous access by several applications to one or more CAN controllers of one or more PC interfaces. Moving all important functions to the kernel optimizes the real-time capability of the VCI driver substantially.

VCI application interface:

- C-API ■ .NET-API ■ JAVA-API
- LabView-API
- DasyLab (contains drivers)
- LabWindows

Linux, SocketCAN, INtime, RTX, QNX and VxWorks

For use of CAN interfaces under Linux and in real-time environments, HMS provides the universal “Embedded Communication Interface” driver (ECI) free of charge together with an interface. The application interface is designed as a “ANSI-C” interface and contains all necessary functions.

CANopen and SAE J1939 APIs

For use of CAN interfaces under CANopen and J1939, HMS offers driver APIs that provide all protocol-specific functions.



CAN-IB130 /PCIe 104	CAN-IB230 /PCIe 104	USB-to-CAN V2 compact	USB-to-CAN V2 professional	USB-to-CAN V2 embedded	USB-to-CAN V2 plugin	CAN@net II /VCI	CANblue II
PCI Express		USB	USB	USB	USB	Ethernet	Bluetooth (V2.1)
-	32 Bit	32 Bit	32 Bit	32 Bit	32 Bit	32 Bit	32 Bit
1 / 2 x CAN	2 / 4 x CAN 1 x LIN	1 x CAN	2 x CAN 1 x LIN (Automotive)	1 x CAN	1 / 2 x CAN 1 x LIN optional	1 x CAN	1 x CAN
CAN 2.0 A/B		CAN 2.0 A/B	CAN 2.0 A/B	CAN 2.0 A/B	CAN 2.0 A/B	CAN 2.0 A/B	CAN 2.0 A/B
ISO 11898-2	ISO 11898-2 1 x ISO 11898-3 (opt.)	ISO 11898-2	2 x ISO 11898-2 1 x ISO 11898-3 (Autom.)	ISO 11898-2	ISO 11898-2 1 x ISO 11898-3 (opt.)	ISO 11898-2	ISO 11898-2
Angled socket board 2x5		Sub-D9 or RJ45 plug	2 x RJ45 with RJ45/ Sub-D9 adapter	Sub-D9	Connection cable with open ends	Sub D9 plug acc. to CiA 303-1	Sub D9 plug acc. to CiA 303-1
1 kV, 1 sec.		optional	optional	1 kV, 1 sec.	optional	1 kV, 1 sec.	1 kV, 1 sec.



CAN Infrastructure

Repeaters, Bridges and Gateways for CAN

Highlights

- ✓ Cost savings due to simple wiring
- ✓ Allows larger system expansion
- ✓ Filter and conversion functionality
- ✓ Increased system reliability
- ✓ Line protection by galvanic isolation
- ✓ Bridging of large distances and easy system access using Bluetooth, Ethernet...
- ✓ DIN rail bus backbone bus

CAN Repeaters

In terms of robustness, temperature range and safety, IXXAT repeaters are specially designed for use in an industrial environment. The reliability of a system can be significantly increased while typically saving costs due to simpler wiring.






CAN repeaters are used to establish a physical coupling of two or more segments of a CAN bus system. They can be used to implement tree or star topologies as well as for long drop lines. Systems connected by repeaters are independent electrical segments that can be optimally terminated in terms of signals. In addition, network segments can be electrically decoupled using a galvanically isolated repeater.

CAN Bridges and Gateways

The use of bridges and gateways opens up a large number of configuration possibilities. For example, CAN systems can be implemented over a larger area, devices without CAN interfaces can be connected to CAN systems or CAN systems can be coupled using different technologies, such as Bluetooth, Ethernet or PROFINET.

CAN bridges can link CAN networks of different bit rates or protocols with each other. They are based on the store-(modify)-forward principle where CAN messages are received by a sub-network and then transmitted to the other sub-network. Translation and filter rules can also be used, allowing a protocol adaptation to be carried out



Technical Specifications					
Product	CAN-CR200	CAN-CR210/FO	CAN-CR220	CAN-Repeater	FO-Repeater
Description	Stackable ISO 11898-2 CAN repeater	Stackable ISO 11898-2 to fiber optic converter	ISO 11898-2 with 4 kV galvanic isolation	ISO 11898-2 CAN rep. with low-speed option	ISO 11898-2 to fiber optic converter
CAN bus interface	2 x ISO 11898-2; DIN rail bus	1 x ISO 11898-2; DIN rail bus	2 x ISO 11898-2	2 x ISO 11898-2; optional ISO 11898-2 to ISO 11898-3	1 x ISO 11898-2
CAN connectors	SUB D9	SUB D9	SUB D9	Screw-terminals	Screw-terminals
Integrated CAN bus termination	Switchable			Switchable via soldering jumpers	
Galvanic isolation	CAN 1 / CAN 2 1 kV, 1 sec.	CAN1 - PWR 1 kV CAN 2: Fiber-Optic	CAN 1 / CAN 2 / PWR 4 kV, 1 sec.	CAN 1 / CAN 2 1 kV, 1 sec.	CAN 1 1 kV, 1 sec.
LWL connection	-	F-SMA or ST (fiber optic 50/125 µm duplex)	-	-	ST (fiber optic 50/125 µm duplex)
Baudrate	All baudrates. (Please note that transmission delay limits usage in networks above 888kpbs).				
Transmission delay	approx. 200 ns (equal to 40 meter bus length)	approx. 300 ns (equal to 60 meter bus length)	approx. 200 ns (equal to 40 meter bus length)	approx. 200 ns (equal to 40 meter bus length)	approx. 300 ns (equal to 60 meter bus length)



between the sub-networks. A bridge can, therefore, provide simple gateway functions.

CAN bridges are good for creating hierarchical networks by transferring only the information to the connected sub-networks via bridges which are relevant to the sub-network. The bridge function can also be executed with the aid of other transmission systems.

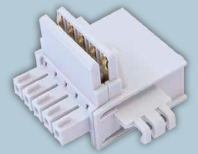
For example, the CAN-Ethernet-CAN bridge is set-up by two CAN-Ethernet gateways which enable connection to remote CAN networks. An adaptation to customer specific requirements can be made by using the Application Development Kit for the CANbridge.

As an extension to the CAN bridges, CAN gateways allow access to CAN networks via other communication

systems. In each case, the protocols of the connected bus systems are mapped to the other communication model.

