Your Partner for Communication

IXXAT

Products and Services

for the Communication in Industry and Automobile
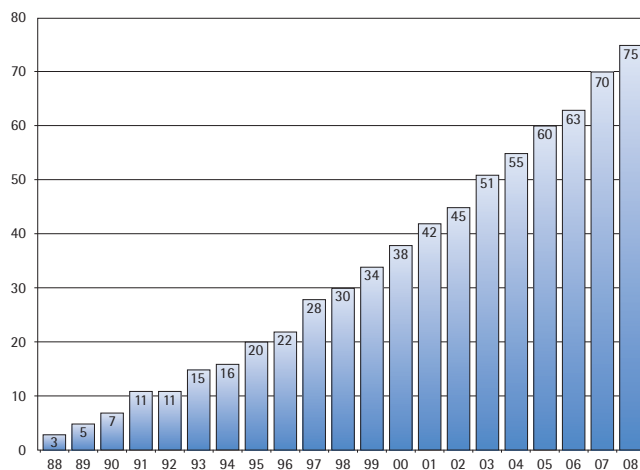
2009 | 2010

IXXAT

IXXAT

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IXXAT

IXXAT – a reliable and strong partner
for advanced data communication

IXXAT is one of the leading suppliers of data communication technology for the automation and automotive industry.

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 turnover in the research and development of new technologies and products.

Since many years quality management is the essential basis of our work. We provide constant training for our employees to insure their familiarity with the latest technological advancements and apply approved development processes according to ISO 9001:2000. Together with efficient project management methods this is the basis for reliable and successful partnerships with our customers.

As a pioneer of CAN technology, we have made major contributions to the successful growth of CAN in industrial applications. IXXAT has been actively involved in the development of the worldwide successful used CANopen standard from the beginning. In addition to the continuous development of CAN-based products and development services we focus on the development of products and services for real-time Ethernet based solutions today.

Our primary applications in the field of industrial communication systems involve solutions based on CAN (CANopen, DeviceNet) and real-time Ethernet (EtherNet/IP, Profinet, EtherCAT, Powerlink, SERCOS III).

For our customers in the automotive area, we have already performed many customer specific protocol implementations based on CAN and developed products and solutions for diagnosis and testing of CAN-, LIN- and FlexRay-based systems.

Today, our test and diagnosis tools as well as our gateways for FlexRay systems are successfully used in many applications. Our universal "Automotive Test Platform" serves as powerful and cost effective platform for the implementation of customer specific measurement systems in the automotive environment. Our newest automotive product "CARcorder" enables the recording of the bus traffic for all bus systems in a vehicle.

We will continue to further improve our technological expertise in data communication technologies to constantly provide our customers with state-of-the-art products and services.
Therefore, several new products and services for advanced industrial and automotive data communication can be found in this catalog and on our webpage.

Employees

Our increase in employees reflects our corporate growth

Our success is based on more than 20 years of successful development services. During this time we successfully accomplished many development projects for well known customers worldwide. Due to the high quality of our development processes we also comply to the requirements for the development of safety critical software according to IEC 61 508-3.

We support our customers during the entire development process, starting with the development of system concepts, followed by the development of hard- and software and finally including the series production of hardware components and the delivery of complete data communication systems.

Prof. Dr.-Ing.
Konrad Etschberger

Founder of IXXAT
Automation GmbH

Dipl.-Ing.
Christian Schlegel

Chief Technical Officer
IXXAT Automation GmbH

Engineering Services

In addition to our products, engineering services in the area of data communications are a significant part of our portfolio.

We develop hardware and software based on our core technologies and offer services in the following areas:

- Consulting, studies, system designs, training
- Hardware and embedded systems solutions
- Communication protocols (industrial, automotive)
- Safety relevant software
- Configuration and test tools
- Gateway solutions
- Test and inspection equipment

Our goal is to establish long-term partnerships with our customers. Since we typically support the products and projects throughout the entire life cycle, our customers benefit from the extensive efforts we invest into the development of advanced technologies. This also includes the benefits generated from our participation in the development of communication standards as an active member in various associations and industry committees. One of IXXAT`s primary objective is to provide the customers a competitive advantage by supporting them in bringing the products to the market quickly. We continually strive to achieve high quality development results within the given time and cost frame, based on our efficient ISO 9001:2000 certified quality management system and well-approved development, production and project management processes.

Consulting, system studies and design, training
Our consulting services cover all technical questions concerning our technology focuses.
We provide customized concepts and proposals for solutions or we develop system specifications together with our customers on request. For your employees we offer specific seminars e.g. on the subjects of CAN, CANopen, DeviceNet, Ethernet/IP and Powerlink.

Development and production of hardware components
We are familiar with all important microcontroller chips and FPGAs as well as with interface standards and data communication interfaces. We develop customer specific boards or modify our products according to the customer's requirements. We also offer the series production and maintenance of these products on request.

Communication protocols
The specification and implementation of communications protocols has been a main focus of IXXAT's activities for more than 20 years. Besides the specification of customer specific protocols, we do offer the development of protocol software, the implementation on devices and the development of test environments and methods.

Safety relevant software development
Based on our qualified development processes, we also fulfill the increased requirements for the development of safety relevant software according to IEC 61508. Examples for this include the development of the safety relevant protocol stacks for Powerlink and SERCOS III.

Configuration and test tools
We develop Windows-based tools according to customers' requirements for configuration, test and maintainance of communication systems such as CAN, CANopen, Powerlink and FlexRay. The developments are based on our standard tools, which already provide relevant programming interfaces for custom-specific extensions.

Gateway solutions
Our know-how in the area of data communications as well as our own communication components are an ideal starting point for the development of gateway solutions. Examples for this include the development of configurable gateways for CAN/FlexRay or Powerlink/CANopen.

Automotive test and logging devices
Many years of experience in the development of communication systems as well as the development of bus analyzing tools provide the basis for the development of universal and specific message recording and test devices for usage in the automotive industry.

Solutions	**Basic Software** Driver Board-Support-SW Protocol Software	**Embedded Devices** Interface Boards Gateways CPU-Boards User Interfaces	**Test&Service** Test/Analyzing Tools Test Systems Service Tools Remote Maintenance	**Safety** SW Development according to IEC/EN61508	**PC Software** Measurement Visualization Configuration
Operating Systems	**PC-based OS** Windows NT/2000/XP, Linux		**Embedded OS** VxWorks, Linux, Windows CE and others		
Data Communication	**Industrial** CAN, CANopen, Device-Net, Powerlink, Ether-Net/IP, Profinet, EtherCAT, SERCOS III	**Automotive** CAN/J1939/CCP ISO15765/KWP2000 K-Line, LIN FlexRay	**Wireless** Bluetooth GSM/GPRS WLAN	**Ethernet/Internet** TCP/IP IEEE1588 Webserver, E-Mail XML	
Hardware	**PC Interface Technology** PCI, PCI express, cPCI, PMC, USB, PC card, PC/104	**Microcontroller** ARM, Infineon, Freescale, Atmel, Renessas, Intel, STMicroelectronics	**FPGA Technology** Altera (VHDL, IP-Cores)		

Seminars ———————— ISO 9001 ———————

▶ For CAN, CANopen, DeviceNet, EtherNet/IP, Powerlink and FlexRay

With our well-proven seminars on different topics of data communications our customers benefit from our long-term experience in the field of industrial data communication. Our lecturers are engineers with special knowledge on the specific topics. We make every effort to keep the contents of our seminars up to date with the latest developments in technology and to continually improve both contents and didactics. We offer standard and tailor-made seminars in the form of in-house seminars in German and English language.

For further information about the seminars please visit our webpage.

▶ Quality Management ISO 9001 certified

IXXAT's ISO 9001 certification confirms our successful aspiration to an active and qualified usage of our quality management system and the advantages for our customers resulting from it.

Overview PC/CAN Interfaces

The IXXAT PC/CAN interfaces enable PC applications to access CAN networks with an uniquely variety of different PC interface standards. The customer can select an optimum PC/CAN interface according to the application, performance requirement or required unit costs. More than 10 different PC interface standards are supported, and for many of them, we offer several different CAN boards. The complete IXXAT PC/CAN interface product range was developed, and will continue to be developed exclusively by IXXAT, so we can maintain complete control over production, product maintenance and product life cycle. This criterion is an important one, especially in the industrial sector that values the longevity of its products. Today, function-compatible alternatives still exist, even for boards already developed in 1990. Almost all boards are available from stock and can be supplied within a short time frame.

Despite the wide variety of CAN interface boards, all IXXAT interfaces can be operated with the hardware-independent VCI driver (Virtual CAN Interface). Therefore, it is very easy to switch between CAN interfaces. Even future technologies are already being "integrated" today.

Interface Board	Technic	PC-access	Microcontrollersystem	CAN Controller	Businterface	Certification
Passive CAN Interfaces						
PC-I 04/PCI	PCI	Memory mapped	passiv	up to 2 x SJA 1000	High-Speed	CE, CSA/UL
PC-I 04/104	PC/104	Memory mapped	passiv	up to 2 x SJA 1000	High-Speed	CE, CSA/UL
Active CAN Interfaces						
iPC-I 320/PCI II	PCI	DPRAM memory mapped	8 Bit	up to 2 x SJA 1000	High-Speed	CE, CSA/UL, FCC
iPC-I 320/104	PC/104	DPRAM memory mapped	8 Bit	1 x SJA 1000	High-Speed	CE, CSA/UL
iPC-I XC16/PCI	PCI (3,3 V and 5 V)	DPRAM memory mapped	16 Bit	1 x TwinCAN (2 x CAN)	High-Speed and optional Low-Speed (switchable via softw.)	CE, CSA/UL, FCC, EN 60601-1
iPC-I XC16/PCIe	PCI express	DPRAM memory mapped	16 Bit	1 x TwinCAN (2 x CAN)	High-Speed and optional Low-Speed (switchable via softw.)	CE, FCC
iPC-I XC16/PMC	PMC	DPRAM memory mapped	16 Bit	1 x TwinCAN (2 x CAN)	Switchable High-/Low-Speed interface	CE, FCC
iPC-I 165	ISA	DPRAM memory mapped	16 Bit	up to 2 x SJA 1000	High-Speed	CE, CSA/UL
CAN@net II/VCI	Ethernet	10/100 MBit/s Ethernet	32 Bit	1 x SJA 1000	High-Speed	CE, FCC, CSA/UL
Mobile CAN Interfaces						
tinCAN 161	PCMCIA	DPRAM memory mapped	16 Bit	2 x SJA 1000	High-Speed and Low-Speed	CE
USB-to-CAN II	USB V2.0 (full speed)	USB	16 Bit	2 x SJA 1000	High-Speed and Low-Speed	CE, CSA/UL, FCC
USB-to-CAN compact	USB V2.0 (full speed)	USB	16 Bit	1 x SJA 1000	High-Speed	CE, CSA/UL, FCC
CANblue/VCI	Bluetooth	Bluetooth	16 Bit	1 x SJA 1000	High-Speed	CE

For custom applications requiring fully integrated PC/CAN interfaces, we also offer hardware and software licensing of our interface technologies.

QUALITY OF OUR HARDWARE

IXXAT is certified according to ISO 9001:2000. Our goal is to guarantee the high quality of the products that we provide to our customers. Therefore, all IXXAT Interfaces are tested 100 %.

CE CERTIFICATION AND CSA APPROVAL

The IXXAT PC/CAN interface boards fulfill the currently valid EMC directive 89/336/EEC and are CE-certified in accordance with the following standards (these can vary according to the interface used, see manual):

- EN 61000-6-2 (immunity, industrial interference immunity)
- EN 61000-4-2 (air discharge 8 kV, contact discharge 4 kV)
- EN 61000-4-3 (electromagnetic field compatibility 80 MHz – 1 GHz, 10 V/m)
- EN 61000-4-4 (transient distortion factor, burst, bus line 1 kV)
- EN 61000-4-6 (HF current compatibility 150 kHz-80 MHz, 10 V)
- EN 55022 (class B, interference emission, trade and small industrial sector)

In addition, almost all IXXAT PC/CAN interface boards have CSA approval for USA and Canada (equivalent to UL approval).

IXXAT

On 27th January 2003, binding European directives were agreed upon for the restriction of hazardous substances – these took effect permanently on July 1, 2006.
The main aim of the directive is to restrict substances that are harmful to both the environment and to one's health.

IXXAT delivers all products in accordance with the RoHS directive and is registered at the EAR foundation in Fürth (ElektroG/WEEE). Because of this, all IXXAT components which are distributed exclusively in the B2B area were registered.

Our registration number at EAR: 29724241

SUPPORTED PHYSICAL CAN BUS STANDARDS

High Speed bus connection according to ISO 11898-2
All CAN boards are available as standard with an on-board CAN bus interface according to ISO 11898-2 (high-speed). Connection of the CAN hardware to the network is generally made via a Sub-D-9 plug-in connector according to CiA-DS102. Versions with alternative plug-in connectors (e.g. RJ45) can be supplied on request.

Low-speed bus connection (fault-tolerant) according to ISO 11898-3
For some CAN boards, a CAN low-speed bus connection is available either as an option or is integrated and activated by software.

GALVANIC ISOLATION

The bus connection of the CAN hardware is available as an option with galvanic isolation. Galvanic isolation is achieved by means of opto couplers or magnet couplers and DC/DC converters on the board, and therefore, does not require an external power supply.

ACTIVE AND PASSIVE CAN INTERFACES

CAN boards can basically be divided into two groups:

Passive CAN Interfaces
These boards require direct access of the PC driver to the CAN controller of the board. The PC must configure and operate the CAN controller.

Active ("intelligent") CAN interfaces
These boards have an independent microcontroller system. In addition to configuration of the CAN controller, the microcontroller can also perform time-critical tasks such as the transmission, reception and filtering of CAN messages, can provide received messages with time-stamps, and, can process higher protocols such as CANopen or DeviceNet.

Today PCs are at least 100 times faster than the microcontrollers used on the CAN boards. Nevertheless, the use of CAN boards with their own microcontrollers makes sense because of the following two consideration:

- CAN controllers have only very limited buffering capacities for received messages. In the worst case, a CAN message is received approx. every 50 μs. Depending on the CAN controller used, only a few or only one message can be buffered. This results in a high real-time requirement of the host PC for the reaction of a CAN message which must always be guaranteed in order to prevent a loss of messages.

- The very short processing time for reading and passing a CAN message (copying of approx. 12 bytes) is a contrast to the slow context switch of the PC operating system which is triggered by a CAN message. Despite its excellent processing power, this quickly results in a very high load for the PC.

Especially for non-deterministic operating systems such as Microsoft Windows, these aspects can cause a problem with high transmission rates and/or high levels of data traffic. By using powerful active CAN boards, the load on the PC can be relieved or the time-critical requirements can be reduced. For applications with higher requirements in terms of data traffic and deterministic processing of the CAN messages, the use of active boards is always recommended, since variable factors such as the performance of the PC, the number and type of additionally installed boards and drivers and the number of executed programs (e.g. hard disk accesses) do not guarantee a deterministic access to CAN networks.

Active CAN boards also offer the following additional advantages:

- By pre-filtering CAN messages already on the CAN hardware, only relevant messages are forwarded to the PC. Since messages are no longer filtered by the PC program, the workload of the PC decreases.

- With the VCI, independent cyclic transmission of CAN messages by the microcontroller is supported. CAN messages can be transmitted on CAN networks under real-time conditions independent of the PC.

If, on the other hand, the PC is only used for the configuration of CAN components, for example, which is generally carried out via a small number of CAN messages, the performance of a passive board is completely sufficient.

The active CAN interfaces from IXXAT are equipped with various microcontrollers. The standard CAN interfaces are equipped with an 8-bit microcontroller. For most applications with low to medium average message rates these CAN boards are sufficient.

For applications with higher requirements on the communication process, IXXAT supplies active CAN interfaces with 16-bit microcontrollers. Due to the larger memory and higher execution speed, even two CAN networks with high baudrate and high bus load can be operated and monitored. These boards can also perform the function of a CANopen master/manager for networks with many nodes.

SOFTWARE SUPPORT

IXXAT supports its CAN interfaces with a wide variety of powerful software packages. In addition to the standard CAN driver software, these also include development, analysis and configuration tools, as well as program libraries for higher layer protocols.

CAN drivers for Windows

The delivery specification of every IXXAT CAN board includes the universal driver "Virtual CAN Interface" (VCI) for Windows 2000/XP/Vista. This powerful driver package supports all CAN boards, regardless of their PC interface, with a uniform programming interface (API). This means that applications based on VCI-API can be used with all IXXAT CAN boards without modifying the application program.
The VCI CAN driver also contains a simple CAN bus monitor which enables transmission and reception of CAN objects in a CAN system.

As is typical with Windows, the IXXAT CAN boards are installed conveniently and safely via the Windows device manager.

VxWorks and Linux

For the VxWorks and Linux operating systems, IXXAT provides the BCI driver (Basic CAN Interface). The BCI supports the active and passive (only Linux) IXXAT interfaces.