Accessories

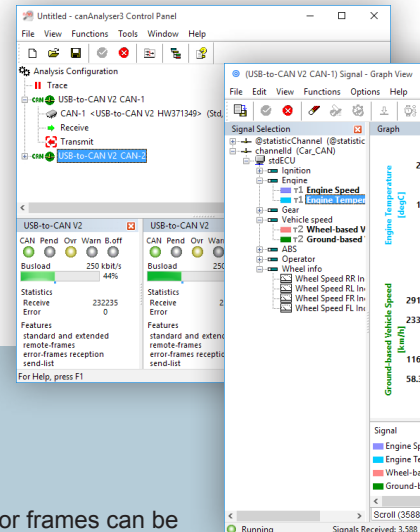
The T bus connector enables the backbone bus connection of the stackable repeaters.



Technical Specifications	CANbridge	IXXAT CME/PN	CAN@net II/Generic	CAN-GW 100/RS232	CANblue II
Product	CANbridge	IXXAT CME/PN	CAN@net II/Generic	CAN-GW 100/RS232	CANblue II
Description	Configurable CAN/CAN bridge	PROFINET-CANopen gateway	CAN/Ethernet Gateway and Bridge	RS232/CAN converter	CAN/Bluetooth Gateway, Bridge and PC Interface
Application field	Extension of the network dimension and network segmentation	Connection of CANopen devices and networks to PROFINET	CAN connection via Ethernet for Linux or emb. applications as well as network extension via CAN-Ethernet-CAN bridge	Connection of devices with RS232 interface to CAN/CANopen	Wireless CAN connection of Windows, Linux or emb. applications
Functionality	- Message filtering - Identifier conversion - Baudrate conversion	- Bidirectional transmission - IO-Device (PROFINET) - CANopen-NMT-Master	- Message filtering	- CAN/CANopen operation mode	- Message filtering
Fieldbus interfaces	2 x CAN	1 x CAN	1 x CAN	1 x CAN	1 x CAN
CAN bus interface	2 x ISO 11898-2	ISO 11898-2	ISO 11898-2	ISO 11898-2	ISO 11898-2
CAN connection	DIN rail version via screw terminals; Alu version via Sub D9 plug according to CiA303-1	Screw terminals	Sub D9 plug according to CiA 303-1	Screw terminals	Sub D9 plug according to CiA 303-1
Further interfaces	RS232 for the device configuration	PROFINET: 2x100 MBit/s ETH via RJ45 (2 port switch)	10/100 Mbit/s Ethernet, auto negoti., auto crossover, RJ45 plug	RS232 (600 to 115200 Bit/s), handshake	Bluetooth specification V2.1, Class 1 / +17 dBm
Galvanic isolation	optional	yes	yes	optional	yes

CAN Analyzing and Diagnostic

canAnalyser and diagnostic tools



canAnalyser and Modules

The canAnalyser is a powerful, versatile tool for development, testing and maintenance of Controller Area Network systems. The software package is based on a modular concept and employs special features that offer exceptional openness and extensibility.

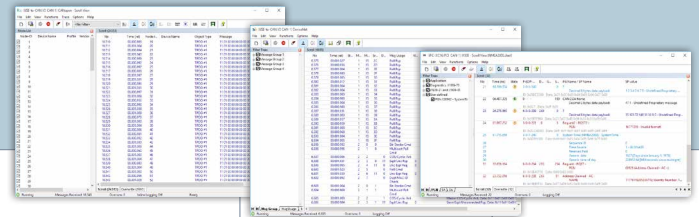
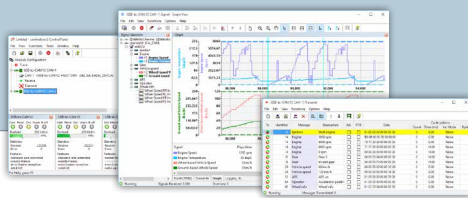
The canAnalyser offers functions covering many areas of application, such as: transmission of individual messages and signals or transmission of sequences, reception and interpretation of messages and signals and display of statistical data.

The signals are managed within a database and can be loaded using special import filters. Import filters are available for the CANdb, FIBEX, DIM and LDF format. CANdb and DIM databases can be created by using the included editor tool. Statistical values like bus

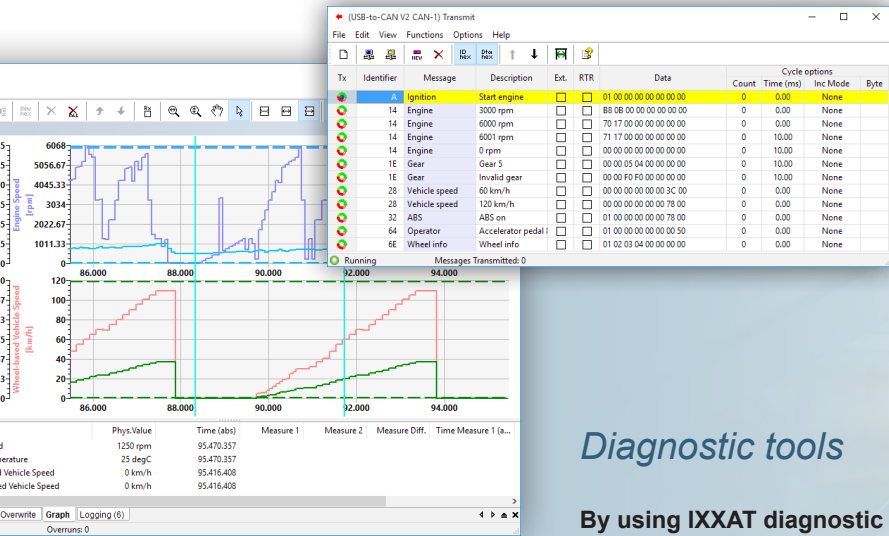
load or error frames can be evaluated together with the signals from a database.

New, script-based statistics functions also permit quick, easy adaptation to your specific application needs.

Additional functions are provided by optional modules, such as the protocol specific display of messages in CANopen, DeviceNet or J1939 based systems. Customer-specific functions



Product	canAnalyser lite	canAnalyser 3	CANopen Module	DeviceNet Module	SAE J1939 Module
Description	PC based analyzing tool for CAN systems	PC based analyzing tool for CAN systems	CANopen extension for canAnalyser /-lite	DeviceNet extension for canAnalyser /-lite	SAE J1939 extension for canAnalyser /-lite
Included functions/modules	Reception, Transmission, Trace, Replay and Sequencer module for CAN, CAN-FD and LIN messages Signal reception module CANdb, FIBEX, DIM, LDF import	In addition to the lite version: Signal/Graphic and Transmit Module for Signals	Interpretation and display of CAN messages in accordance with the CANopen standard (CiA 301, ...) CAN FD USDO interpretation	Interpretation and display of CAN messages in accordance with the DeviceNet standard	Interpretation and display of CAN messages in accordance with the SAE J1939 standard
Features	Online monitoring of bus traffic Transmission of singleshot, cyclic messages and sequences Creation of command controlled message sequences Recording of messages with configurable trigger conditions Graphical presentation of message content on the time line Statistical analysis Detection/presentation of the bus load Open programming interface Scripting host	In addition to the lite version: Multi-line and multi-board operation Multiple module instances	Message display in scroll or overwrite mode EDS, DCF, XDD file import Export to CSV and clipboard Change highlighting and receive statistics Filtering by node number and message type Interpretation of all relevant protocols and PDO content File recording	Display in scroll mode Configuration of explicit and fragmented connections Evaluation and monitoring of the fragmentation protocol with message wise or fragment presentation Filtering by Message Group, Message ID, MAC ID and message type File recording	Message display in scroll or overwrite mode Interpretation of application, diagnosis and connection manag. messages Change highlighting and reception counter Filtering by Parameter Group Number destination and source address File recording
Operating system	XP / Vista / Windows 7 (32/64 bit) / Windows 8 (32/64 bit) / Windows 10 (32/64 bit)				



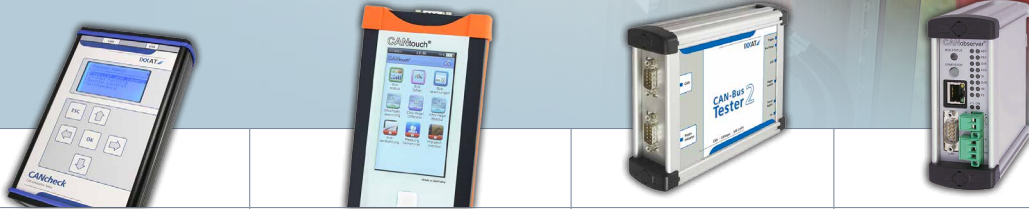
Diagnostic tools

By using IXXAT diagnostic tools, CAN systems can be analyzed and evaluated upon installation and during operation. The tools allow recording of the transmitted data and errors as well as detection of signal, transmission and wiring errors.

Based on the analysis results, errors can be quickly and easily eliminated or an existing system can be optimized to achieve higher reliability. In addition, newly created systems can be subjected to a thorough test.

can be easily integrated via an open .NET programming interface in the form of individual modules.

The canAnalyser is based on the VCI driver and can be used with all IXXAT PC CAN interfaces.



Product	CANcheck	CANtouch	CAN-Bus-Tester (CBT)	CANobserver
Description	Hand-held installation tester for CAN systems for commissioning, troubleshooting and maintenance	Hand-held tool for the CAN bus physics and protocol analysis	Powerful tool for the CAN bus physics and protocol analysis	Diagnostic tool for the long-term error monitoring of CAN bus systems
Features	Test of wiring, terminators, cable length, impedance Signal level and bus load Determination of transmitted IDs and display of reception frequency Display of error frames per time unit Autom. baudrate detection Operation via LCD display/keypad CANopen mode: Message display according to the node number Storage of measurement results and transm. via USB	Measurements designed as apps: Bus status (Bus traffic load) Bus errors (Active/passive frame err.) Bus voltages (CAN supply voltage and shield voltage) Common mode voltage CAN Levels (absolute / differential) Bus wiring (Short-circuits, loop resistances, cable length,...) Node measurement (Quality level, edge steepness, oscilloscope disp.) Protocol monitor	Analysis of the signal quality (levels, slopes, faults) Integrated oscilloscope Powerful trigger functions Monitoring of bus status, bus load, error messages Wiring test Integrated CAN monitor for transmission and reception Automatic baudrate detection Creation of inspection reports	Physical monitoring: - Signal quality (0..100 %) - Signal-to-noise level - Signal edges Logical monitoring: - Active/Passive error, overload frames, acknowledge errors E-mail reports (device and status information, error messages) Maintenance without PC, continuous recording up to 10 years
Display	LCD display with backlight	Color display with touch screen	-	LEDs for status / errors
CAN interface	1 x CAN (ISO 11898-2)	1 x CAN (ISO 11898-2)	1 x CAN (ISO 11898-2)	1 x CAN (ISO11898-2)
Further interfaces	USB 2.0 for PC based control and message download; BNC trigger output for the oscilloscope	USB 2.0 for measurement data transfer (USB Mass Storage Device)	USB 2.0 for PC connection; BNC trigger output for the oscilloscope	10/100 MBit Ethernet, RJ-45 LAN; Free programmable error output lines (max. 30 V DC)
Protocols	CAN, CANopen	CAN, CANopen, DeviceNet, SAE J1939		
Power supply	4 x 1.5 V AA battery or USB	Integr. lithium-ion battery o. external	9-36 V DC; Power supply incl.	9-36 V DC
Operation and configuration	Via keyboard or terminal program	Via touch screen	Via software tool for Win XP/ Server2003/Vista u. Win7	Via web-interface; Control room connection via SNMP

IXXAT INpact

Versatile industrial Ethernet PC interface with multi-protocol support

Highlights

- ✓ One board for all common industrial Ethernet networks
- ✓ Easy switching between protocols through a standardized API
- ✓ Easy integration thanks to different form factors
- ✓ High performance for demanding real-time applications
- ✓ Future-proof solution based on proved IXXAT and Anybus technologies

Application areas

- Process data visualization, e.g. within control stations or machines
- Human-Machine-Interfaces (HMI), mobile solutions based on Mini PCIe
- Data acquisition within test benches or test systems
- Measurement and analysis applications

Until now, it has been complicated to develop PC based applications for several industrial Ethernet standards since different interface cards and application programming interfaces had to be used for each protocol. IXXAT INpact simplifies this thanks to its protocol-independent solution that can be used in a wide range of applications.

Variants

The INpact PC interfaces are available in two different versions: Firstly, as dedicated versions for each network with pre-installed network protocols, and secondly as a highly flexible and open version to which the desired industrial Ethernet protocol can be flashed. This feature allows easy switching between all available protocols in a quick and cost-efficient manner without any additional costs.