LabView and LabWindows

For the standard visualization interfaces LabView and LabWindows, IXXAT provides free, fully functional integration examples based on the VCI CAN driver. Here, all important functions for transmitting and receiving CAN messages are fully supported. The IXXAT CAN interface boards can be operated directly under LabView and LabWindows with minimal adaptation work. If required, the integration examples can be quickly adapted to specific customer requirements.

CANopen

The CANopen Master API enables PC access to CANopen systems via the active CAN interfaces from IXXAT. Based on this software package, powerful Windows based control, test and service programs can be developed quickly and easily.

CAN Interface	Windows	Linux	CANopen	Labview	LabWindows	VxWorks	ODVA Conformance Test SW
Passive CAN Interfaces							
PC-I 04/PCI	X	X	–	X	X	–	–
PC-I 04/104	X	X	–	X	X	–	–
Active CAN Interfaces							
iPC-I 320/PCI II	X	X	X	X	X	X	X
iPC-I 320/104	X	X	X	X	X	X	–
iPC-I XC16/PCI	X	X	X	X	X	–	X
iPC-I XC16/PCIe	X	X	X	X	X	–	–
iPC-I XC16/PMC	X	X	X	X	X	–	–
iPC-I 165	X	X	X	X	X	X	X
CAN@net II	X	X [1]	X	X	X	X [1]	–
Mobile CAN Interfaces							
tinCAN 161	X	–	X	X	X	–	X
USB-to-CAN II	X	X	X	X	X	–	X
USB-to-CAN compact	X	X	X	X	X	–	X
CANblue	X	X [2]	–	–	–	X [2]	–

1.) The Linux and VxWorks connection is made with the Generic version of the product by a TCP/IP socket interface, which provides all necessary CAN functions.

2.) The connection is made by the Generic version of the product using Bluetooth SPP communication, which has to be supported by the operating system. The serial ASCII protocol provides all necessary CAN functions.

CAN Driver for Windows (VCI)

▶ **Powerful driver software with generic programming interface for all IXXAT PC-CAN interface cards**

With the VCI, IXXAT presents the third generation of its proven CAN driver based on the successful VCI concept. The driver provides a uniform programming interface that is independent of the PC interface technology, and thus allows the use of all IXXAT CAN interfaces without adaptation of the application software.

The VCI is designed as a system server and allows simultaneous access of 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-compatibility of the VCI driver. The user interface is designed as a "C" Port that offers all necessary functions for CAN-based applications. In addition to the "C" Port, the VCI offers a .net API and therefore it can be used with all Windows .net languages and scripts (e.g. C#).

Communication with the CAN interface card occurs via message channels. A message channel consists of one transmit and one receive FIFO. Message channels can be created exclusively or cooperatively. If message channels are created cooperatively for a certain CAN controller, the data of that CAN controller is distributed equally to the various message channels. The receive FIFO of a message channel supports the access methods "event-controlled" and "polling" where a FIFO fill level mark can be defined to trigger an event. In addition, specific message filtering can be carried out for each CAN controller. The CAN messages are read from the receive FIFO with status and time stamp of the time of reception.

In addition to the standard transmit method, intelligent cards (cards with their own microcontroller system) support extended transmit functions such as the transmission of messages with a time delay, which controls the message flow via a transmit inhibit time, or cyclic on-board transmission, by which high bus loads and exact cycle times of messages can be generated. Also available are incrementing functions which can alter the transmit data.

The VCI supports a plug & play notification system by which both the insertion and the removal of CAN interfaces is automatically detected and processed. This makes it possible to remove devices while a VCI application is running.
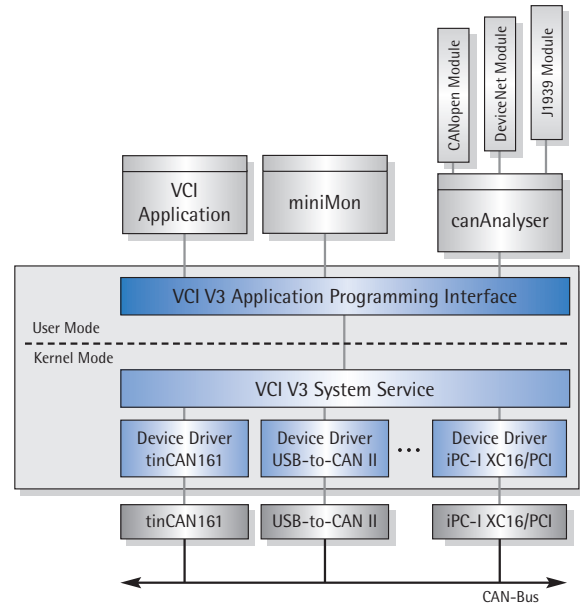
The use of IXXAT CAN interface cards in conjunction with the test and programming system Labview® from National Instruments is supported by a VI library.

- Convenient card installation via the Windows device manager
- Prepared dialog for selection of the installed cards simplifies the integration into the user application
- Management functions for start-up and testing of the PC/CAN interface
- Automatic firmware download with active cards directly from the driver enables simple firmware updates
- Standard (11-bit identifier, CAN 2.0A) and extended protocol (29-bit identifier, CAN 2.0B)
- Detection and display of error frames on the bus
- Measurement and display of the bus load (only with active CAN cards)
- Reception of self-transmitted messages (self-reception), possible operation in "Listen only mode"
- Cyclic transmission of CAN messages (only with active cards)

The CAN interfaces are installed in accordance with the Windows standard. During installation, the data of the installed CAN interfaces is entered into the registry.

The VCI driver version 3 is available for Windows 2000/XP/Vista. Older Windows operating systems will be supported by the version 2 of the VCI driver.

It is also possible for CAN cards and CAN modules of other vendors to be supported by the VCI CAN driver. Please ask us if you are interested in this capability.

FREE CAN MONITOR "MINIMON"

For simple testing purposes and start-up of the PC interfaces, a free CAN monitor (miniMon) is installed with the VCI. This monitor can be used to display CAN messages with time stamp, message identifiers and data. A logging function enables the data received to be recorded directly to hard disk. CAN messages are transmitted via a list wherein CAN messages are entered. Installed interfaces are displayed with the available CAN controllers, the current bus load and the controller status.
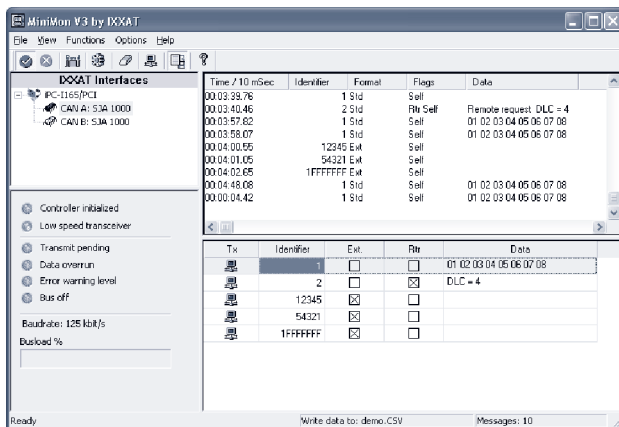
CONTENTS OF DELIVERY

- VCI
- CAN monitor "miniMon"
- Demo programs in C, C#
- Installation and programming manual

Version 2 of the VCI driver

In addition to the VCI V3 driver, IXXAT continues to offer its proven VCI V2 driver which supports all interfaces listed in the catalog, including those with older operating systems (such as Windows NT/98/Me).

CAN Driver for Linux and VxWorks

OVERVIEW

With the BCI (Basic CAN Interface), selected active and passive CAN interfaces from IXXAT are supported under the Linux and VxWorks operating systems. The driver simultaneously supports two CAN channels per CAN board and up to four (also different) CAN boards in one PC. The BCI features a simplified user interface, but, nevertheless, provides all necessary mechanisms for convenient operation of the CAN boards.

Messages are transmitted and received via queues, with a separate transmit and receive queue available for each CAN channel. The messages received can be processed either via interrupts or by polling. For interrupt processing, two different operating modes are available: the "latency" mode enables short reaction times to received messages, while the "throughput" mode guarantees maximum data throughput. If active boards are used, the messages received are already provided with a time-stamp and can be pre-filtered by the CAN interface via programmable software and firmware filters.

The Linux version of the CAN driver is implemented as a loadable kernel module.

FUNCTIONS OF THE CAN DRIVER

- Transmission and reception of CAN messages via queues
- Programmable firmware filters for message reception (only on the active boards)
- Programmable software filters in the BCI driver for message reception
- Standard (11-bit identifier, CAN 2.0A) and extended protocol (29-bit identifier, CAN 2.0B)
- Automatic firmware download enables simple software updates
- Support of up to 4 CAN boards with 1 or 2 CAN controllers

SUPPORTED PC/CAN INTERFACES

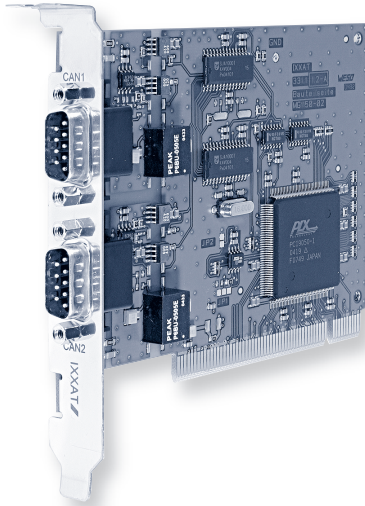| Card	Linux (Kernel V 2.4 or higher)	VxWorks
iPC-I 320/PCI II	X	X
iPC-I 320/104	X	X
iPC-I 165 (ISA)	X	X
iPC-I XC16/PCI	X	–
iPC-I XC16/PCIe	X	–
iPC-I XC16/PMC	X	–
PC-I 04/PCI	X	–
PC-I 04/104	X	–

CONTENTS OF DELIVERY

(Availability of the product on request)
- Driver for Linux or VxWorks as source code
- Sample program in C
- Programming manual

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PC-I 04/PCI

▶ **Passive CAN interface for PCI bus systems**

This is a passive board (no microprocessor on board) for the PCI bus with up to two CAN channels. It represents a very economic solution for connecting a PC to a CAN network in applications with low performance requirements.

TECHNICAL DATA

PC bus interface	PCI Bus (specification 2.1), 32 Bit, 33MHz, 5V
PC address range	Plug & Play, 1024 bytes memory mapped and 128 bytes I/O area
Interrupts	INT A, Plug & Play
CAN controller	SJA 1000
CAN bus interface	ISO 11898-2, Sub D9 connector according to DS 102, optional galvanic decoupled
Power supply	5 V DC, 300 mA typ.
Temperatur range	-20 ºC to +70 ºC
Certification	CE, CSA/UL
Size	Approx. 95 x 125 mm

CONTENTS OF DELIVERY

- PC/CAN interface card, manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0057.10100	PC-I 04/PCI; one CAN channel
1.01.0057.10200	PC-I 04/PCI; one CAN channel with galvanic isolation
1.01.0057.11110	PC-I 04/PCI; two CAN channels
1.01.0057.11220	PC-I 04/PCI; two CAN channels with galvanic isolation

PC-I 04/104

▶ **Passive CAN interface for PC/104 bus systems**

This is a passive CAN board (no microprocessor on board) for the PC/104 bus with up to two CAN channels. It represents a very economic solution for connecting a PC to a CAN network in applications with low performance requirements.

TECHNICAL DATA

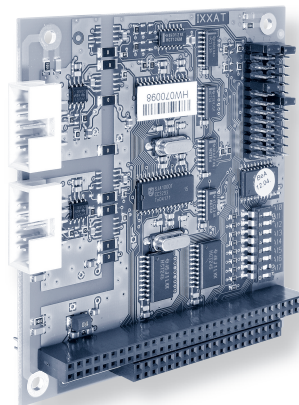|	
PC bus interface	PC/104 bus, 8 bit
PC address range	C000h-FFC0h (memory mapped), adjustable in 1 kB steps
Interrupts	IRQ 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15 separated for each CAN controller, shared interrupt, edge/level mode
CAN controller	SJA 1000
CAN bus interface	ISO 11898-2, bent 2 x 5 pin connectors according to DS 102, optional galvanic decoupling
Power supply	5 V DC, 150 mA typ.
Temperature range	-20 ºC to +70 ºC
Certification	CE, CSA/UL
Size	Approx. 90 x 96 mm

ORDER OPTIONS

- Galvanic decoupling

CONTENTS OF DELIVERY

- PC/CAN interface card and manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0070.10100	PC-I 04/104; one CAN channel
1.01.0070.10200	PC-I 04/104; one CAN channel with galvanic isolation
1.01.0070.11110	PC-I 04/104; two CAN channels
1.01.0070.11220	PC-I 04/104; two CAN channels with galvanic isolation

iPC–I 320/PCI II

iPC–I 320/104

▶ **Intelligent PC/CAN interface for PCI bus systems**

▶ **Intelligent CAN interface for PC/104 bus systems**
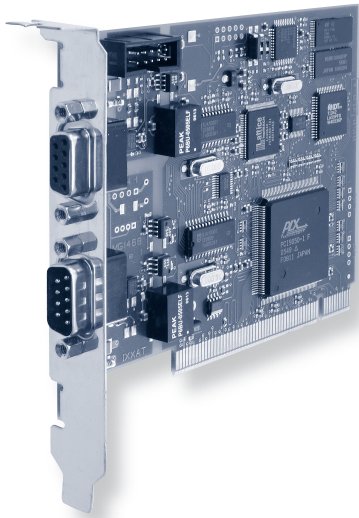
This active CAN board with one or two CAN channels is appropriate for use in a wide variety of CAN applications. Filtering, pre-processing, transmission and time stamped storage of the CAN messages are just some of the features offered by the on-board microcontroller. In combination with the universal CAN driver (VCI), the iPC-I 320/PCI II allows an easy integration of PC supported CAN applications. Offering an exceptional combination of functionality and value, it is perfectly suited for high-volume productions. In addition, the iPC-I 320/PCI II is also well-suited for use with the IXXAT analysis and configuration tools.

This is an active CAN board with one CAN channel which is appropriate for a wide variety of CAN applications. Filtering, preprocessing, transmission and time-stamped storage of the CAN messages are just some of the features offered by the on-board microcontroller. In combination with the universal CAN driver (VCI) the iPC-I 320/104 allows for the easy integration of PC-supported CAN applications. Offering exceptional functionality and value, it is perfectly suited for high-volume productions.

TECHNICAL DATA

PC bus interface	PCI bus (2.1), 32 Bit, 33 MHz, 5 Volt
PC address range	Plug & Play, 8 kB memory mapped and 128 Bytes I/O-area
Interrupts	INT A, Plug & Play
Microcontroller	Dallas DS80C320, 22.1184 MHz
Memory extension	128 kByte SRAM, 128 kByte Flash, 4 kByte DPRAM
CAN controller	SJA 1000
CAN bus interface	ISO 11898-2, Sub D9 connector according to DS 102, optional galvanic decoupling
Power supply	5 V DC, 300 mA typ.
Temperature range	0 ºC to +70 ºC
Certification	CE, FCC, CSA/UL
Size	approx. 124 x 97,5 mm

TECHNICAL DATA

PC bus interface	PC/104 bus, 8 bit
PC address range	C000h–FE00h (memory mapped), adjustable in 8 kB steps
Interrupts	IRQ 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 15
Microcontroller	Dallas DS80C320, 22,1184 MHz
Memory extension	128 kByte SRAM, 128 kByte Flash, 4 kByte DPRAM
CAN controller	SJA 1000
CAN bus interface	ISO 11898-2, bent 2 x 5 pin connector according to DS 102, galvanic decoupling
Power supply	5 V DC, 190 mA typ.
Temperature range	-40 ºC to +85 ºC
Certification	CE, CSA/UL
Size	Approx. 90 x 96 mm

CONTENTS OF DELIVERY

- PC/CAN interface card and manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

CONTENTS OF DELIVERY
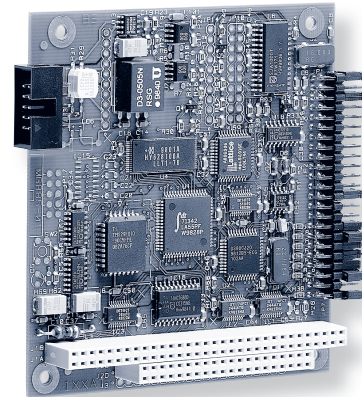
- PC/CAN interface card and manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0039.10100	iPC–I 320/PCI II; one CAN channel
1.01.0039.10200	iPC–I 320/PCI II; one CAN channel with galvanic isolation
1.01.0039.11110	iPC–I 320/PCI II; two CAN channels
1.01.0039.11220	iPC–I 320/PCI II; two CAN channels with galvanic isolation

ORDER NUMBER

1.01.0043.10200	iPC–I 320/104; one CAN channel with galvanic isolation

IXXAT

iPC-I XC16/PCI

▶ **Intelligent CAN interface for 5 V and 3.3 V PCI bus systems with optional Low Speed bus interface**
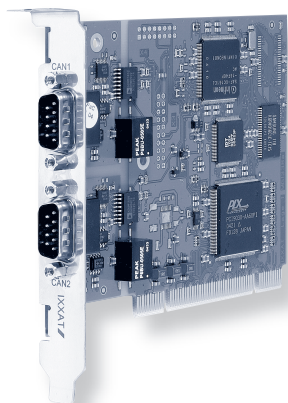
Covering a wide range of industrial and automotive CAN applications, this is a powerful and economic active CAN board with two CAN channels. The on-board microcontroller offers filtering, preprocessing, transmission and time stamped storage of the CAN messages. Due to the powerful microcontroller, both CAN controllers can operate simultaneously without losing any data, even in systems with a high bus load. In combination with the VCI CAN driver, the iPC-I XC16/PCI allows the seamless integration of PC-supported CAN applications. In addition, the iPC-I XC16/PCI is well-suited for use with the IXXAT analysis and configuration tools and as a CANopen network controller.