INpact enables easy connection of PC-based slave applications to various industrial Ethernet networks, such as:

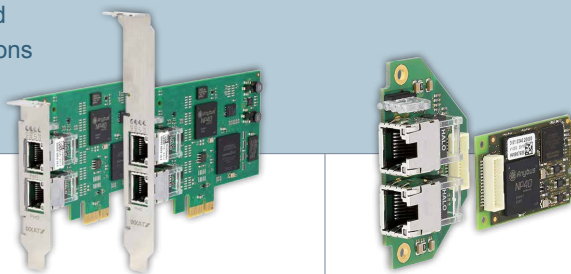
- PROFINET
- EtherNet/IP
- EtherCAT
- Powerlink
- Modbus TCP

The board is available as PCIe version with standard or low-profile slot-brackets and as PCIe Mini version enabling the space-saving implementation for mobile or hand-held systems.

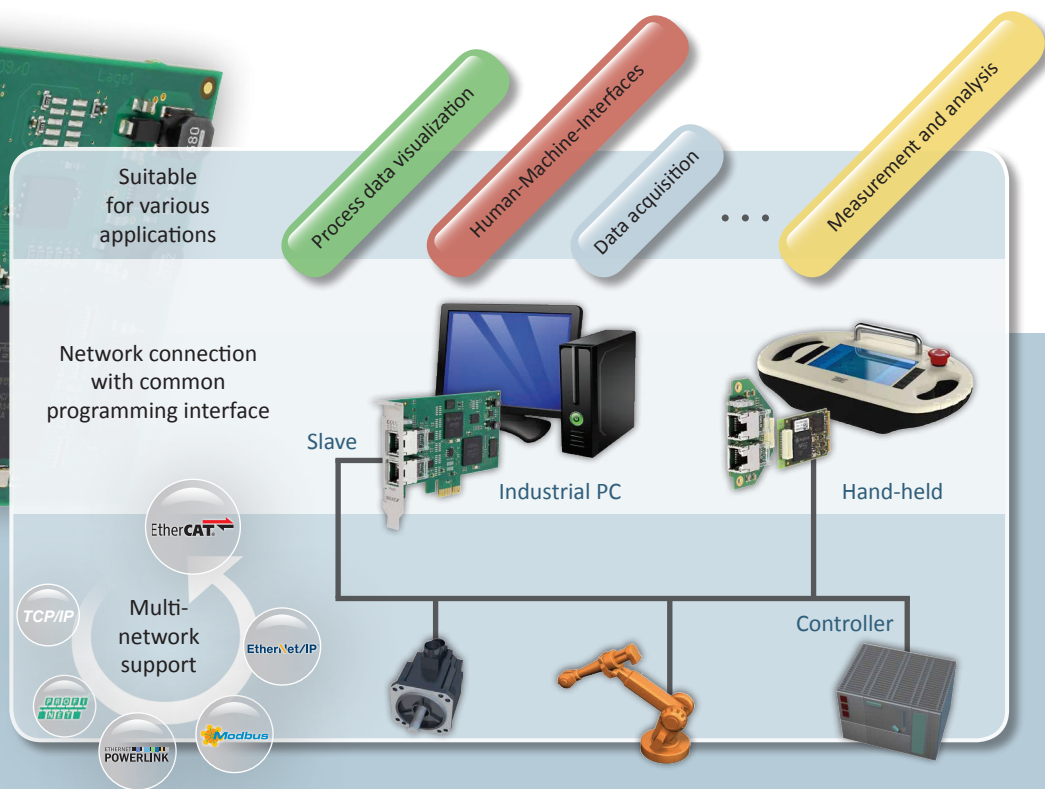
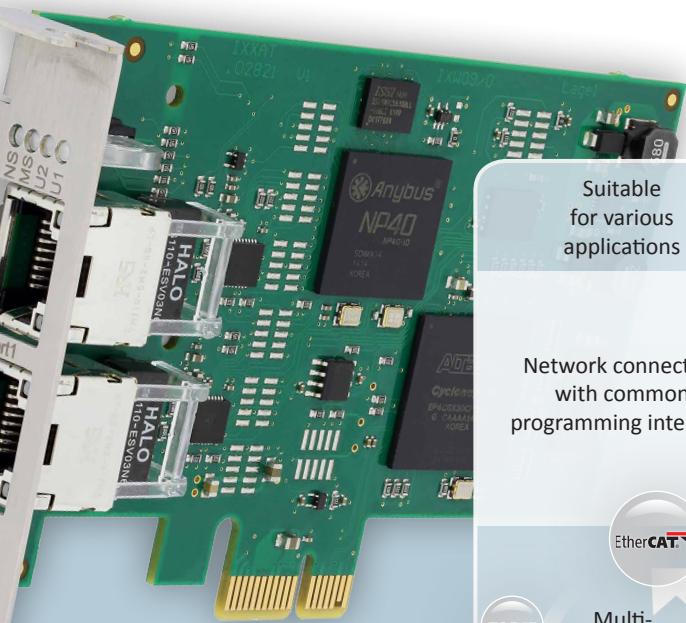
Technology

The multi-network capability of INpact is based on HMS' proven Anybus CompactCom technology used within millions of automation devices globally. The network connection is made through a 2-port Ethernet interface (10/100 Mbit, RJ45), which also supports protocol specific switch functions – such as IRT for PROFINET, DLR for EtherNet/IP and Hub for Powerlink.

The galvanically isolated network interfaces decouple the industrial Ethernet network from the PC system, providing



Technical Specifications	PCIe Standard and Low Profile	PCIe Mini
Format	PCIe Standard and Low Profile	PCIe Mini
Field bus interface	Two Ethernet ports, 100/10 Mbit	Two Ethernet ports, 100/10 Mbit
PC interfaces	PCI Express single lane port (x1) acc. to PCI Express base specification, rev. 1.1	Mini PCI Express (x1)
Network handling	Anybus NP40	Anybus NP40
Power supply	Via PCIe socket (3.3 V / 12 V DC)	Via PCIe PCIe (3,3 V)
Current consumption	Typ. 200 mA / 3.3 V DC, 120 mA / 12 V DC	Typ. 600 mA / 3.3 V DC
Form factor	Standard height / low profile PCI Express add-in card profile	Full Mini Card form factor
Operating temperature range	0 °C to 70 °C Optional: -40 °C to 70 °C	-40 °C to 60 °C



efficient protection against EMC issues and overvoltage.

The FPGA-based Anybus NP40 network processor handles the communication, providing all functions required to process the communication between the different Industrial Ethernet networks and the PC-based application.