TECHNICAL DATA

PC bus interface	PCI-Bus (2.2), 32 Bit / 33 MHz, 5 Volt or 3.3 Volt
PC address range	Plug & Play, 16 kB memory mapped and 128 bytes I/O area
Interrupts	INT A, Plug & Play
Microcontroller	Infineon XC161, 40 MHz
Memory extension	512 kByte SRAM, 128 kByte FLASH, 8 kByte DPRAM
CAN controller	TwinCAN (two CAN channels)
CAN bus interface	ISO 11898-2 acc. to DS 102, Sub D9 connector, optional galv. decoupling and high-/low-speed bus interface (ISO 11898-3) switchable via software
Power supply	5 V DC, 100 mA typ.; 3.3 V DC, 120 mA typ.
Temperature range	-20 ºC to +70 ºC
Certification	CE, FCC, CSA/UL
Size	Approx. 89 x 124 mm

### ORDER OPTIONS

- LIN interface on request

CONTENTS OF DELIVERY

- PC/CAN interface card and manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0047.33110	iPC-I XC16/PCI; two CAN channels with high-speed bus interface
1.01.0047.33220	iPC-I XC16/PCI; two CAN channels with high-speed bus interface and galvanic isolation
1.01.0047.33260	iPC-I XC16/PCI; two CAN channels with high/low-speed bus interface and galvanic isolation

iPC-I XC16/PCIe

▶ **Intelligent CAN interface for PCI express bus systems**
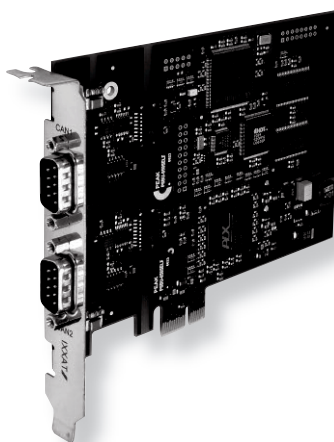
This is a powerful and economic solution for an active CAN board with two CAN channels. Some of the features offered by the on-board microcontroller include filtering, pre-processing, transmission and time-stamped storage of the CAN messages.
Due to the powerful microcontroller, both CAN controllers can operate simultaneously without losing any data even in systems with a high bus load. In combination with the VCI CAN driver, the iPC-I XC16/PCIe allows the seamless integration of PC-supported CAN applications. In addition, the iPC-I XC16/PCIe is well-suited for use with the IXXAT analysis and configuration tools, and, for use as a CANopen network controller.

TECHNICAL DATA

PC bus interface	PCIe (r1.0a), x1 link (2,5 Gbps per direction)
PC address range	Plug & Play, 16 kB memory mapped and 128 bytes I/O area
Interrupts	INT A, Plug & Play
Microcontroller	Infineon XC161, 40 MHz
Memory extension	512 kByte SRAM, 128 kByte FLASH, 8 kByte DPRAM
CAN controller	TwinCAN (two CAN channels)
CAN bus interface	ISO 11898-2 acc. to DS 102, Sub D9 connector, optional galv. decoupling and high-/low-speed bus interface (ISO 11898-3) switchable via software
Power supply	12 V DC, 60 mA typ.; 3.3 V DC, 200 mA typ.
Temperature range	0 ºC to +70 ºC
Certification	CE, FCC
Size	Approx. 90 x 150 mm

ORDER OPTIONS

- LIN interface on request
- CAN high/low speed bus interface on request

CONTENTS OF DELIVERY

- PC/CAN interface card and manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0053.33110	iPC-I XC16/PCIe; two CAN channels
1.01.0053.33220	iPC-I XC16/PCIe; two CAN channels with galvanic isolation

iPC-I XC16/PMC

▶ **Intelligent board for 5 V and 3.3 V PMC bus systems with high/low-speed CAN interface and LIN interface**
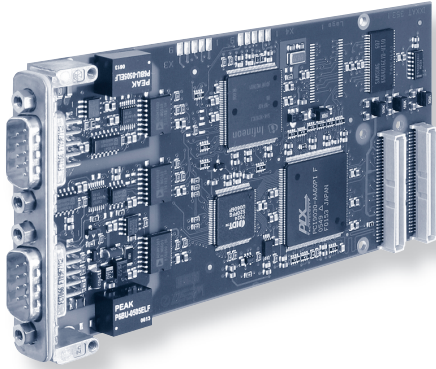
Covering a wide range of industrial and automotive CAN applications, this is a powerful and economic solution for an active CAN board with one or two CAN channels. The interface is state-of-the-art, supports PMC and can be easily installed by Plug & Play. Some of the features offered by the on-board microcontroller include filtering, pre-processing, transmission and time-stamped storage of the CAN messages.
Due to the powerful microcontroller, both CAN controllers can operate simultaneously without losing any data even in systems with a high bus load. In combination with the VCI CAN driver, the iPC-I XC16/PMC allows the seamless integration of PC-supported CAN applications.

TECHNICAL DATA

|	
PC bus interface	PMC Bus (2.2), 32 Bit / 33 MHz, 5 Volt or 3.3 Volt
Memory range	Plug & Play, 16 kB memory mapped and 128 bytes I/O area
Interrupts	INT A, Plug & Play
Microcontroller	Infineon XC161, 40 MHz
On board memory	512 kByte SRAM, 128 kByte FLASH, 8 kByte DPRAM
CAN controller	TwinCAN (two CAN channels)
CAN bus interface	ISO 11898-2 and ISO 11898-3, Sub D9 connector according to DS 102, galvanic decoupled and high-/low-speed bus interface switchable via software
LIN controller	TJA1020
LIN bus interface	ISO 9141/LIN, Master/Slave mode switchable via software, galvanic isolation
Power supply	5 V DC, 100 mA typ.; 3.3 V DC, 120 mA typ.
Temperature range	-20 ºC to +70 ºC
Certification	CE, FCC
Size	Approx. 74 x 149 mm single CMC

CONTENTS OF DELIVERY

- PC/CAN interface card and manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0049.33660	iPC-I XC16/PMC; two CAN channels with high/low speed bus interface and galvanic isolation; one LIN channel with galvanic isolation

iPC-I 165

▶ **Intelligent CAN interface for ISA bus systems**
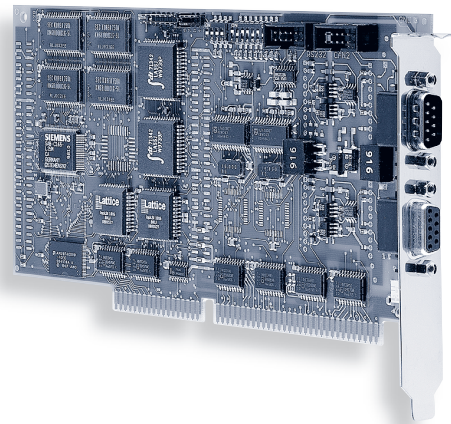
This is a powerful and economic solution covering a wide range of CAN applications requiring an active CAN board with one or two CAN channels.
Some of the features offered by the on-board microcontroller include filtering, preprocessing, transmission and time stamped storage of the CAN messages.
Due to the powerful microcontroller, both CAN controllers can operate simultaneously without losing any data, even in systems with a high bus load.
In combination with the VCI CAN driver, the iPC-I 165 allows an easy integration of PC supported CAN applications. In addition, the iPC-I 165 is well-suited for use both with the IXXAT analysis and configuration tools and as a CANopen network controller.

TECHNICAL DATA

PC bus interface	ISA-Bus, 16 Bit
PC address range	C000h-FE00h (memory mapped), adjustable in 16 kB steps
Interrupts	IRQ 3, 4, 5, 7, 9, 10, 11, 12, 14, 15
Microcontroller	Infineon SAB C165, 20 MHz
Memory extension	512 kByte SRAM, 512 kByte Flash, 8 kByte DPRAM
CAN controller	SJA 1000
CAN bus interface	ISO 11898-2, Sub D9 connector according to DS 102, optional galvanic decoupling
Power supply	5 V DC, 250 mA typ.
Temperatur range	0 ºC to +50 ºC
Certification	CE, CSA/UL
Size	Approx. 110 x 220 mm

CONTENTS OF DELIVERY

- PC/CAN interface card and manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0045.10200	iPC-I 165; one CAN channel with galvanic isolation
1.01.0045.11110	iPC-I 165; two CAN channels
1.01.0045.11220	iPC-I 165; two CAN channels with galvanic isolation

IXXAT

USB-to-CAN compact

USB-to-CAN II

▶ **Intelligent low-cost CAN interface for the USB-Port**

▶ **Intelligent CAN/LIN Interface for the USB Port**

The USB-to-CAN compact is a low-cost, active CAN module for connection to the USB bus. The 16-bit microcontroller system enables reliable, loss-free transmission and reception of messages in CAN networks with both a high transmission rate and a high bus load. In addition, messages are provided with a time-stamp and can be filtered and buffered directly in the USB-to-CAN compact. The module can also be used as a master assembly, e.g. for CANopen systems. Together with the universal CAN driver VCI, supplied with the delivery, the USB-to-CAN compact allows the simple integration of PC-supported applications into CAN systems.

Combining an extremely attractive price with compact construction, the USB-to-CAN compact is ideal for use in series products and in conjunction with the canAnalyser for development, service and maintenance work.

Active interface with two CAN channels and one LIN channel (automotive version) for connection to the USB bus.
With its powerful 16-bit microcontroller system, the interface allows filtering, pre-processing and saving of received messages. Transmission and reception processes can be controlled loss-free even with a high transmission rate and bus load.
Together with the universal CAN driver VCI, also supplied with the delivery, the USB-to-CAN II module allows the simple integration of PC-supported applications into CAN systems. In conjunction with the canAnalyser from IXXAT, USB-to-CAN II is a convenient, mobile analysis and development tool. The interface can also be used as a master assembly, e.g. for CANopen systems with many subscribers.

TECHNICAL DATA

PC bus interface	USB, version 2.0 (full speed)
Microcontroller	Infineon C161U, 24 MHz
Memory extension	128 kByte RAM, 512 kByte Flash
CAN controller	SJA 1000
CAN bus interface	ISO 11898-2, Sub D9 connector or RJ45 connector according to DS 102, galvanically decoupled as an option
Power supply	Provided by USB port, 250 mA typ
Temperature range	-20 ºC to +80 ºC
Certification	CE, FCC, CSA/UL
Size	80 x 45 x 20 mm

TECHNICAL DATA

PC bus interface	USB, version 2.0 (full speed)
Microcontroller	Infineon 161u, 36 MHz
Memory extension	512 Kbyte RAM, 512 Kbyte Flash
CAN controller	SJA 1000
CAN/LIN bus interface	2 x RJ45 connector with RJ45 on Sub-D9 adapter cable (10 cm), galvanically decoupled as an option **Industrial version:** 2 x ISO 11898-2 **Automotive version:** 1 x ISO 11898-2, 1 x ISO 11898-2 and 11898-3 switchable via software, 1 x LIN master/slave
LIN protocol	V 1.3 and V 2.0
Power supply	5 V, 400 mA max. via USB
Temperature range	-20 ºC to +80 ºC
Certification	CE, FCC, CSA/UL
Size	98 x 55 x 20 mm

CONTENTS OF DELIVERY

- CAN interface, user's manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"
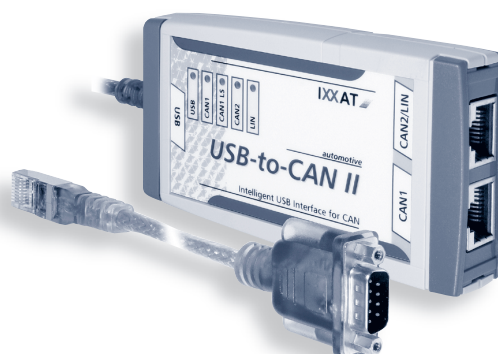
CONTENTS OF DELIVERY

- USB-to-CAN II, two adapter cables, user manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0087.10100	USB-to-CAN compact (SUB-D9 plug)
1.01.0087.10200	USB-to-CAN compact (SUB-D9 plug); with galvanic isolation
1.01.0088.10100	USB-to-CAN compact (RJ45 plug)
1.01.0088.10200	USB-to-CAN compact (RJ45 plug); with galvanic isolation

ORDER NUMBER

1.01.0062.11110	USB-to-CAN II - Industrial Version; two high-speed CAN channels
1.01.0062.11220	USB-to-CAN II - Industrial Version; two high-speed CAN channels with galvanic isolation
1.01.0066.11220	USB-to-CAN II - Automotive Version; two high-speed CAN channels (one switchable to low-speed) with galv. isolation; one LIN channel with galv. isolation

CAN@net II/VCI

▶ **Intelligent CAN Adapter with Ethernet Interface**

The CAN@net II allows simple, flexible access from a PC to CAN systems via Ethernet. Due to its ability to support the TCP/IP protocol, the CAN@net II allows the worldwide direct connection to a PC, implementation in an LAN, or, communication with the gateway via the Internet.

With the VCI CAN driver, included in the delivery, the CAN@net II can be operated in the same way as all IXXAT CAN PC interface boards. Therefore, all VCI-based CAN-programs and tools can be run with the CAN@net II. The VCI CAN driver is also capable of communicating via a PC with up to 128 CAN@net II devices simultaneously.

In addition to the CAN@net II/VCI, IXXAT also offers the CAN@net II/Generic, which can be addressed via a standard TCP/IP socket or used as CAN-Ethernet-CAN bridge (see also CAN@net II/Generic in the section "CAN gateways/bridges").

TECHNICAL DATA

Ethernet–Interface	10/100 Mbit/s Ethernet (10Base-T/100Base-T), Autodetect, Connector RJ45, Auto crossover
IP address allocation	DHCP, via PC tool
Microcontroller	Freescale MCF5235, 150 MHz
Memory extension	8 MByte DRAM, 4 MByte Flash
CAN controller	SJA1000
CAN bus interface	ISO 11898-2, Sub D9 connector according to DS102, galvanically decoupled
Power supply	9-32 V DC, 3 W
Size	22.5 x 100 x 115 mm
Housing	Plastic housing for top hat rail mounting
Temperature range	-20 ºC to +70 ºC
Certification	CE, FCC, CSA

CONTENTS OF DELIVERY

- CAN@net II/VCI, user's manual
- CAN driver VCI for Windows 2000, XP, Vista
- Simple CAN monitor "miniMon"

ORDER NUMBER

1.01.0086.10200	CAN@net II/VCI; one CAN channel

CANblue/VCI

▶ **Intelligent CAN Module with Bluetooth Interface**

The CANblue/VCI is a CAN module that is connected to the PC wirelessly via Bluetooth. It is ideal for servicing and accessing CAN systems that are otherwise difficult to access.

Depending on the space limitations, the maximum distance between the CANblue and the PC/notebook can be up to 100 m.

Because it is supported by the VCI CAN driver, the CANblue/VCI can be operated with all IXXAT tools and with customer-specified programs. In addition, wireless access to CAN systems via Bluetooth can also be easily achieved with existing VCI-based application programs and tools.

TECHNICAL DATA

Bluetooth interface	Bluetooth specification V2.0, Class 1/+16,9 dBm (49 mW), 100m
Microcontroller	Infineon C161U, 36 MHz
Memory extension	256k Flash, 128k RAM
CAN controller	SJA1000
CAN bus interface	ISO 11898-2 (High Speed) and ISO 11898-3 (Low-Speed), switchable, Sub D9 plug according to DS102, galvanic decoupled
Power supply	9-30 V DC, 2.5 W
Housing	Stable metal housing
Temperature range	-20 ºC to +70 ºC
Certification	CE
Size	88 x 72 x 35 mm

CONTENTS OF DELIVERY

- CANblue module and user's manual
- CAN driver VCI for Windows 2000, XP
- Simple CAN tool "miniMon"

ORDER NUMBER

1.01.0125.00000	CANblue/VCI; one CAN channel

IXXAT

CAN-Repeater

▶ **ISO 11898-2 CAN Repeater (with Low-Speed Option)**

The CAN Repeater is used for the galvanic isolation of two segments of a CAN network and for creating star or tree topologies. One special feature of the Repeater is that it separates a defective segment from the rest of the network so that the remaining network can continue working. After elimination of the defect, the segment is switched into the network again.

As an option, the Repeater can be equipped with a low-speed bus interface (ISO 11898-3), allowing the operation as high/low-speed converter. Its galvanic isolation isolates both CAN segments from each other as well as from the power supply.