Programming

The INpact comes with a comprehensive driver package for Windows and Linux, enabling simple and rapid development of customer-specific applications – independent of the used board version and Industrial Ethernet protocol. Thanks to the uniform application

programming interface, it is possible to switch quickly between industrial Ethernet protocols without extensive programming.

Drivers for real time operating systems such as RTX, Intime, VxWorks and QNX are supported upon request.

INpact CE Slave	INpact PIR Slave PCIe	INpact ECT Slave PCIe	INpact EIP Slave PCIe	INpact EPL Slave PCIe	INpact EIT Slave PCIe
Common Ethernet	Profinet	EtherCAT	EtherNet/IP	Powerlink	Modbus-TCP
<p>The protocols specific functions correspond to those of protocol-specific variants.</p> <p>The CE version has at delivery a basic functionality, allowing you to load the desired protocol.</p>	<ul style="list-style-type: none"> - Conformance Class A,B and C - MRP client functionality - Generic and Profinet specific diagnostic support - Up to 1440 bytes I/O data for each direction incl. status bytes - FTP server, email client - Adaptable web server - Server Side Include (SSI) - JSON functionality 	<ul style="list-style-type: none"> - CoE (CANopen over EtherCAT) - FoE (File Access over EtherCAT) - Modular Device Profil Support - DS301 conform - EMCY support - Up to 1486 bytes I/O data for each direction - Distributed clock 	<ul style="list-style-type: none"> - Beacon based DLR (Device Level Ring) - FTP server, email client - Adaptable web server - Server Side Include (SSI) - Up to 1448 bytes I/O data for each direction - CIP Parameter Object support - Extended CIP object implementation - Unconnected CIP routing 	<ul style="list-style-type: none"> - Support of the Powerlink V2.0 profile, Version 1.2.0 (CN) - Supports ring redundancy - Up to 1490 bytes I/O data for each direction - Supports 1 TPDO and 1 RPDO (each 1490 bytes) - Support of segmented SDO transfer 	<ul style="list-style-type: none"> - Modbus-TCP Server/Slave - Adaptable web server - FTP server, email client - JSON funct. - Up to 1536 bytes I/O data for each direction - Server Side Include (SSI)

...eine Übersicht aller Funktionen finden Sie auf unserer Webseite

Protocol Software and APIs

Flexible protocol implementation into your embedded or PC-based systems

HMS protocol software packages, libraries and APIs enable the easy and fast implementation of different fieldbus and industrial Ethernet standards into embedded or PC-based systems.

Highlights

- ✓ **Modular software structure with comprehensive configuration and scaling possibilities**
- ✓ **High efficiency with minimum resource requirements**
- ✓ **Clearly structured, simple programming interface for connection of the application program**
- ✓ **Reliable operation in thousands of applications worldwide**

Protocol software

The proven HMS software packages are characterized by their high modularity and scalability, which enables optimum adaptation to customer requirements.

In this way, both simple applications can be implemented with extremely low resources and complex applications with a comprehensive scope of func-

tions. The clearly structured programming interface also facilitates integration in the application software.

The software packages are offered for a large number of microcontroller platforms and compilers, but can be also very easily adapted to specific target systems.



Product	CANopen Protocol Software	DeviceNet Slave Protocol Software	SAE J1939 Protocol Software
Description	Software package for the development of CANopen slave and CANopen master/manager devices	Software package for the development of DeviceNet slave devices	Software package for the development of J1939 devices
Supported standards	CiA 301, CiA 303-3, CiA 305, CiA 302 (depending on the used package variant)	ODVA - The CIP Networks Library Volume 1: Common Industrial Protocol (PUB00001) Volume 3: DeviceNet Adaptation of CIP (PUB00003)	J1939-21, J1939-81, J1939-73, J1939-82, NMEA 2000 V1.2000, ISO 15765-2
Included functionality	<ul style="list-style-type: none"> - Static or variable PDO mapping, multiplexed PDO - CAN-ID configuration according to Predef. Connection Set - Client (Master/Slave) and server SDO with support for normal, expedited and block transfer mode - SYNC, EMERGENCY and TIMESTAMP objects - NMT Node Control, NMT Error Control - Layer Setting Services with LSS Fastscan support - Flying NMT master according to CiA 302-2 - Optional multi-channel support <p>CANopen Manager Version:</p> <ul style="list-style-type: none"> - Process image with network variable support acc. 302-4 - Standardized NMT start-up procedure, configurable via local object directory - Support of IEC61131-3 run-time systems <p>Also available as real-time variant (see web page)</p>	<ul style="list-style-type: none"> - Supported CIP objects classes: Identity, Message Router, DeviceNet, Assembly, Connection, Acknowledge Handler - Group-2-Only-Server (Predefined Master/Slave Connection Set with Explicit, Poll, Bit-Strobe, Change of State/Cyclic) - Group-2-Server - Device Heartbeat and Shutdown Message (Prod.) - Offline Connection Set - Quick Connect - Interfaces for user specific hardware for switches (MAC ID and baudrate) and indicators (MS-LED, NS-LED) <p>Also available as master variant (see web page)</p>	<p>Besides the standard functionality the software offers:</p> <ul style="list-style-type: none"> - Cyclic message transmission - Timeout monitoring for receive messages - Function and data interface - Layer 2 communication - Sniffer operation <p>Optional:</p> <ul style="list-style-type: none"> - ISO 15765-2 extension - NMEA2000 extension - J1939 CAN driver - Diagnosis extension



Product	CANopen Master API	CANopen Manager API	SAE J1939 API
Description	Windows API for the development of simple PC-based control and test programs	Windows API for the development of powerful CANopen PC-based control solutions	Windows API for the development of J1939 service and test applications
Standards	CiA 301, CiA 305	CiA 301, CiA 302	
Included functions	<ul style="list-style-type: none"> - Transmission/reception of PDOs (synchronous and asynchronous) - Client (Master/Slave) and server SDO with support for normal, expedited and block transfer mode - NMT Node Control, NMT Error Control (Heartbeat, Node Guarding) - SYNC, EMERGENCY and TIMESTAMP objects - For C, C#, vb.net, Delphi and LabView - Multi-channel support 	<ul style="list-style-type: none"> - Complete CANopen master functionality including support of the standard bootup procedure - Support for CANopen slaves according to CiA 301 vers. 3/4 - Automatic configuration of devices at system startup via configuration manager according to CiA 302-3 - Local object dictionary with integrated management of network variables - Hot-swap support - Simple program integr. via Windows DLL & process image - All functions locally parameterized via the object dictionary 	<ul style="list-style-type: none"> - Supports all the features of the protocol software - Automatic conversion of received messages into signals and vice versa - Use of the J1939 designer data base for signal interpretation - Supports multiple CAN channels and therefore also J1939 networks

Windows APIs

On request, HMS provides a comprehensive service offer for your development project:

- Technical support by our experienced team.
- Detailed code introduction for your developers.
- Software adaptation, implementation and testing, as well as development of custom hardware.