TECHNICAL DATA

|	
Display	Transmit (2 green LEDs), defective segment (2 red LEDs)
CAN bus interface	ISO 11898-2 with CAN choke. Screw terminals. CAN 1, CAN 2 and power supply are galvanic isolated against each other. CAN termination resistors are integrated (switchable).
Baudrate	Up to 888 kbps
Delay	200 ns (corresponds ~40 m (~120ft.) bus length)
Power supply	9-35 V DC, 1.5 W typ., through terminals
Temperature range	-20 ºC to +70 ºC
Housing, size	Plastic enclosure, 110 x 75 x 22 mm

CONTENTS OF DELIVERY

- CAN-Repeater, Quick reference

ORDER NUMBER

1.01.0064.44000	CAN-Repeater (2 x ISO/IS 11898-2) with galvanic isolation
1.01.0064.46000	CAN-Repeater (ISO/IS 11898-2 to ISO/IS 11898-3) with galvanic isolation

CAN-CR200

▶ **Modular ISO 11898-2 CAN Repeater**
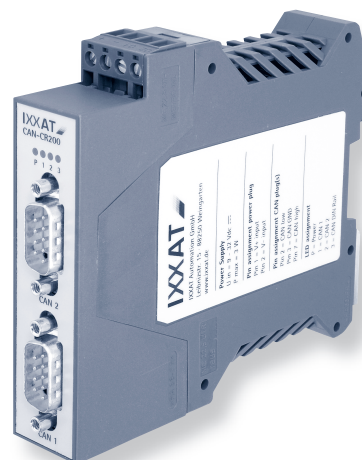
The CAN-CR200 is used for the galvanic isolation of two segments of a CAN network and for creating star or tree topologies. Several CAN-CR200 can be connected to a CAN-hub via the integrated backbone bus. One special feature of the Repeater is the automatic recognition and separation of a defective segment from the rest of the network so that the remaining network can continue working. After elimination of the defect, the segment is switched into the network again.

The galvanic isolation isolates the CAN segments from each other as well as from the power supply.

TECHNICAL DATA

|	
Display	Transmit and defective segment (three duo LEDs), Power (one LED)
CAN bus interface	ISO 11898-2 with CAN choke. Two Sub-D9 connectors and one backbone bus. CAN 1, CAN 2 and backbone bus are galvanic isolated against each other. CAN termination resistors are integrated (switchable).
Baudrate	Up to 888 kbps
Delay	200 ns (corresponds ~40 m (~120ft.) bus length)
Power supply	9-32 V DC, 1.5 W typ., through terminals
Temperature range	-20 ºC to +70 ºC
Housing, size	Plastic enclosure, 22.5 x 100 x 115 mm

CONTENTS OF DELIVERY

- CAN-CR200, Quick reference

ACCESSORIES

- T bus connector for creating star/tree topologies

ORDER NUMBER

1.01.0067.44010	CAN-CR200
1.04.0073.00000	T bus connector

IXXAT

CAN-CR220

▶ **ISO 11898-2 CAN Repeater with 4 kV Galvanic Isolation**
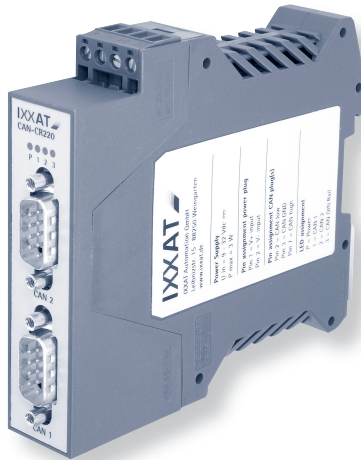
The CAN-CR220 is used for the galvanic isolation of two segments of a CAN network and offers a very high galvanic isolation of 4 kV, allowing it be utilized in medical applications. One special feature of the Repeater is the automatic recognition and separation of a defective segment from the rest of the network so that the remaining network can continue working. After elimination of the defect, the segment is switched into the network again.

The galvanic isolation isolates the CAN segments from each other as well as from the power supply.

The CAN-CR220 is tested according DIN/EN 50178 (DIN VDE 0160: 1988-05 and DIN VDE 0160/A1: 1989-04).

TECHNICAL DATA

Display	Transmit and defective segment (two duo LEDs), Power (one LED)
CAN bus interface	ISO 11898-2 with CAN choke. Two Sub-D9 connectors. CAN 1, CAN 2 and power supply are galvanic isolated against each other. Galvanic isolation 4 kV/1 second, 2.5 kV/60 seconds. CAN termination resistors are integrated (switchable).
Baudrate	Up to 888 kbps
Delay	200 ns (corresponds ~40 m (~120ft.) bus length)
Power supply	9-32 V DC, 1.5 W typ., through terminals
Temperature range	-20 ºC to +70 ºC
Housing, size	Plastic enclosure, 22.5 x 100 x 115 mm

CONTENTS OF DELIVERY

■ CAN-CR220, Quick reference

ORDER NUMBER

1.01.0067.44400	CAN-CR220

FO-Repeater

▶ **Converter from ISO 11898 to fiber optic cable**

The FO Repeater is used for the conversion of the CAN-signal from copper wire (ISO 11898-2) to fiber optic cables. This provides a complete isolation and protection against EM-influences.

One special feature of the Repeater is that it separates a defective segment from the rest of the network so that the remaining network can continue working. After elimination of the defect, the segment is switched into the network again.

TECHNICAL DATA

Display	Sending (2 green LEDs), defective segment (2 red LEDs)
CAN bus interface	ISO 11898-2. Screw terminals. CAN termination resistors are integrated (switchable).
FOC connection	2 x F-SMA or ST terminals for duplex line (Glass 50/125 µm duplex)
Baudrate	Up to 888 kbps
Delay	~300 ns (translates into ~60 m (~90 ft.) bus length) between the wire connection of a FO Repeater through the fiber optic cable to the wire connection of a second FO Repeater (not including the signal delay time of the fiber optics, which is ~5 ns/m)
Power supply	9-35 V DC, 3 W typ., through terminals
Temperature range	-20 ºC to +70 ºC
Housing, size	Plastic enclosure, 110 x 75 x 22 mm (without FO connector)

CONTENTS OF DELIVERY

■ FO-Repeater, Quick reference

ORDER NUMBER

1.01.0063.01010	CAN Fiber Optic Repeater – Glass fiber version with F-SMA connector
1.01.0063.01020	CAN Fiber Optic Repeater – Glass fiber version with ST connector

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IXXAT

CAN-CR210/FO

▶ **Stackable converter from ISO 11898-2 to fiber optic cable**

The CAN-CR210/FO is used for the conversion of the CAN signal from copper wire (ISO 11898-2) to fiber optic cables. This provides a complete isolation and protection against EM-influences. For creating star or tree topologies, several CAN-CR210/FO can be connected to a CAN-hub via the integrated backbone bus (also in conjunction with CAN-CR200).

One special feature of the repeater is, that it separates a defective segment from the rest of the network, so that the remaining network can continue working. After elimination of the defect, the segment is switched into the network again.

TECHNICAL DATA

Display	Transmit and defective segment (three duo LEDs), Power (one LED)
CAN bus interface	ISO 11898-2, galvanic isolated, Sub-D9 connector. CAN termination resistors are integrated (switchable). Integrated backbone bus.
FOC connection	2 x F-SMA or ST terminal for duplex line (Glass 50/125 µm duplex)
Baudrate	Up to 888 kbps
Delay	~300 ns (translates into ~60 m (~90ft.) bus length) between the wire connection of a FO Repeater through the fiber optic cable to the wire connection of a second FO Repeater (not including the signal delay time of the fiber optics, which is ~5 ns/m)
Power supply	9 - 32 V DC, 3 W typ., through terminals
Temperature range	-20 ºC to +70 ºC
Housing, size	Plastic enclosure, 22.5 x 100 x 115 mm (without FO connector)

CANbridge

▶ **Configurable CAN/CAN Bridge**

The CANbridge allows the coupling of two CAN networks, including networks with different bit rates. Unlike a CAN-Repeater, which only translates the electric signals, the CAN messages are received completely by the bridge and then sent to the other CAN network in line with existing filter and conversion rules (Store-Forward principle). With the aid of conversion rules (gateway tables), CAN messages can be filtered or forwarded under another identifier. With these mechanisms, the bus load can be reduced in the individual networks by only sending messages which are of interest to the other network.

The CANbridge has a powerful 16-bit microcontroller that can process bursts at higher data rates without message loss. LEDs signal the current status of the coupled networks.

The CANbridge is configured via a configuration file which is downloaded to the device by a loader program.

The CANbridge is available in three different versions: as an industrial version in either a DIN rail housing or in a robust metal housing, and as an automotive version in a robust metal housing.

Microcontroller	Fujitsu MB90F543
Memory extension	128 k Flash on-chip, 6 k RAM on-chip, 256 Bytes I2C EEPROM
CAN controller	2 x CAN on-chip, CAN 2.0A, 2.0B
CAN bus interface	2x ISO 11898-2 (High Speed), as an option galvanic isolated or 1x ISO 11898-2 and 1x ISO 11898-3 (low-speed)
Serial interface	RS232 for device configuration
Voltage supply	9-36 V (**Industrial Version**), 7-16 V (**Automotive Version**), 1.5 W
Temperature range	-20 ºC to +70 ºC
Certification	CE
Housing	Robust metal housing approx. 100 x 85 x 32 mm or plastic DIN rail housing approx. 110 x 75 x 22 mm

- CANbridge
- Configuration software for Windows 9x/Me/NT/2000/XP/Vista
- Operation Instruction

- **Industrial version:** Housing option, galvanic isolation
- **Automotive version:** second CAN-bus interface according to ISO 11898-2 (high-speed) or ISO 11898-3 (low-speed)

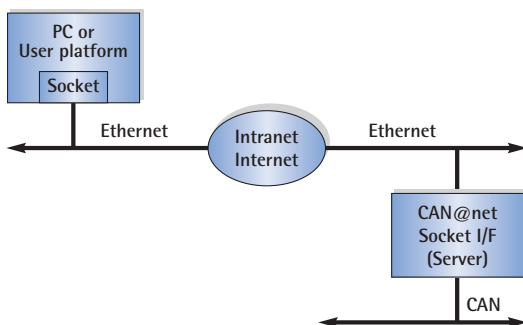|	
1.01.0121.11020	CANbridge – **DIN Rail**, 2 x High-Speed Bus Interface, Industrial Version
1.01.0121.22020	CANbridge – **DIN Rail**, 2 x High-Speed Bus Interface (galvanic isolated), Industrial Version
1.01.0120.22010	CANbridge – **Aluminium**, 2 x High-Speed Bus Interface (galvanic isolated), Automotive Version
1.01.0120.23010	CANbridge – **Aluminium**, 1 x High-Speed Bus Interface (galvanic isolated) + 1 x Low-Speed Bus Interface, Automotive Version
1.01.0120.22020	CANbridge – **Aluminium**, 2 x High-Speed Bus Interface (galvanic isolated), Industrial Version

IXXAT

CAN@net II/Generic

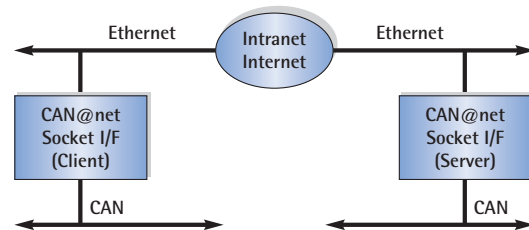▶ **CAN-Ethernet-Gateway and CAN-Ethernet-CAN-Bridge**

Using two CAN@net II/Generic, a CAN-Ethernet-CAN bridge can be implemented. This bridge allows the exchange of CAN messages between two CAN systems via TCP/IP where filter tables can be defined.

Bridge configuration

CONFIGURATION & FIRMWARE UPDATE

The configuration of the TCP/IP parameters can be performed using an PC tool with automatic device detection. The configuration of the bridge functionality and the CAN communication is supported by an implemented webserver.

CAN-ETHERNET GATEWAY

In the gateway mode the CAN@net II/Generic is connected to a PC or to a controller platform via TCP/IP. The application program on the host communicates via a standard TCP/IP socket and uses a simple ASCII protocol. The CAN@net II/Generic offers simple, flexible access to CAN systems via a LAN or via the Internet.

TECHNICAL DATA

PC bus interface	10/100 Mbit/s Ethernet (10Base-T/100Base-T), Autodetect, RJ45 connector
IP address allocation	DHCP, via PC tool
Microcontroller	Freescale MCF5235, 150 MHz
Memory extension	8 Mbyte DRAM, 4 Mbyte Flash
CAN controller	SJA1000
CAN bus interface	ISO 11898-2, Sub D9 galvanically decoupled (500V)
Current supply	9-32 V DC, 3 W
Temperature range	-20 ºC to +70 ºC
Certification	CE, FCC, CSA
Housing	Plastic housing for top hat rail mounting
Size	approx. 22,5 x 100 x 115 mm

CONTENTS OF DELIVERY

- CAN@net II/Generic
- User manual
- Sample programs

ORDER NUMBER

1.01.0086.10201	CAN@net II/Generic; one CAN channel

CANlink II

▶ **RS232–CAN Converter**

With the CANlink II, devices with a serial RS232 port can be connected to the CAN bus. Two modes are available for use in CAN and CANopen networks. In the CAN mode (layer 2), the received CAN data is transmitted transparently to the RS232 interface. Data sent by means of RS232 is packed in CAN telegrams. One configurable identifier is available for each transmission and reception. In CANopen mode the CANlink works as a CANopen subscriber, where the serial data is saved as a bytestream object in the manufacturer-specific object dictionary range.

SUPPORTED CANOPEN FEATURES

- 1 x server SDO expedited, non-expedited, no CRC check
- 1 x TX PDO and 1 x RX PDO (static mapping)
- Emergency message, Heartbeat producer, NMT slave

TECHNICAL DATA

Microcontroller	Fujitsu MB90F543
Memory extension	128 k Flash, 6 k RAM, 256 Bytes EEPROM
CAN controller	1 x CAN on-chip, CAN 2.0A, 2.0B
CAN bus interface	1x ISO 11898-2, optional galv. isolated
Serial port	RS232 (600 up to 115200 bits/s), Handshake
Power supply	9-36 V, 1.5 W
Temperature range	-20 ºC to +70 ºC
Certification	CE
Housing	Plastic top hat rail housing 110 x 75 x 22 mm

CONTENTS OF DELIVERY

- CANlink II
- Configuration software for Windows, user's manual

ORDER NUMBER

1.01.0033.10000	CANlink II – DIN Rail
1.01.0033.20000	CANlink II – DIN Rail, with Galvanic Isolation

LIN2CAN

▶ **Powerful LIN-CAN-Gateway**

The LIN-CAN gateway is a universal device for both the analysis of LIN networks (Local Interconnect Network) via the CAN bus and for the emulation of LIN slave or master modules. In addition, the device can be used as a LIN-PC interface for PC-based configuration and monitoring software, or, for PC-supported LIN device development.

OPERATION MODES

The LIN-CAN Gateway supports four operating modes:

- LIN-CAN Gateway as LIN Master or LIN Slave
- LIN-Slave Emulation
- LIN-Master-Slave Emulation
- LIN-PC Interface

The various modes will be configured via PC. The configuration is saved as "non-volatile" in the device.

TECHNICAL DATA

Microcontroller	Fujitsu MB90F543
Interfaces	1x CAN ISO 11898-2 High-Speed,
	1x CAN ISO 11898-3 Low-Speed,
	1x LIN, 1x RS232
Memory extension	128 kByte Flash, 518 kByte RAM
Extras	Configurable Sleep mode with Wake up via
	CAN, LIN or RS232
Power supply	7 V – 16 V DC, 1.5 W
Temperature range	-20 ºC to +70 ºC
Certification	CE
Housing	Robust metal housing approx. 100 x 85 x 32 mm

CONTENTS OF DELIVERY

- LIN2CAN
- Configuration software for Windows 2000/XP/Vista
- User's manual

ORDER NUMBER

1.01.0130.00000	LIN2CAN

IXXAT

CANblue/Generic

▶ **CAN-Bluetooth-CAN Bridge and CAN-Bluetooth Module with ASCII Protocol**

Bluetooth interface	Bluetooth specification V2.0, Class 1/ +16,9 dBm (49 mW), 100m
Microcontroller	Infineon C161U, 36 MHz
Memory	256 k Flash, 128 k RAM
CAN controller	SJA1000
CAN bus interface	ISO 11898-2 and ISO/IS11898-3, switchable, Sub D9 plug according to DS102, galvanic decoupled
Voltage supply	9 - 30 V DC, 2.5 W
Temperature range	-20 ºC bis +70 ºC
Certification	CE, FCC
Housing	stable metal housing
Size	85 x 72 x 35 mm

CONTENTS OF DELIVERY

- CANblue/Generic, manual

ORDER NUMBER

1.01.0125.00001	CANblue/Generic

BRIDGE MODE

The bridge mode allows the user to set-up a CAN-Bluetooth-CAN bridge by using two CANblue/Generic devices. Message exchange occurs on layer 2 and is transparent. The device can also be used in systems with CANopen, DeviceNet or customer-specific protocols. Filters can be set for data exchange via Bluetooth. By using more than two CANblue/Generic devices the coupling of the devices can be made dynamically. Depending upon the existing environmental conditions, the maximum distance between the devices is up to 100m.

ASCII PROTOCOL MODE

In this mode, functions for transmitting and receiving CAN messages and for configuring the CANblue/Generic are available to the user based on simple ASCII commands. The CANblue/Generic is ideal for "non-Windows" systems or embedded platforms.

canAnalyser

▶ The powerful CAN Tool for Development, Testing and Service

The canAnalyser is a powerful, versatile tool for the development, testing and servicing of Controller Area Network based systems. The canAnalyser is already used extensively, especially in the area of industrial automation, and, is also being used more and more in the automotive industry.
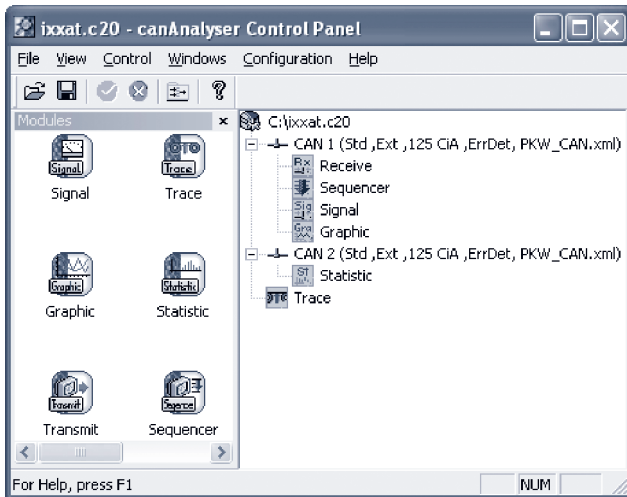
Control Panel

The software package is based on a modular concept which combines exceptional openness and versatility. Customer specific functions can be easily integrated via an open .NET programming interface in the form of individual modules. By using a powerful CAN interface from IXXAT, the canAnalyser achieves the reception of CAN messages and time oriented buffering even when dealing with very high bus loads and baudrates.

In the standard version the canAnalyser offers functions covering many areas of application:

- Online monitoring of bus traffic
- Transmission of one-off or cyclic messages and entire message sequences
- Parallel monitoring of several CAN buses
- Recording of CAN messages with various trigger conditions
- Static evaluation of the message traffic
- Recording and display of bus load
- Graphic display of message contents over the time axis
- Creation of command controlled message sequences

An integral part of the canAnalyser is the processing of message databases. With this, each CAN identifier can be allocated a message name and the signals transmitted in the data field can be interpreted and displayed as physical parameters in different ways. The canAnalyser also processes the widely used CANdb format. In all modules the relevant message name from the database is displayed in addition to the CAN identifier.

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

HIGHLIGHTS

- Multilingual 32-bit software for Windows2000/XP/Vista
- Support of all CAN interfaces supplied by IXXAT
- Support of 11- and 29-bit identifiers (CAN 2.0A/2.0B)
- Timestamp for receive objects with a resolution of 1 μsec (depending on the used hardware)
- Passive mode (no transmission of Ack bit and error frames, thus no interference of the CAN system by the canAnalyser)
- Detection and display of error frames
- Integrated support of project databases
- Online trace on hard disk with various trigger conditions
- Support of all CAN controllers available on the interface board (multi-line mode)
- Display of the CAN controller status and bus load
- Documented .NET programming interface for extension by user-specific modules
- Execution of Scripts

### FUNCTIONS

▶ Configuration and Operation

The control panel of the canAnalyser is the central element for configuration. Supported by a Wizard, the required CAN interface is selected and the CAN controller on the board is configured. It also defines which function modules are assigned to the CAN controllers. The configuration is clearly displayed in the form of a tree and the module assignment occurs intuitively by means of drag and drop. Each CAN bus can be assigned a database.

▶ Programmability

Due to the open programming interface, the canAnalyser can be extended by the user's own modules or user interfaces. With common Windows development systems (e.g. Visual Studio.NET), new, independent modules can be developed and added to the canAnalyser. It is possible for users to create interfaces for their systems or for certain devices or tools with system specific analysis functions.

▶ Scripting Host

The Scripting Host provides a powerful interface that combines the advantages of graphic Windows programs with the flexibility of scripts. By using the Scripting Host the canAnalyser can be quickly and easily adapted to specific measuring and analysis tasks. This allows the user to simulate devices and protocols or to test existing devices in the simulated restbus and to put them into operation. Specific test environments can be easily created using any Windows interface components. The Scripting Host supports the standard script languages C# and Visual Basic .NET. The incorporation of DLLs also enables the integration of further modules.
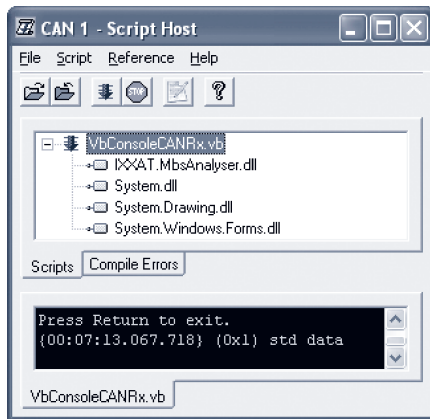
Scripting Host

▶ **Receiving and displaying CAN messages (Receive Module)**

The CAN messages transmitted on the CAN bus can be displayed online in different ways. Either all messages or only certain ones, selected via an adjustable filter, are displayed. Messages can be displayed in two ways. In scroll mode, the messages are displayed together with the time of reception one after the other in a list. This form of display is particularly suitable for monitoring message sequences. On the other hand, in the overwrite mode the messages received are listed according to the identifier and permanently overwritten with the incoming data. Each message is assigned a counter, which displays the commonness of its transmission. Here the altered byte is highlighted in color. With the additional cycle time monitoring, the regularity of reception is observed.

For further monitoring of certain message groups, the receive module can be started multiple times, where each instance can display one section of the CAN data flow.
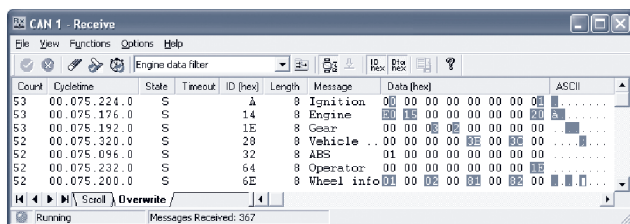
Receive Module

▶ **Transmission of CAN-messages (Transmit Module)**

Messages to be transmitted can be arranged by the user in a message table. Individual entries from this table can be transmitted once or cyclically. The table contains both the definition of the message (identifier, data bytes, RTR bit) and a description of the message. The data entry can be either decimal or hexadecimal. For messages to be transmitted cyclically, cycle times of 250 us (depending on the used hardware) to 100 s can be specified. In cyclic transmission mode, identifiers or data contents can be incremented automatically.
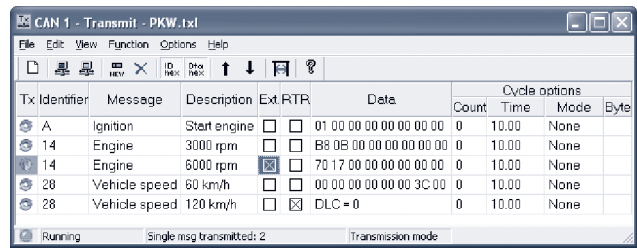
Transmit Module

▶ **Recording CAN messages (Trace Module)**

With the trace module all received messages and error frames are recorded directly onto the hard disk. The recording can be started and stopped via the trace control. In addition, trigger conditions for starting and stopping as well as filters for the CAN messages to be recorded can be defined for each bus. A trace can be viewed at any time and can be reloaded into a system offline for analysis by specifically configured analysis modules, or, online with the aid of the sequence module (limited number of messages).

▶ **Play-back of Trace Files (Replay Module)**

The Replay Module enables the play-back of trace files. In online mode the messages can be send to the CAN network and received via self reception, in offline mode the messages can be distributed to the connected canAnalyser modules.
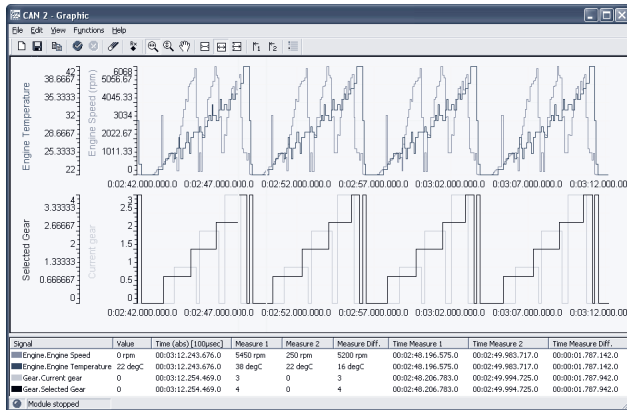
▶ **Transmitting message sequences (Sequencer Module)**

During the development of CAN devices, functions, protocols and complete systems situations can be tested by transmitting message sequences. Unavailable devices can also be simulated. The message sequences are created with a few easy to learn commands (such as transmitting a message, waiting for a message, pause with specified duration, repeat, user input) via an integrated editor and then executed at the push of a button.
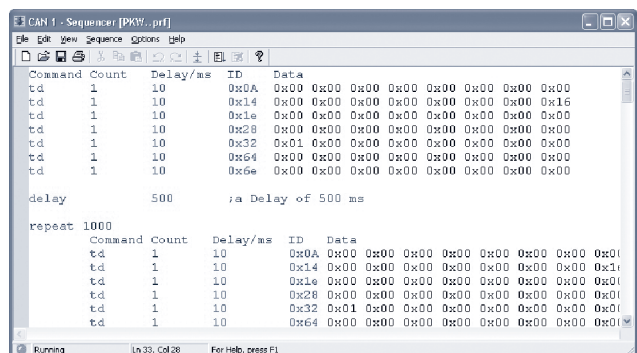
Sequencer Module

▶ **Graphic display of data (Graphic Module)**

Data contents of CAN messages are displayed in the graphic module in a window over the time axis. The information to be displayed, such as name and unit is automatically taken from the database allocated to a CAN bus. The data is displayed in real time, where a maximum of 16 signals per graphic window are distributed over up to 4 time axes. In addition, the current value of a signal is displayed numerically. With the aid of a metering bar, specific values can be determined and evaluations carried out.
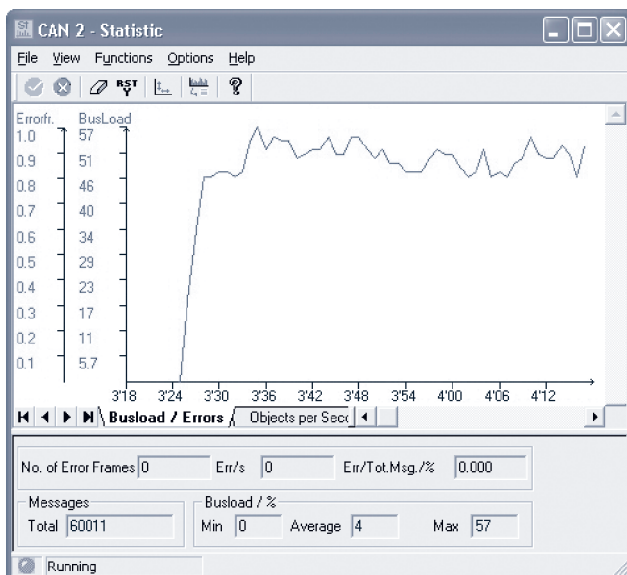
Graphic Module

Signal Module

▶ **Statistic analysis of network variables (Statistic Module)**

With the statistic module, important variables of a CAN network can be both statistically recorded and displayed graphically. The module determines the current bus load of the system and displays this over the time. In addition to general data such as the number of error frames or the total number of transmitted CAN messages, the frequency of the individual CAN messages is displayed as a histogram.

▶ **Editor for the project databases**

The basis for the interpretation and symbolic display of the data transmitted in the CAN message is the project database. In this, a CAN message is first assigned a name according to its identifier. The message can contain up to 64 individual data (signals). The file format used is XML. In addition, there exists an import filter for the CANdb format.

Each signal can be interpreted as an analog, digital or string value.

The structure of the project database is displayed in a two part window as a hierarchical tree with signal type dependent icons, with separate, clear input masks existing for each area.

Statistic Module

Database Editor

▶ **Symbolic interpretation and display of transmitted process variables (Signal Module)**

Beyond the display of the receive module, not only is the identifier of a CAN message with a symbolic name displayed, but the complete contents of the message are also extracted and displayed as signals (physical values) based on the interpretation rules stored in the database.

Whether in scroll mode or in overwrite mode, the signals contained in a CAN message can be displayed with the signal module. Messages and signals can be activated and deactivated individually, i.e., excluded from interpretation.

IXXAT

HARDWARE REQUIREMENTS

- PC with Windows 2000/XP/Vista
- IXXAT CAN interface and CAN driver VCI

CONTENTS OF DELIVERY

- Software as single user license, consisting of control panel, receive module, transmit module, trace module, replay module, sequencer module, statistic module
- Database editor
- User's manual
- USB license key

ADDITIONALY AVAILABLE SOFTWARE

- **LIN analysis:** With the LIN2CAN device it is possible to monitor and transmit LIN messages with the canAnalyser. The LIN2CAN is configured as a gateway and converts the LIN messages into CAN messages and vice versa.

ORDER NUMBER

1.02.0133.00000	canAnalyser

▶ The low-cost introduction to professional CAN analysis

As the "little brother" of the canAnalyser, the canAnalyser-lite provides the most important functions required for CAN analysis in a compact form.

Offering functions for online monitoring of bus traffic, for single-shot or cyclic transmission of messages and complete message sequences, for recording bus traffic with various trigger conditions and for statistical evaluation of bus traffic, it possesses the main functions for the analysis of Controller Area Network systems while providing a low-cost introduction.

Since the configuration files and the project databases of both versions are compatible, it can be easily upgraded to the full version, if required.

FUNCTIONS

The lite version contains the following modules:

- Receive module for receiving and displaying CAN messages
- Transmit module for transmitting messages
- Trace module for recording messages with filter and trigger functionality
- Sequencer module for transmitting message sequences
- Statistic module for displaying parameters and message frequencies

These modules correspond to those of the full version and are managed by means of the control panel that is also supplied.

In contrast to the canAnalyser, the canAnalyser-lite does not allow multiple instances of a module, has no open programming interface, and, can only be operated with one CAN bus.

HIGHLIGHTS

- Multilingual 32-bit software for Windows 2000/XP/Vista
- Support of all CAN interfaces supplied by IXXAT
- Support of 11- and 29-bit identifiers (CAN 2.0A/2.0B)
- Timestamp for receive objects with a resolution of up to 500 µsec (depending on the used hardware)
- Passive mode (no transmission of Ack bit and error frames, thus no interference of the CAN system by the canAnalyser
- Detection and display of error frames
- Online trace on hard disk with various trigger conditions
- Display of the CAN controller status and the bus load

- PC with Windows 2000/XP/Vista
- IXXAT CAN interface and CAN driver VCI

CONTENTS OF DELIVERY

- Software as single user license, consisting of control panel, receive module, transmit module, trace module, replay module, sequencer module, statistic module
- Database editor
- User's manual
- USB license key

FURTHER INFORMATION

A free demo version is available on our homepage. The product homepage, with tutorial, tips and support can be found at www.cananalyser.com.

ADDITIONAL APPLICATION

- **LIN analysis:** With the LIN2CAN device it is possible to monitor and transmit LIN messages with the canAnalyser. The LIN2CAN is configured as a gateway and converts the LIN messages into CAN messages and vice versa.

▶ **Comparison of functions of the can*Analyser* and the can*Analyser-lite***

	canAnalyser	canAnalyser-lite
Receive Module	x	x
Transmit Module	x	x
Trace Module	x	x
Replay Module	x	x
Sequencer Module	x	x
Graphic Module	x	–
Statistic Module	x	x
Signal Module	x	–
CANopen Module	o	o
DeviceNet Module	o	o
SAE J1939 Module	o	o
Two channel capability	x	–
Open programming interface	x	–
Scripting Host	x	–
Multiple Module instances	x	–

x   included in delivery specification
o   optional
–   not support

ORDER NUMBER

1.02.0166.00000	canAnalyser-lite

CANopen Module

▶ **CANopen Interpreter for canAnalyser**

As an addition to the canAnalyser, the CANopen Module interprets all received CAN messages according to the CANopen specifications CiA301, CiA302 (incl. Flying Master) and CiA305 (LSS). The messages are recognized as SDOs, PDOs (also multiplexed), NMT, Emergency, Sync and Timestamp objects and interpreted accordingly. Here, it is possible to filter the messages according to both their node number and their message type. An SDO transfer is displayed with index and subindex and the symbolic name of the addressed object dictionary entry. Any abort code which may occur is correctly displayed. The display is color coded according to the message type. In addition, the SDO display can be switched between the display of the individual subsequences and an overall display of the byte stream transferred.
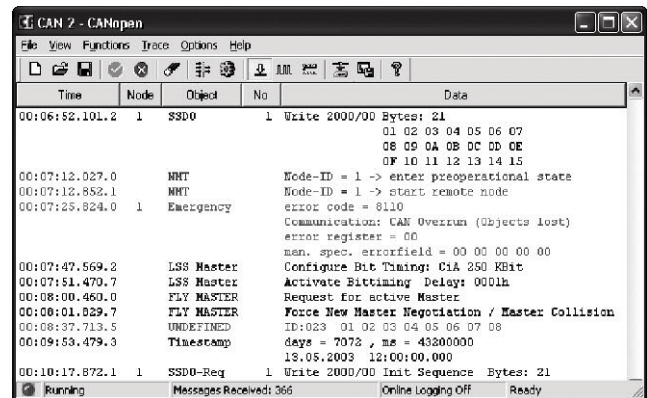
CANopen Module

The basis for the interpretation of the received data is the so-called configuration set. This either allocates an EDS/DCF file to the 127 possible network subscribers or defines its device profile. The configuration set can be loaded, edited and saved. In addition, it is possible to add, delete and modify the CAN objects used by each node and their CAN identifiers. The profiles used for interpretation are integrated via external ASCII files.