HMS offers APIs for various protocols enabling the development PC-based applications under Windows.

Based on this APIs, you can quickly and easily realize control, service and test programs.

To access the fieldbus system IXXAT PC CAN interfaces can be used.

Tools

In addition to our protocol software packages and APIs we also offer configuration and analysis tools to support your development project:

- CANopen Device Manager
- COTI DLL for CANopen Conformance Test Tool
- SAE J1939 Designer
- EIPscan
- DeviceNet Conformance Test Driver
- canAnalyser with CANopen, DeviceNet and SAE J1939 Module



EtherNet/IP Adapter Software	EtherNet/IP Scanner Software	EtherCAT Master Protocol Software
Communication driver (EIPA) for Windows and developers kit (EADK) for the development of embedded adapter devices	Communication driver (EIPS) for Windows and developers kit (ESDK) for the development of embedded scanner devices	Software package for the development of EtherCAT master controllers
ODVA - The CIP Networks Library Volume 1: Common Industrial Protocol (PUB00001) Volume 2: EtherNet/IP Adaptation of CIP (PUB00002)		Compliant to the EtherCAT Master Class Directive according to ETG.1500
Supported CIP objects classes: Identity, Message Router, Assembly, Connection Manager, TCP/IP Interface, Ethernet Link Adapter class functionality: - UCMM Message Server - Class 3 Message Server - Class 1 I/O Server Additional functions: - UCMM Message Client	Supported CIP objects classes: Identity, Message Router, Assembly, Connection Manager, Connection Configuration, TCP/IP Interface, Ethernet Link Scanner class functionality: - UCMM Message Server and Client - Class 3 Message Server and Client - Class 1 I/O Server and Client	<ul style="list-style-type: none"> - Two product editions available: Class A (Full Featured) and Class B (Basic Features) - For various CPU architectures like x86, ARM, PowerPC and others - Operating system and compiler independent - Optimized for SMP multi-core operation (symetric multi-processing)

PLC Extensions

CANopen® interfaces for SIMATIC® industrial automation systems



The CANopen modules by HMS enable system integrators to easily and inexpensively integrate CANopen field devices with SIMATIC industrial automation equipment.

Highlights

- ✓ Easy integration of CAN or CANopen-based devices with Siemens equipment
- ✓ Enabling interaction between PROFIBUS or PROFINET controllers – such as the S7-1200 or ET200S device series – with CAN/CANopen fieldbus devices (gateways)
- ✓ Supports implementation of any custom CAN based fieldbus protocol due to CAN 2.0A mode
- ✓ Fully integrated into the hardware catalog of TIA Portal or STEP 7
- ✓ PLC function blocks available for easy integration in to TIA Portal, respectively STEP 7

Both modules are supported by optimized and highly intuitive CANopen configuration tools that enable users to quickly generate all required configuration data for the CANopen network. Due to the support for operation in transparent CAN 2.0A mode, system integrators have the possibility to implement any custom CAN based fieldbus protocol.



The 1 SI CANopen for the SIMATIC ET200@S modular I/O system and the CM CANopen module for the SIMATIC S7-1200® basic controller implement the HMS CANopen master technology in a compact format fully integrated with the SIMATIC hardware. They enable you to directly extend SIMATIC automation solutions with CAN or CANopen based equipment making more expensive and space demanding PROFIBUS or PROFINET to CANopen gateways unnecessary.

Product	1 SI CANopen for SIMATIC ET200S	CM CANopen for SIMATIC S7-1200
Supported CANopen Features		
Implemented CiA specifications	CiA 301 version 4.2 CiA 302 version 4.1, parts 1-3	CiA 301 version 4.2 CiA 302 version 4.1, parts 1-4
Process Data Objects (PDO)	128 RPDO, 128 TPDO	64 RPDO, 64 TPDO
TPDO transmission types and protocols	Acyclic synchronous, cyclic synchronous, event-driven PDO write protocol	Acyclic synchronous, cyclic synchronous, event-driven PDO write protocol
Service Data Objects (SDO)	SDO functionality, normal (segmented) and expedited upload & download protocols	SDO functionality, normal (segmented) and expedited upload & download protocols
Device monitoring	Heartbeat producer/consumer	Heartbeat producer/consumer
CAN bit rate	20 kbit/s – 1 Mbit/s	20 kbit/s – 1 Mbit/s
CANopen Master Specific Features		
Network Management (NMT)	Master functionality with NMT node control and NMT error control	Master functionality with NMT node control and NMT error control Support for NMT startup process according to CiA 302
Node guarding (NMT error control)	Master and slave	Master and slave
Service Data Objects (SDO)	Client and server	Client and server
CANopen Slave Specific Features		
Network Man. (NMT) state machine	yes	yes
Node guarding (NMT error control)	Slave	Slave
Synchronization	Consumer	Consumer
Service Data Objects (SDO)	Server	Server
Automatic bit rate detection	yes	no



IXXAT Econ

Embedded PC solution with multi-protocol support



Highlights

- ✓ Multi-protocol support for Industrial Ethernet and fieldbus
- ✓ Easy programming via Soft-PLC or Application Development Kit
- ✓ High performance for real-time applications
- ✓ Analog/digital IOs for direct connection of sensors/actuators

The IXXAT Econ is a powerful embedded PC for top-hat rail mounting with Linux operating system. Customized gateway and control solutions can be swiftly and easily implemented based on the IXXAT Econ for a variety of different fieldbus and industrial Ethernet standards.

Out-of-the-box variants

HMS offers software packages making the IXXAT Econ an out-of-the-box master for EtherCAT and CANopen. The EtherCAT master implements the proven EtherCAT Master Class B software from acontis. The specially optimized link layer enables cycle times of less than 1 ms. The CANopen master functionality is provided by the multi-channel variant of the IXXAT CANopen master/slave software from HMS.

Soft PLC

HMS offers an intuitively operated Soft-PLC programming environment for the IXXAT Econ. The Soft-PLC is consistent with IEC 61131-3 and enables the fast

and intuitive programming and configuration of simple control applications. This includes support for the most important protocols, like CANopen or PROFINET.