SYSTEM REQUIREMENTS

- canAnalyser or canAnalyser-lite (Version 2.0 or newer)

CONTENTS OF DELIVERY

- Software as single-user license
- User manual

ORDER NUMBER

1.02.0145.00000	CANopen Module for canAnalyser/ canAnalyser-lite

IXXAT

DeviceNet Module

▶ DeviceNet Interpreter for canAnalyser

As an addition to the canAnalyser, the DeviceNet module interprets all received CAN messages according to the ODVA DeviceNet standard and displays the received parameters according to Message Group, MAC ID and Message ID.
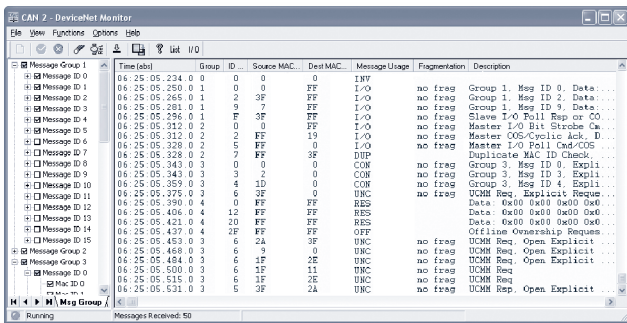
DeviceNet Module

The incoming information is divided into Unconnected Message, Explicit Message, I/O Message, Duplicate MAC-ID Check Message, Device Heartbeat Message, Device Shutdown Message, Offline Connection Set as well as reserved and invalid DeviceNet messages and their content decoded, depending on type:

- **Explicit Messages:** All specified common services and class names as well as the error responses are displayed. Furthermore the fragmentation protocol is analyzed and monitored. The interpretation of Explicit Messages is based on the connection table which contains the used message format. The connection table is filled automatically by detection of the connection set-up and can be configured manually.
- **I/O Messages:** Support of both Predefined Master/Slave Connection Set (Poll, Bit-Strobe, COS/Cyclic, Multicast Poll) and dynamic messages from groups 1 and 3. Fragmented I/O Messages can be configured by the user; for these messages, the fragmentation protocol is analyzed and monitored.
- **Unconnected:** Unconnected Message Manager Port (UCMM) and Unconnected Port of the Predefined Master Slave Connection Set are supported.

In addition, filtering of the received messages according to both MAC-ID and message type can be set and saved during operation. For further processing of the interpreted data in other applications, the content of the analysis window can be exported to a text file (CSV format).

SYSTEM REQUIREMENTS

- canAnalyser or canAnalyser-lite (Version 2.0 or newer)

CONTENTS OF DELIVERY

- Software as single-user license
- User manual

ORDER NUMBER

1.02.0148.00000	DeviceNet-Modul for canAnalyser/canAnalyser-lite

J1939 Module

▶ J1939 Interpreter for canAnalyser

As an addition to the canAnalyser, the J1939 Module provides the display of received messages according to the SAE J1939 notation. This includes the interpretation of received messages and the extraction of Parameter Group Number, Source Address and transmitted Suspect Parameters with name, value and unit. Furthermore the Messages Priority, Data Page, Protocol Data Unit Format and Protocol Data Unit Specific Fields are displayed.
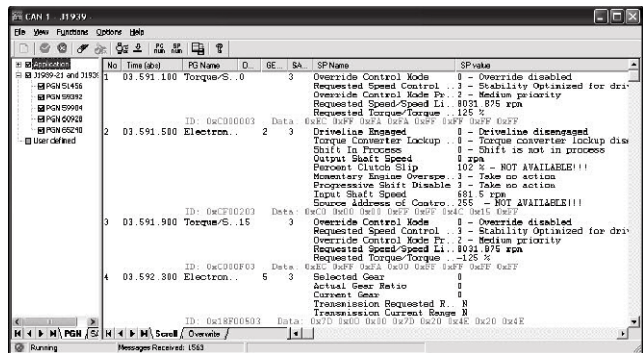
J1939 Module

The J1939 module allows the processing and interpretation of the transport protocol as well as the interpretation of diagnostic messages. Proprietary application messages can be interpreted if a user defined database with Parameter Group and Suspect Parameter definitions is provided. The J1939 module also provides for the processing and interpretation of the transport protocol as well as for the interpretation of diagnostic messages. To clearly arrange displayed messages, it is possible to set filters for Parameter Group Numbers and Source Addresses. Received messages can be saved into a CSV file. Furthermore, the filter and module configuration can be stored, imported and exported.

SYSTEM REQUIREMENTS

- canAnalyser or canAnalyser-lite (Version 2.0 or newer)

CONTENTS OF DELIVERY

- Software as single-user license
- User manual

ORDER NUMBER

1.02.0149.00000	J1939 Module for canAnalyser/canAnalyser-lite

CANcorder MMC

▶ **A versatile Data Logger for the Diagnosis of CAN Networks and the Recording of Process Data**

IXXAT's CAN data logger "CANcorder MMC" is a powerful, cost-effective tool for archival logging of data traffic in CAN systems. Its intelligent trigger functions allow logging and saving of CAN messages before and after a freely-definable trigger event. These trigger events can be error frames, time delays, keys of the remote control, the digital input or a received CAN bit pattern. This bit pattern is described in program text similar to C-syntax and enables all elements of a CAN message to be linked to logical operators and values. Due to the CANdB file import, a signal based trigger configuration is supported. In the multi-stage trigger, up to three consecutive trigger events can be analyzed, leading to the implementation of complex trigger conditions. As a result, sporadic errors can be specifically logged and downloaded to the PC for further analysis.

Besides recording CAN messages, the CANcorder MMC can be used for the transmission of up to four cyclic messages. Cycle times between 62 days and 10 ms can be defined for each message, and, the offset between the four messages can be set.

The CANcorder MMC is available with two CAN channels (11 bit or 29 bit identifier) and allows data to be recorded in single or dual mode. Due to the large buffered data memory of 4 MB, up to 230,000 messages can be recorded. The memory can be used for up to 128 different trace records. The recorded data is transfered to the memory card as soon as a trace record becomes completely taken. Because of this, the recording capacity is only limited by the size of the memory card.
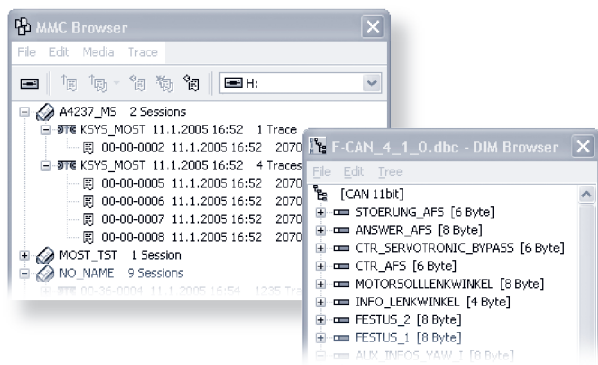
The CANcorder MMC is configured with the aid of a convenient Windows configuration tool. This also allows trace data to be downloaded from the device to the PC and saved to the hard disk for further analysis. The CANcorder MMC does not have to be connected to the PC for this, as the configuration data and the logs can be transferred using the memory card.
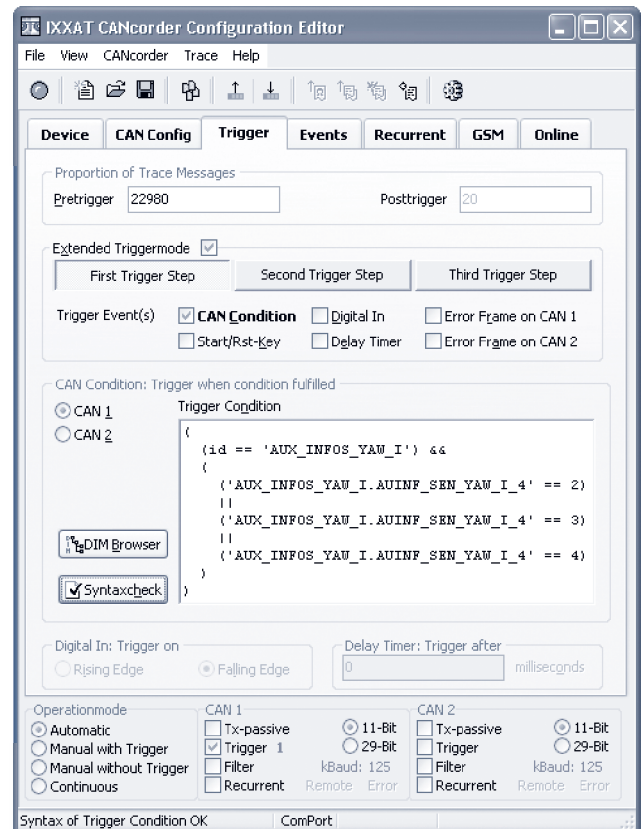
Besides the manual configuration, the CANdb import functionality allows for a simpler configuration of trigger events by using the signal names and values which are defined in the CANdb database. To do this, these are entered via Drag&Drop into the CANcorder trigger/filter controls of the configuration tool.

Due to the Sleep-Mode (automatic power-down after a specified time with no bus traffic) and the optionally available remote connection via GSM module/cell phone (option TeleControl), the CANcorder is particularly appropriate for mobile applications in passenger cars and commercial vehicles. The TeleControl option allows events to be signaled by SMS, the up-loading of Trace records via GSM-module/cell phone, and, remote configuration.

As a result of its easy handling and configuration, the CANcorder is also an indispensable tool for both the long-term monitoring of industrial machines and systems, and, the recording of operation data.

IXXAT

CAN bus interface	2 x High-Speed ISO/IS 11898-2, optional Low-Speed ISO/IS 11898-3, Sub-D9 connector according to DS 102, as an option electrically decoupled
Baudrate	Up to 1 MBits/s
Microcontroller	Infineon C165; 22,118 MHz
CAN controller	SJA1000
Memory extension	4 MB data memory for recording of up to 230,000 messages, battery-buffered; Memory card slot, max 1024 MB memory card (SD or MMC)
Power supply	7 - 50 V DC
Temperature range	-20 °C to +80 °C
Size	Approx. 165 x 85 x 32 mm

FEATURES

- Easy configuration without knowledge of programming with a dialog-based Windows program
- Two CAN channels (single or simultaneous recording)
- Bus interfaces for low and high speed applications (ISO 11898-2 and ISO 11898-3)
- Recording of messages using standard (CAN 2.0A, 11 bit) or extended CAN format (CAN 2.0B, 29 bit)
- Recording of data, error and remote frames with time stamp
- Conversion of the binary traces for further processing to ASCII, canAnalyser/32, CANalyzer, CSV format
- Configurable message filter for recording specific data
- CANdb import functionality for the easy configuration of trigger events
- Cyclic transmission of up to four pre-defined messages
- 4 Mbytes data memory battery buffered for up to 230,000 messages, variable memory usage for 1 to 128 separate traces
- Continuous long-time recording
- Configurable sleep mode with wake-up on CAN, RS 232 or trigger input
- Trigger input (TTL, 5 V) and trigger output (TTL, 5 V)
- Configuration and upload of traces via RS232 (max. 115.2 Kbauds) or memory card (card reader required for PC)
- Support of remote inquiry / remote configuration via modem/GSM (option TeleControl)
- Freely definable SMS-transmission for status-/event signaling via GSM/cell phone (option TeleControl)
- Solid metal case
- Manual cable remote control: CANcorder RC (option)
- Firmware update via memory card
- Command line script control (configuration up-/download, trace upload, clock setting, erase of memory card or on-board memory)

CONTENTS OF DELIVERY

- CANcorder MMC
- Memory card with 256 MB
- Windows application for configuration and for data upload for Windows 9x/Me/NT/2000/XP/Vista
- Serial cable for configuration and data upload (RS232)
- Power supply cable
- Manual

OPTIONS

- **CANcorder–RC:** Cable remote control with start/stop key and one free configurable key (trigger, set a marker in the data stream)
- **TeleControl:** Remote inquiry, remote configuration and SMS transmission via modem/GSM module or cell phone

Device rental service
The CANcorder MMC can also be rented on a temporary basis. The minimum rental time is 2 weeks, but it can be extended on a weekly basis. At the conclusion of the rental period, should the user wish to purchase the device, all previously paid rental fees will be credited towards the purchase price.

ORDER NUMBER

CANcorder MMC	
1.01.0095.11010	with 2 high-speed bus interfaces
1.01.0095.15010	with 1 high-speed and 1 low-speed bus interface
1.01.0095.22010	with 2 high-speed bus interfaces, galvanic isolated
1.01.0095.55010	with 2 low-speed bus interfaces

CANcorder MMC TeleControl	
1.01.0096.11010	with 2 high-speed bus interfaces
1.01.0096.15010	with 1 high-speed and 1 low-speed bus interface
1.01.0096.22010	with 2 high-speed bus interfaces, galvanic isolated

1.01.0081.00000	Remote Control Unit for the CANcorder

CANcheck

▶ Installation tester for CAN networks

The CANcheck is operated by means of a simple menu control via cursor keys and LCD display. Test results can be output via the LCD display or a connected PC.

For display of the results on a PC, the CANcheck is connected to the PC via a USB port. Results are displayed on the PC via a terminal program. The logging function of the terminal program enables the test results to be either archived in a file or printed out.

TECHNICAL DATA

Display	128 x 64 pixels; background light can be switched on or off
Keypad	Touch-sensitive keypad with 6 keys
Switch on/off	Switch on by pressing any key; switches off automatically after 10 mins.
USB port	USB 2.0 (full speed)
CAN interface	ISO 11898-2 High-Speed CAN
Power supply	4 x 1.5 V Mignon Battery (AA) or USB
Operating time	approximately 24 hrs. with a battery capacity of 2850 mAh
Temperature range	0 ºC to +50 ºC
Housing and dimensions	Sturdy aluminum housing 116 x 160 x 34 mm (W/H/D)

CANcheck allows users to analyze CAN networks during commissioning, maintenance and helps searching faults. This battery-operated, hand-held device connects to the CAN network to be tested and operates using a clearly-structured menu.

CONTENTS OF DELIVERY

- CANcheck installation tester
- CAN "Y" cable with Sub-D9 plug (2 m)
- 1-to-1 CAN/Trigger cable
- USB cable
- Manual

FUNCTIONS

- Cable test with network switched off and operational test with network switched on
- Wiring test: test of the resistances between all pins of the CAN-connector (assignment in accordance with CiA), providing assessment based on pre-defined threshold values
- Terminal resistance test: measurement of the resistance between CAN_H and CAN_L
- Cable length: measurement of cable length via pulse-time delay, cable impedance
- Measurement of the signal level: absolute and differential signal level listed according to identifier
- Baud rate detection: detection of baud rate of the tested CAN system
- Identifier scan: determination of all identifiers transmitted and display of reception frequency
- CANopen mode: Signal level and reception frequency listed according to node-ID
- Bus load: measurement of the current bus load of the CAN system
- Error frames: number of error frames per time unit
- User's guide: test instructions before the test, OK or error message after the test, continuation after acknowledgement
- Multilingual: test instructions in German or English

ORDER NUMBER

1.01.0097.00000	CANcheck – Installation tester for CAN networks

CAN–Bus–Tester (CBT2)

▶ **A Powerful Tool for CAN–Protocol Analysis and Testing of Bus Physics**

Many faults found in CAN bus systems have physical causes. With the CAN-Bus-Tester, it is possible to detect and analyze these faults. In addition, the most important logical analysis functions are also integrated into the Tester (otherwise found only in protocol analyzers). The Tester can be used with all bus systems with 11- or 29-bit identifiers according to ISO 11898-2. A USB-interface makes hot-plug&play possible between PC and Bus-Tester. Automatic baud rate detection and the self-connecting BusScan enable easy monitoring of the physical signal-to-noise ratio of the bus, sorted according to CAN-identifiers received. Generally, devices which transmit messages with low signal-to-noise ratio are highly susceptible to failures. Depending on the test strategy, various methods of identifying faults can be used, including setting various trigger events (identifier, physical and/or logical faults and error-frames). All faults are defined up to the individual bit position and are displayed with a time stamp. A trigger signal available via the external trigger output can be used for triggering an oscilloscope. A certain (faulty) CAN-message can thus be shown selectively on the oscilloscope.