Development Kits

In order to support complex applications, HMS offers well-documented application development kits for the Econ. The ADKs include a board support package incorporating all interface drivers, sample applications, the respective protocol software package and the Linux operating system.

IXXAT Econ 100 – easily expandable

Besides the Econ 10, the Econ 100 is especially suited for applications with high requirements in terms of interfaces and extensibility.

By using an expansion board, the IXXAT Econ 100 can be directly equipped with additional digital and analog IOs for direct connection of sensors and actuators.

Product	IXXAT Econ 100	IXXAT Econ 10
CPU	Dual-Core Cortex A9 CPU	Dual-Core Cortex A9 CPU
Operating system	Linux	Linux
Memory	256 MB DDR-RAM	128 MB DDR-RAM
Flash	256 MB SD card (optional up to 32 GB)	Integrated 128 MB Flash and 32 MB SPI Flash
On-board interfaces	- 1 x 1000/100/10 MBit LAN - 1 x 100/10 MBit LAN (e.g. EtherCAT Master) - 2 x CAN High-Speed, galvanic isolated - 2 x USB (2.0) optional: - 1 x RS232 interface, instead of 1 x CAN	- 3 x 100/10 MBit LAN - 2 x CAN HS - 1 x USB (OTG) - 1 x RS232, 1 x RS485 - 2 x digital input (0-24 V) - 2 x digital output (0-24 V)
Optional expansion board	- 8 x digital input (0-24 V, galv. isolated) - 8 x digital output (0-24 V, 2 A max., galv. iso.) - 6 x analog input (0-10 V, 12 bit res.) - 2 x analog output (0-10 V, 12 bit res.)	-
Cooling	Passive	Passive
Power supply	9-32 V, 2-pin Phoenix Contact connector	9-30 V, 3-pin Phoenix Contact connector
Housing	Steel	Plastic, IP20
Mounting	DIN rail mounting	DIN rail mounting
Dimensions	72 x 154 x 105 mm	22,5 x 110 x 101 mm



IO Modules

Easy connection of analog/digital IO signals to CAN, CANopen and EtherCAT

With the CANio 250/500 and the EtherCAT I/O, HMS offers three modules enabling quick and easy connection of analog and digital input and output signals to CAN, CANopen and EtherCAT systems – whether in experimental setups, test benches or vehicles.

Highlights

- ✓ Support for digital and analog IOs on one platform
- ✓ Universal use due to robust design and wide power supply range
- ✓ Easy configuration and versatile configuration options
- ✓ Adaptation to specific requirements via CANio ADK
- ✓ Plug-in version available for direct integration into customer hardware

Easy configuration

The individual configuration of the CANio 250/500 for different applications can be done either by loading configuration data via a CANopen master or by sending configuration messages in a pure CAN network or offline via the free CANio configuration tool. The configuration of the EtherCAT IO module is performed by using an EtherCAT master with a XML configuration file (ESI file).

Development Kit (ADK)





The CANio ADK for the CANio 250/500 enables creation of custom device applications with your customer-specific functionality. The CANio ADK contains all required drivers and is delivered as a binary library together with a comprehensive C-source demo application. As development platform an evaluation kit of the CANio 250/500 is included in the scope of supply.

Universal use

An important feature of the IXXAT IO modules are the inputs and outputs for digital and analog signals on one device, which can be flexibly configured. The devices are delivered in a rugged aluminum housing with a wide voltage and temperature range (6-32 V, resp. -40 °C to +70 °C) allowing for easy integration into existing applications in the industrial and automotive area.

A special focus of the CANio 250/500 is the device operability within CANopen and also standard CAN systems. For this reason, the CANio 250/500 was designed as a self-starting CANopen slave, with all important parameters stored as default values on the device.



				
Product	CANio 250	CANio 250 Plug-In	CANio 500	ETCio 100
Protocol	CAN, CANopen	CAN, CANopen	CAN, CANopen	EtherCAT
Galv. isolation	500 V DC	-	500 V DC	-
Digital inputs	Up to 16 x + clamp 15 (5 V CMOS comp.)	-	4 x + clamp 15 (between 0-34 V, threshold at 50 %)	6 x (between 0-34 V, threshold at 2.5 V)
Digital outputs	Up to 16 x, max. 30 mA, 5 V CMOS signal levels	-	4 x, max. 1 A, output voltage free selectable, up to 32 V	4 x, max. 2 A, output voltage free selectable up to 32 V
Analog inputs	-	-	4 x, 12 bit res. +/- 5 V, or 0-10 V, or +/- 100 mA	2 x, 12 bit resolution 0-10 V
Analog outputs	-	-	4 x, 12 bit resolution +/- 5 V, or +/- 10 V, or 0-5 V, or 0-10 V, switchable via software	2 x, 12 bit resolution 0-10 V, 20 mA (optional 16 bit resolution)
GPIOs	-	25 x, free configurable as analog input, digital in-/output or SPI, 3V3 CMOS	-	-
Plugs	CAN: D-SUB-9 I/O: D-SUB-9	Socket board with 2.54 mm contact spacing	CAN: D-SUB-9 I/O: D-SUB-HD15	16 pin plug; Phoenix-Contact



IEEE 1588 PTP

Solutions for the time synchronization of distributed system in the nanosecond range

HMS provides advanced and proven IEEE 1588 solutions with a wide range of functions. The co-operation with many major semi-conductor manufacturers and the active participation in relevant working committees ensures further development of the software according to the latest technical standards.

Highlights

- ✓ Easy adaptation to different profiles and target systems
- ✓ Annually tested and verified at the IEEE1588 plug fests
- ✓ Optimized use of memory and resources for embedded applications
- ✓ Short synchronization time at system start, after changes in the network as well as in response to disturbances

Protocol Software

The IEEE 1588 Protocol Software enables quick and easy development of IEEE 1588-2008 compliant devices. Due to its modular approach, the adaptation to your application requirements is done very quickly. The interfaces with the target platform, for example to access the UDP/IP socket, are grouped in a separate adaptation layer, simplifying porting to target systems and ensures quick integration.

For the development of IEEE 802.1AS compliant "Time-Aware" nodes for AVB/TSN networks, HMS offers an IEEE 802.1AS protocol software package. As time-aware slave-only end station, the software is the receiver of

the time-synchronization information provided by a grandmaster. It is delivered as ANSI C code with a MISRA-C approach.