Temporary faults on the bus can be registered with an intuitive logger function and all data can be protocolled.

HIGHLIGHTS

■ Analysis of the physical level of all messages
■ Physical analysis of signal-to-noise ratio and edge quality
■ Comprehensive trigger conditions for fault detection
■ Logger function for long-term analysis
■ Automatic baud rate detection
■ Simple connection to CAN-system
■ Simple operation via Windows program
■ Generation of test protocols
■ Transmission of CAN messages
■ Wiring test
■ Protocol monitor
■ Integrated oscilloscope for frame analysis
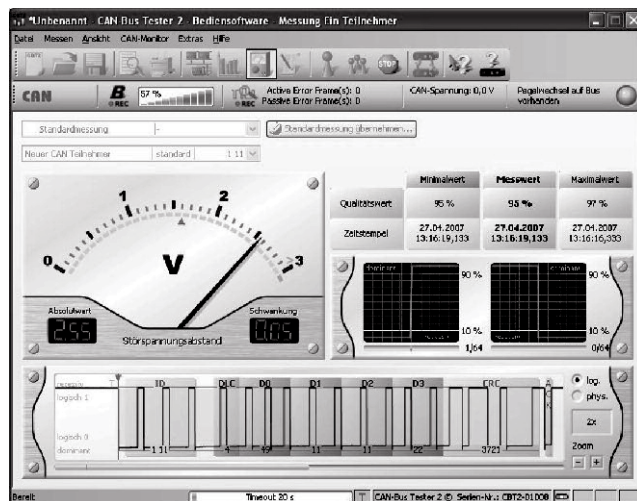
TECHNICAL DATA

Use	CAN according to ISO 11898-2 (High-Speed) with 11-bit or 29-bit identifier (CAN 2.0A and 2.0B)
Baudrate	5 k, 10 k, 20 k, 33.3 k, 50 k, 62.5 k, 75 k, 83.3 k, 100 k, 125 k, 250 k, 500 k, 800 k, 1000 kBit/s
Baudrate detection	All baudrates
Trigger output	BNC-socket, electrically isolated
Connection to CAN bus	Passive, 2 x 9-pole SUB-D connector
PC connection	Via USB, electrically isolated
Supply voltage	9 – 36 V DC, DIN 45323 low-voltage socket; 0.15 – 0.55A
Dimensions and wight	H = 40 mm, W = 125 mm, L = 170 mm, 570 g
Safety/protection	EN 60950 / IP 20 according to EN 60529
EMC	EN50081-1, EN50082-2
Temperatur range	+5 °C to +40 °C

CONTENTS OF DELIVERY

■ CAN-Bus-Tester CBT2
■ Adapter: SUB-D, Open style, M12, DeviceNet
■ Shorting plugs: SUB-D, Open style, M12
■ Adapter circuit board, for easy connection of an oscilloscope
■ Power unit 100 V - 240 V / 50-60 Hz; 24 V, 500 mA, Power cable
■ BNC cable
■ Manual including CD with driver and application software
■ Case

SYSTEM REQUIREMENTS

■ PC: > 1.2 GHz, USB interface, CD-ROM drive
■ Operating system Windows 98/Me/2000/XP/Server 2003/Vista

Device rental service
The CAN-Bus-Tester can also be rented on a temporary basis. The minimum rental time is 2 weeks, but it can be extended on a weekly basis. At the conclusion of the rental period, should the user wish to purchase the device, all previously paid rental fees will be credited towards the purchase price.
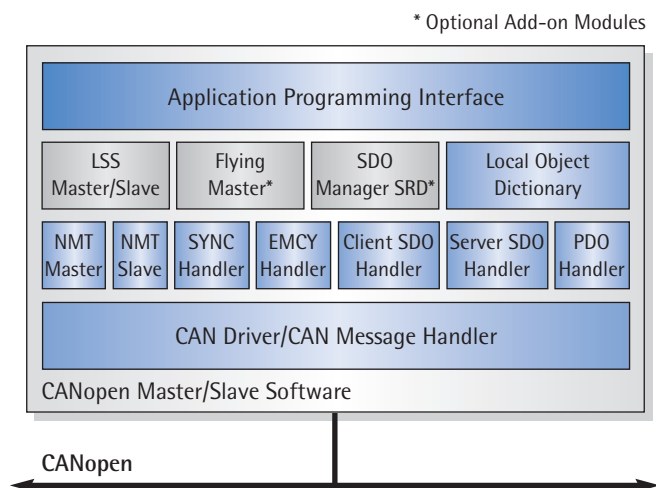
ORDER NUMBER

1.04.0400.00000	CAN-Bus-Tester CBT2

CANopen Protocol Software

▶ **Software package for the development of CANopen slave or simple CANopen master devices**

HIGHLIGHTS

- Comprehensive range of functions based on the CANopen specification CiA 301
- Support of status displays according to CiA 303-3
- Support for Layer Setting Services according to CiA 305
- Enables quick and easy development of CANopen devices (slave or master)
- 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
- Easy portability to alternative micro controllers
- Multi-channel support

* Optional Add-on Modules

Application Programming Interface			
LSS Master/Slave	Flying Master*	SDO Manager SRD*	Local Object Dictionary
NMT Master / NMT Slave	SYNC Handler	EMCY Handler / Client SDO Handler	Server SDO Handler / PDO Handler
CAN Driver/CAN Message Handler			

CANopen Master/Slave Software

CANopen

OVERVIEW OF FUNCTIONS

The CANopen Protocol Software contains all functions required for the implementation of simple CANopen master or CANopen slave devices according to the CANopen specification CiA 301.

SCALABILITY & HARDWARE-SPECIFIC ADAPTION

To insure a high degree of scalability and adaptability, the software package is configured via central files. One configuration file allows to optimally adapt the CANopen functionality provided by the protocol stack to the given application, thus using the available resources more effectively. This enables extreme resource-saving implementations. The core functionality of the CANopen software is implemented independent of the architecture of the individual CAN controller. The CAN driver itself is fully encapsulated in a separate software module. Adaptation to the micro controller type used (e.g. interrupts, timer) is performed centrally in a separate header file.

MULTI-CHANNEL SUPPORT

Upon request, the IXXAT CANopen Protocol Software is available as a multi-channel version.
This version allows the user to implement multiple, independent CANopen devices within one field device. NMT master or slave functionality can be configured independently on each of the channels with fully independent object dictionaries. It also supports the parallel operation of different CAN controllers on each of the channels.

OBJECT DICTIONARY & PROGRAMMING INTERFACE

The object dictionary represents the interface between the application and the communication interface. Each object dictionary entry can be directly allocated a reference to a variable with application data. PDOs and SDOs directly access these application variables. Therefore, no changes to an existing application are required in order to integrate a CANopen protocol stack. User-specific call-back functions can be connected to each application object and enable event-controlled signaling to the application when these objects are accessed. This mechanism allows direct, application-specific reaction to changes in the application data triggered on the bus-side. In addition, the possibility of saving and restoring configured data is also supported.

PROCESS- (PDO) AND SERVICE-DATA-OBJECTS (SDO)

The CANopen Protocol Software supports asynchronous (with or without event timer), synchronous (cyclic and acyclic) and on request (RTR) PDO transfer types. PDO-mapping may be implemented statically or dynamically, depending on available resources and the required reaction times. In addition, the protocol software supports multiplex PDOs including scanner and dispatcher lists. Dummy mapping as well as variable inhibit times are also possible. Objects can be mapped into several PDOs simultaneously. With SDOs, the transfer types expedited, non-expedited (segmented) and block transfer are supported. The SDO response can be delayed at application level for both read and write access. The application can check the data written by SDOs for consistency before the target variables are overwritten. The SDO transfer can be aborted if necessary.

NETWORK MANAGEMENT

The CANopen software supports the boot-up defined in CiA 301 with all network services including node guarding with or without life guarding (master monitoring), and, the heartbeat mechanism with producer monitoring.

IDENTIFIER ALLOCATION

By default, identifiers are allocated according to the predefined I/O connection set, but, they can also be assigned by altering the relevant object dictionary entries.

IXXAT

MASTER FUNCTIONALITY

Smaller CANopen systems frequently require only a simple master device to start the system, instead of a full CANopen manager. Therefore this CANopen software package enables the implementation of such a simple CANopen master with its own object dictionary. A CANopen device implemented on this basis can work in a system either as a slave or as a master and can be configured via the object dictionary with the aid of configuration tools.
The software provides all required services that enable the user to implement an optimized network management control functionality.
The software package "CANopen Manager Software" is the appropriate basis for the implementation of full or more complex CANopen manager devices, and, for the development of programmable devices and controls (PLC).

OPTIONAL FUNCTIONALITY

To supplement the CANopen standard software, the following optional functions are available on request:

- Flying master, startup-capable device or NMT-master-capable device according to CiA 302
- SDO manager (SDM), SDO requesting device (SRD) according to CiA 302

IMPLEMENTATION WORK

The CANopen Protocol Software is delivered as hardware-independent C-source code and is always tested with the latest CANopen conformance test software from the CiA.
The documentation and example programs supplied with the software enable a quick start with the CANopen software. Project files are supplied with the example programs that allow direct integration in the corresponding development environments of the compiler suppliers. All example programs can be run directly on a reference platform (evaluation board of the CPU manufacturer or IXXAT interface board).
Adaptation to the target hardware can normally be carried out in a few days. The sample programs facilitate implementation of a user's application.

SUPPORTED PROCESSORS AND CAN CONTROLLERS

The CANopen Protocol Software is independent of hardware and can be used on a large number of micro controllers and CAN controllers. For processors of the following manufacturers (valid at time of printing of this catalog), IXXAT supplies reference implementations including project files for the development environments used which can be run directly on the corresponding development platforms:

- Atmel, Freescale, Fujitsu, Infineon, Microchip, NXP, NEC, Renesas, STMicroelectronics, Texas Instruments, x86 Architecture

A complete overview of all available versions can be found on the IXXAT web page under the following link
www.ixxat.de/canopen_stack_available_versions_en.html

Adaptation of the CANopen software to processors that are not directly supported can be carried out in a few days provided a CAN driver is readily available, on the basis of a universal ANSI C version. Please contact IXXAT for further information on the available adaptation services.

AVAILABLE VERSIONS

The CANopen Protocol Software is available in two different packages with different scopes of functions: Slave and Master/-Slave. The Master/Slave package supports the complete functionality and can be used for the development of both slave devices and simple master devices. The range of functions of each package is described in the following table:

Function	Slave	Master/Slave
Max. number server-SDO	127	127
Max. number client-SDO	–	127
Max. number PDOs (Tx/Rx)	512	512
Dynamic PDO mapping	x	x
SYNC object	C	P/C
EMERGENCY object	P	P/C
TIME STAMP object	C	P/C
NMT functionality	S	M/S
Node guarding, heartbeat	x	x
CAN-ID configuration according to Predefined Connection Set	x	x
CAN-ID configuration via SDOs	x	x
NMT Start-up object (1F80$_h$)	x	x
Slave Assignment list (1F81$_h$)	–	x
Status display according to CiA 303-3	x	x
Flying Master according to CiA 302	S (optional)	M/S (optional)
LSS services according to CiA 305	S	M/S

C=Consumer; P=Producer; S=Slave; M=Master

CONTENTS OF DELIVERY

- Source code
- Company license (restricted to company site and business field)
- Detailed documentation
- Example programs
- Technical support

SUPPLEMENTARY SERVICES
(not included in contents of delivery)

Maintenance agreement
IXXAT offers a maintenance agreement to supplement the software package. The maintenance agreement consists of the following services for the duration of the agreement:
- Free updates
- Technical support, including general questions concerning CANopen

ORDER NUMBER

Single channel version

| 1.02.0122.TTDDC	CANopen Slave Protocol Software (Versions on request)
1.02.0124.TTDDC	CANopen Master/Slave Protocol Software (Versions on request)

Multi channel version

1.02.0222.TTDDC	CANopen Slave Protocol Software (Versions on request)
1.02.0224.TTDDC	CANopen Master/Slave Protocol Software (Versions on request)

CANopen Manager Software

▶ **Software package for the development of CANopen master devices**

- Suitable for the implementation of CANopen devices with master and/or slave functionality
- Comprehensive functionality based on the CANopen specification CiA 301
- Complete CANopen master functionality with standardized boot-up procedure based on CiA 302 (may be switched off during run-time)
- Supports CANopen slave devices according to CiA 301 Versions 3 and 4
- Support for hot-swapping of CANopen devices in the running system
- Simple integration of application program via the data interface providing process data image according to CiA 302
- Comprehensive diagnostics interface
- IEC61131-3 support based on CiA 302 and CiA 405
- Local Object Dictionary with integrated management of network variables according to CiA 302 and CiA 405
- All functions can be parameterized via Object Dictionary
- Automatic configuration of devices with system start-up (plug&play) by integrated Configuration Manager
- Easy integration with IEC61131-3 run-time systems (with and without operating systems)
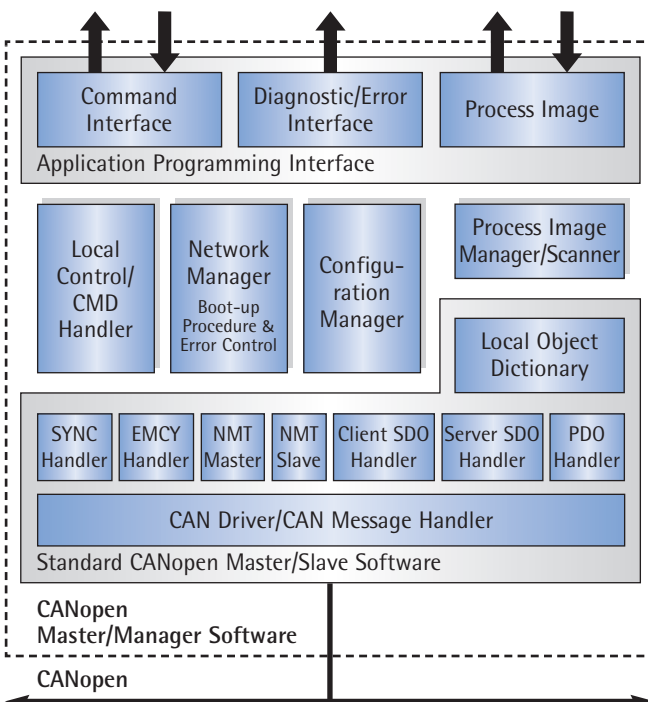
The CANopen Manager Software is a powerful software package which enables the implementation of CANopen master or CANopen manager devices. Devices implemented in this way can be operated as master- and as pure slave devices. The software package is based on the following CANopen standards:

- CiA 301 – CANopen application layer and communication profile
- CiA 302 – CANopen additional application layer functions
- CiA 405 – CANopen interface and device profile for IEC61131-3 programmable devices

The application interface consists of process data image, command interface, and a comprehensive diagnostics interface that allows for a straightforward integration of application programs and PLC run-time systems. Since all necessary interfaces and functions are included in the software package, the user no longer has to take care of the time consuming development and testing of CANopen specific functions (such as control of the system boot-up, testing whether the correct devices are present, automatic download of configuration data or specific reaction to device failures), as it would be the case when using other CANopen software packages.

The exchange of process data with the application program occurs via a data interface. This provides a complete decoupling of application and communication software, and enables the implementation of either single processor or multi processor based systems. The application programming interface consists of the following areas:

Process data image: The I/O data exchanged between the application and CANopen manager are passed via a process data image which is managed according to CiA 302 and CiA 405 via network variables.

Command interface:
The command interface provides the application with all necessary functions for the control of the CANopen manager. This includes commands for initialization, checking the device and system status, and, for the implementation of function modules according to CiA 405.

Client SDO interface:
This interface enables the execution of SDO requests by the application.

Event interface:
This interface notifies the CANopen manager application of important events in both the device and in the system.

Diagnostics interface:
The diagnostics interface allows the application to obtain information on all system devices at any time.

NMT MASTER, STANDARDIZED BOOT-UP PROCEDURE

The NMT master is able to control and monitor up to 126 slave devices. It controls the system start-up according to the standardized boot-up procedure defined in CiA 302. This boots a CANopen system according to a specified sequence with a variety of options such as a system consistency check (check of all devices present in the system for device parameters like manufacturer, device type, revision number, serial number), automatic download of configuration data (by configuration manager), re-boot of a device or the system after a failure, differentiation between mandatory and optional devices, hot-swapping of devices, etc. The software supports devices according to CANopen versions 3 and 4. In addition, the NMT master also has an automatic boot-up procedure. The current system configuration is independently determined and both process data image and the network variables are automatically created. Node monitoring is carried out either by node guarding or heartbeat. The NMT master can be completely configured via object entries according to CiA 302. The master functionality can be switched off at run-time, allowing the device to also work as a CANopen slave.

PROCESS (PDO) & SERVICE DATA OBJECTS (SDO)

The PDOs support the transmission modes asynchronous (as an option with event timer), synchronous (cyclically and acyclically) and on request (RTR). For the PDO Mapping, byte-granularity is the standard. Dummy mapping is also available, as well as variable inhibit times. Objects can be entered in several PDOs simultaneously. SDOs are available both as Client- and as Server-SDOs and support the transfer types expedited, non-expedited (segmented). The number of SDOs and PDOs which can be used is limited only by the resources available.