FPGA IP-Core

The IEEE 1588 IP-Core Module for FPGAs is used to implement 1588 devices with high time stamping accuracy. Due to the implementation of the real-time clock and time stamp unit in the FPGA, it is possible to achieve clock synchronization in the two-digit nanosecond range.

Management Tool

The IEEE 1588 PTP Management Tool enables monitoring and configuration of an IEEE 1588-2008 network. It therefore represents the ideal supplement to the protocol software for the development and commissioning of PTP clocks.

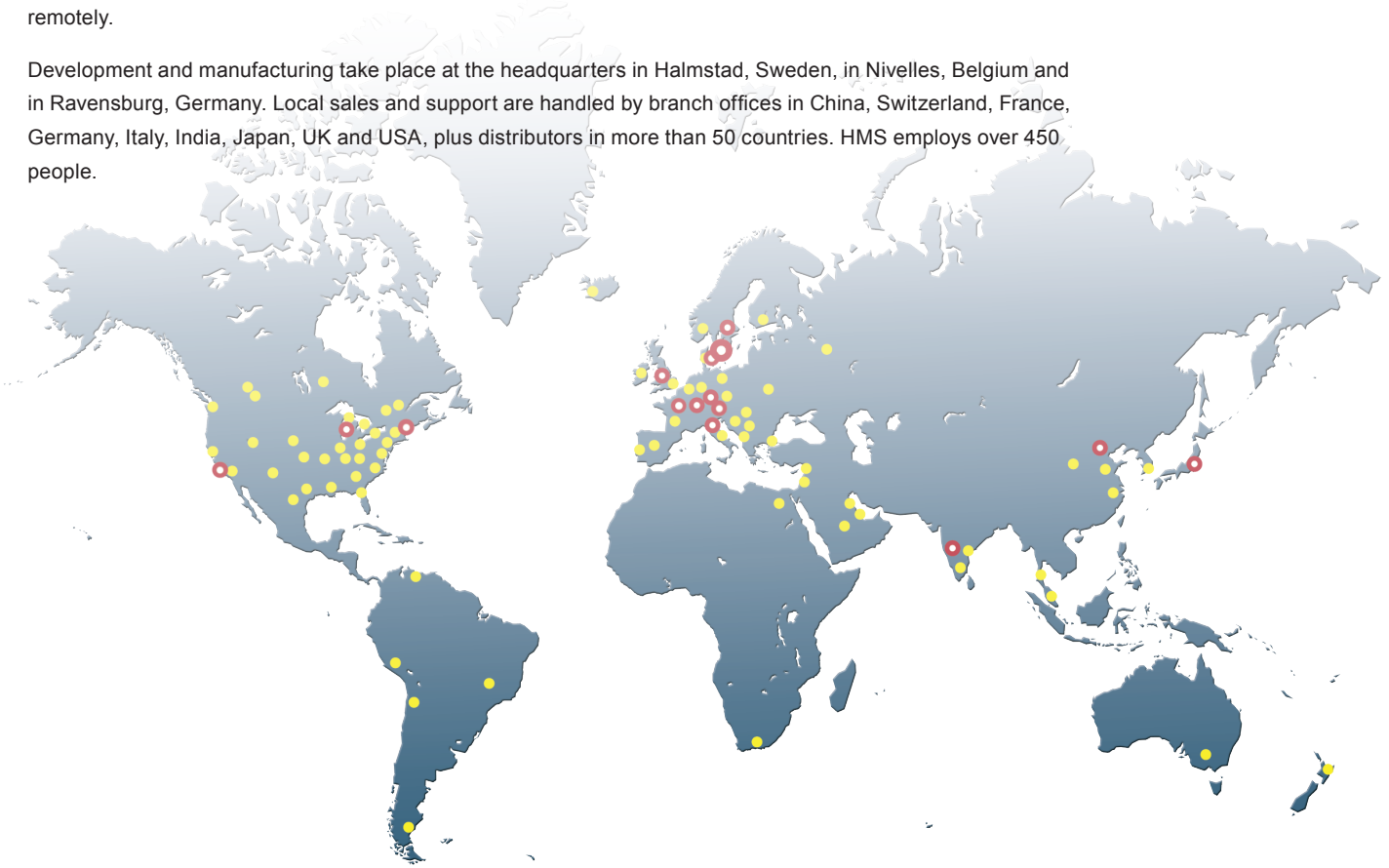
Product	IEEE1588-2008 PTP Protocol Software	IEEE802.1 AS gPTP Protocol Software	IEEE 1588 PTP FPGA IP-Core Module	IEEE 1588-2008 PTP Management Tool
Included functions	Support for Ordinary and Boundary Clocks Best Master Algorithm Management protocol/interface One step/two step support Peer-to-peer and end-to-end delay mechanisms UDP/IPv4 multicast support Operation with or without OS Extension packages - UDP/IPv6 and IEEE 802.3 (layer 2) - Unicast - Master/Slave - Transparent Clock - Unicast over TC, End-to-end TC, Peer-to-peer TC - Telecom features with PDV filter	Time-aware end station synchronizing the local RTC Best master clock algorithm Automotive grade startup time: Synchronization startup time below one second Similar to MISRA-C 2012 802.3 full-duplex Ethernet (media dependent layer) Optional disabling of BMCA Simple API for interfacing the application	Setting/adjustment of the real time clock via software Time stamping of external input signals via trigger unit Triggering external output signals based on configurable timers MII interface for detection of incoming/ outgoing Sync messages Standard address bus/data bus interface Time stamping of IPv4, IPv6 and 802.3 messages Possibility of interrupt generation Generation of external PPS signals to check the clock synchronization Configurable 1588 IOs	Automatic detection of PTP clocks in the network Supports multicast and unicast Supports data sets of the Ordinary, Boundary and Transparent Clocks Display of the master/slave relationship of PTP clocks in tree hierarchy Display of the PTP clock data sets Adjustment of the clock configuration Graphic output of «One Way Delay», «Offset from Master» and «Observed Drift» Support of all domains

HMS Industrial Networks



HMS Industrial Networks is the leading independent supplier of products for industrial communication. HMS develops and manufactures products under the brands: Anybus®, IXXAT® Netbiter® and eWON®. These products enable industrial devices to connect to different industrial networks and systems and also be monitored and controlled remotely.

Development and manufacturing take place at the headquarters in Halmstad, Sweden, in Nivelles, Belgium and in Ravensburg, Germany. Local sales and support are handled by branch offices in China, Switzerland, France, Germany, Italy, India, Japan, UK and USA, plus distributors in more than 50 countries. HMS employs over 450 people.



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