LOCAL OBJECT DICTIONARY

The CANopen Manager Software implements its own object dictionary. This contains object entries specified in CiA 301 and the management of network variables according to CiA 302 and CiA 405. In addition, entries according to CiA 302 are available for the configuration of the NMT master. This enables the complete configuration of the CANopen manager via the network. The application program can also access the local object dictionary via the client SDO interface. In this way a configuration can be implemented via local user interfaces (e.g. display or serial interface).

CONFIGURATION MANAGER

The configuration manager is a central functionality for the automatic configuration of CANopen slave devices within the system. According to CiA 302, the configuration manager stores the configuration data of slave devices. When starting slave devices, these can be parameterized automatically. This enables both the easy servicing and simple replacement of defective devices in a system. Non-volatile memory is required for storing the configuration data.

SUPPORT OF IEC611631-3 RUN-TIME SYSTEMS

Both the data interface and the program structure allows for the simple integration of the CANopen Manager Software with PLC run-time systems such as ProConOS from KW-Software.

SCALABILITY & HARDWARE SPECIFIC ADAPTION

Adaptation of the CANopen Manager Software to the hardware is done in a central file. The resource requirements can also be controlled and adjusted via a configuration file, for example by adapting the size of the process image, the number of available TPDOs, RPDOs, network variables and of client or server SDOs to the applications requirements. Furthermore, the configuration file determines which function units of the CANopen Manager Software should be present in the executable that will be installed on the target hardware.

IMPLEMENTATION

The CANopen Manager Software is delivered as C source code. The documentation and the example program included in the delivery enable a quick start with the software package.

SUPPORTED PROCESSORS, CAN-CONTROLLER & COMPILER

The software package is supplied as standard C code and can therefore be run on a wide range of processors.

An overview of the supported micro controllers is on our website.

CONTENTS OF DELIVERY

- Source code
- Software license
- Detailed manual
- Example programs
- Technical support

SUPPLEMENTARY SERVICES
(not included in contents of delivery)

Maintenance agreement
IXXAT offers a maintenance agreement to supplement the software package. The maintenance agreement consists of the following services for the duration of the agreement:

- Free updates
- Technical support, including general questions concerning CANopen

ORDER NUMBER
(Versions on request)

1.02.0175.TTDDC	CANopen Manager Software – Product licence

CANopen RealTime Software

▶ **CANopenRT – Real-time-capable CANopen Software for the Development of CANopen Devices**

HIGHLIGHTS

- Comprehensive range of functions based on the CANopen specification CiA 301
- Enables quick and easy development of CANopen devices (slave and master)
- Modular software structure with comprehensive configuration and scaling possibilities
- Integration in the operating system of the target system with universal interface
- Easy portability to alternative micro controllers and CAN controllers
- Multi-channel support
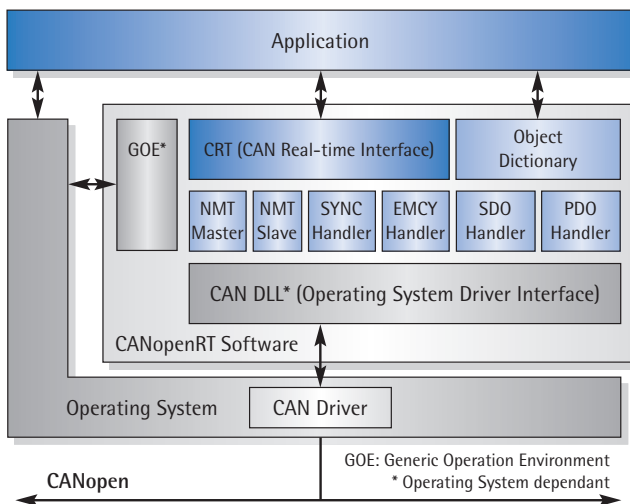
FUNCTIONAL OVERVIEW & SOFTWARE ARCHITECTURE

The CANopenRT software contains all functions necessary for implementing slave or simple master devices according to the CANopen specification CiA 301.

In the CANopenRT software package, a central CANopen task is responsible for processing all protocol related functions and services. This task is triggered as soon as there are pending tasks, and, processes only these tasks.

PROGRAMMING INTERFACE & OBJECT DICTIONARY

The CANopen Real-Time Interface (CRT) is the programming interface between the application tasks and the CANopen protocol stack. The CRT implementation is based on mailboxes, allowing for a non-blocking internal communication. An application may consist of several tasks which can use the CRT independently of each other. Data is exchanged between application and CANopen software via the object dictionary. Each object dictionary entry can be directly allocated a variable reference with application data. In a similar fashion, each application object can also be allocated a user-specific call-back function. This allows for fast, event-controlled reaction of the application when these objects are accessed. Simultaneous access to the data of the object dictionary by the application and CANopen software is controlled by semaphores.

PROCESS- (PDO) & SERVICE-DATA-OBJECTS (SDO)

The CANopenRT software supports the PDO transfer types asynchronous, synchronous and on request. PDO-mapping can be realized either statically or dynamically. In addition multiplex-PDO, dummy mapping and variable inhibit time are available. Objects may be mapped into several PDOs simultaneously. For SDOs, the transfer types expedited, non-expedited (segmented) and block transfer are supported.

MASTER FUNCTIONALITY & NETWORK MANAGEMENT

The CANopenRT software supports the boot-up message introduced with version 4 of the CANopen specification. It provides supports for all network services including node guarding with or without life guarding (master monitoring), and heartbeat with producer monitoring as defined in CiA 301. Functionality, such as control of the system boot-up, automatic download of configuration data and specific reaction to node failures is not included but can be implemented by the user based on the available NMT services.

OPERATING SYSTEM SUPPORT

All operating system services are encapsulated in virtual OS calls, which are contained in a central module (Generic Operating Environment, GOE). The CANopenRT software can be easily adapted to alternative operating systems. Only the support for semaphores and mailboxes, or message queues, is required.

IMPLEMENTATION WORK

The CANopenRT protocol software is delivered as a hardware-independent, standard C-source code. The documentation and example programs supplied with the software allow for a quick start with the CANopen software. If the operating system used has its own CAN driver, a wrapper for this driver is required to adapt the native driver interface of the operating system to the driver interface expected by the CANopenRT software package.

IXXAT

The CANopenRT Protocol Software is available in slave master/-slave versions. The master/slave package covers the complete range of functions and may be used for the development of both pure slave devices and simple master devices. The CANopen functionality available with the CANopenRT software fully corresponds to that available with the CANopen Protocol Software.

SUPPORTED OPERATING SYSTEMS

IXXAT directly supports the CANopenRT software package on a number of different operating systems. In addition optimized versions for other operating systems are available directly from the manufacturer of those systems. Please consult the IXXAT home page for an up-to-date list of supported target operating systems.

CONTENTS OF DELIVERY

- Source code
- Software license
- Detailed manual
- Sample programs
- Technical support

OTHER SERVICES
(not included in contents of delivery)

Maintenance agreement
IXXAT offers a maintenance agreement to supplement the software package. The maintenance agreement consists of the following services for the duration of the agreement:

- Free updates
- Technical support, including general questions concerning CANopen

ORDER NUMBER
(includes both single and multi-channel versions)

| 1.02.0212.xxxxx | CANopenRT Slave Software |
| 1.02.0214.xxxxx | CANopenRT Master/Slave Software |

CANopen Maritime Software

▶ **CANopen Maritime – Software for the development of CANopen devices for maritime applications and areas of application which require redundant communication mechanisms according to CiA 302.**

Building on many years of experience with CANopen based communication systems, IXXAT has developed a specification for CANopen applications in the maritime sector and the CANopen Maritime Software in cooperation with leading manufacturers of maritime automation systems.
The software package implements the CANopen framework for maritime electronics, CiA 307, and is specially designed for the increased safety requirements in maritime automation. The requirements of maritime classification organizations demand a single point of failure tolerance of the communication system. This is supported via the redundant communication on two independent CAN lines and by the flying master concept.

HIGHLIGHTS

- Comprehensive range of functions based on the CiA 307 CANopen framework for maritime electronics, CiA 301 CANopen application layer and communication profile, and CiA 302 CANopen additional application layer functions
- Enables quick development of CANopen Maritime slave or master devices
- Modular software structure with comprehensive configuration and scaling capabilities
- Clearly structured, simple programming interface for integration in application programs
- Easy portability to alternative micro controllers and CAN controllers

CONTENTS OF DELIVERY

- Source code
- Software license
- Detailed manual
- Sample programs
- Technical support

ORDER NUMBER

| 1.02.0280.00000 | CANopen Maritime Software Slave product line license (Maintenance contract required) |
| 1.02.0281.00000 | CANopen Maritime Software Master/Slave product line license (Maintenance contract required) |

CANopen Master API

▶ **Software package for the development of CANopen service and test applications under Windows**

FUNCTION OVERVIEW

The CANopen Master API is a software package targeted at rapid development of CANopen master applications on a PC using Windows.

The software package consists of two components: The CANopen master software (firmware) for an active IXXAT CAN interface, and, a programming interface in the form of a Windows DLL. The firmware implements a complete CANopen master and manages the CANopen communication processes completely independently, leaving the PC available for the application program.

The application accesses data of remote CANopen devices via a function interface which supports both SDO and PDO services. Compared to an intermediate data storage in form of a local object dictionary, the advantage of this approach is that the data is immediately available to the application and can be directly processed without introducing any further latencies.

The application thus has full control of all CANopen services which allows the user to also implement complex control algorithms. Therefore, the CANopen Master API is suitable for both the development of control programs and for the implementation of service and test programs.

FUNCTIONALITY

- Transmitting and receiving of client SDOs with unlimited data length (expedited, non-expedited, block transfer)
- Transmitting and receiving PDOs (synchronous and asynchronous)
- Receiving emergency messages
- Transmitting sync messages
- Transmitting the time stamp message
- NMT master functions for control of boot-up and node guarding or heartbeat

SUPPORTED CAN INTERFACES

An application program based on the CANopen Master API can be used without modifications on various active IXXAT CAN interfaces. The CANopen Master API supports multiple CAN boards in parallel, and depending on the hardware, up to two independent CAN channels per card.

Currently the following IXXAT CAN interface modules are supported under Windows 2000/XP/Vista:

- iPC-I 165 (ISA)
- iPC-I 320/PCI
- iPC-I XC16/PCI and iPC-I XC16/PCIe
- tinCAN161
- USB-to-CAN II
- USB-to-CAN compact
- CAN@net II

CONTENTS OF DELIVERY

- CANopen Master API software
- Run-time license for one installation
- Manual, demo applications
- Technical support

ORDER NUMBER

1.02.0132.00000	CANopen Master API

IXXAT

CANopen Manager API

▶ **Software package for the implementation of complex PC-based CANopen control solutions**

Combined with the iPC-I XC16/PCI or iPC-I XC16/PCIe CAN interface card, the CANopen Manager API represents an ideal basis for the implementation of complex PC-based CANopen control solutions. This package is also suitable for integration with IEC 61131-3 runtime environments based on Microsoft Windows PC-platforms. Since the CANopen protocol mechanisms are processed on the CAN interface card's micro controller, the full PC processing capacity is available to the application.

HIGHLIGHTS

- Full CANopen master functionality including support of the standardized boot-up procedure
- Automatic configuration of devices on system start-up thanks to integrated configuration manager
- Local object dictionary with integrated management of network variables including the option to create application specific objects
- Support of CANopen slave devices in accordance with CiA 301 versions 3 and 4
- Support for hot-swap of CANopen devices in a running system
- Simple integration of the application program via a Microsoft Windows DLL with C function interface
- Communication between PC application and firmware via process data image, command interface and diagnostics interface
- All functions can parameterized locally via the object dictionary

FUNCTION OVERVIEW

The IXXAT CANopen Manager API provides a comprehensive application programming interface for a CANopen manager which is running locally on the micro controller of the supported IXXAT CAN interface. Every effort has been made to provide the full scope of functionality to the PC application. Thus, the PC application has full control over the process of network initialization and the slave boot-up process.

The programming interface implemented by CANopen Manager API is divided into function categories. Each category covers a clearly defined section of the overall functionality provided:

- Basic functions for initialization, software or hardware configuration
- Functions for network management
- Functions for management of the local object dictionary and for running SDO services
- Functions for data exchange by means of process data image
- Functions for state monitoring and diagnostics

DATA INTERFACE AND PROCESS MAP

The exchange of process data with the application program is carried out via a data interface. This allows a complete decoupling of application and communication software. The data interface consists of the following areas:

Process data image:
I/O data and other process parameters received and to be transmitted via PDOs are transferred from the application to the CANopen manager and vice versa via the process data image. The organization of the process data image is in accordance with CiA 302 and CiA 405 by means of network variables.

Command interface:
The command interface provides the application with all functions for the control of the CANopen manager. These include commands for initialization and checking of the device and system state.

Client-SDO interface:
This interface allows access to remote slave devices from the user application.

Event interface:
The CANopen manager is informed of important events in the device and the system via this interface.

Diagnostics interface:
This interface allows the application to obtain information at any time on the state of all devices in the system.

NMT MASTER

The NMT master implemented in the CANopen manager is able to control and monitor up to 126 slave devices. The system is started according to the standardized boot-up procedure defined in CiA 302. Automatic download of configuration data, restart of a device or of the system in the event of a fault or after failure of the device is also available. Device monitoring can either be carried out via node-guarding or heartbeat. The NMT master can be configured completely via object dictionary entries in accordance with CiA 302. In addition, the NMT master supports an automatic configuration mode. This automatically determines the current system configuration and automatically creates the process data image and network variables.

IMPLEMENTED SPECIFICATIONS

- CiA 301 – CANopen application layer and communication profile
- CiA 302 – CANopen additional application layer functions
- CiA 405 – CANopen interface and device profile for IEC61131-3 programmable devices

SUPPORTED TARGET HARDWARE & OPERATING SYSTEM

- Windows 2000/XP/Vista, iPC-I XC16/PCI or iPC-I XC16/PCIe interface board

CONTENTS OF DELIVERY

- CANopen Manager API software
- Run-time license for one installation (basic license required)
- Manual
- Technical support

ORDER NUMBER

1.02.0135.00000	CANopen Manager API (Software Development Kit)
1.02.0134.00000	CANopen Manager API (Run-Time Licence)

CANopen ConfigurationStudio

▶ **Project Management and Configuration Tool for CANopen Devices and Systems**

OVERVIEW

The CANopen ConfigurationStudio is a powerful tool for project management and configuration of CANopen devices and systems. Special features of the tool include an user friendly interface, modularity and the underlying database concept. Based on a client-server structure, the tool is extremely flexible and can be customized using various program modules (client modules).
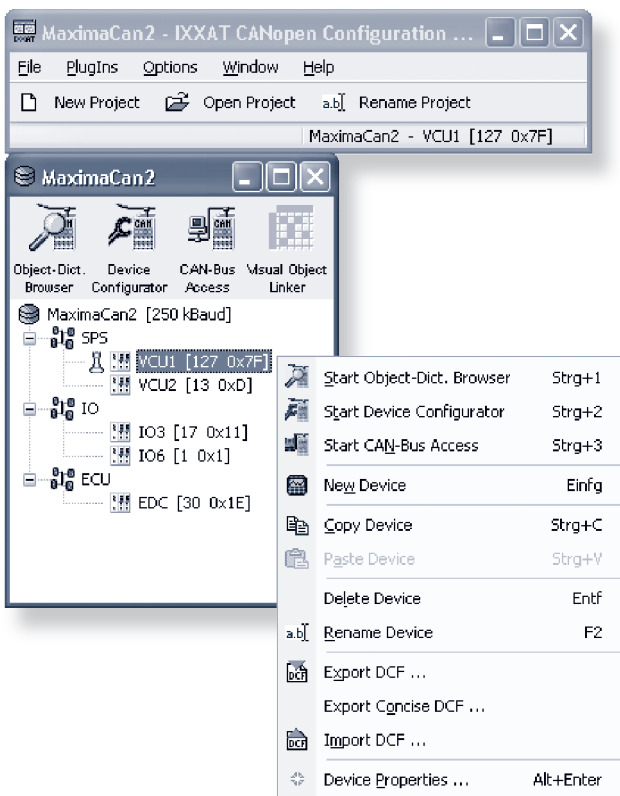
CANopen ConfigurationStudio

The range of applications of the CANopen ConfigurationStudio stretches from an easy to use device configuration tool which allows the user to comfortably manage and configure CANopen devices to a complex network configuration tool with automated PDO mapping and linking functions.

For entry-level users of CANopen devices and systems, the program offers client modules, which allow network configuration directly on the application level and hide all CANopen configuration data, such as PDO mapping, and the assignment of CAN identifiers. In this scenario, the user is only responsible for connecting input and output, or I/Os with network variables. The CANopen ConfigurationStudio is also prepared for integration with programming environments of CANopen PLCs.

The basis of the ConfigurationStudio is a database-oriented management of all configuration and device data required by the user. A very fast import function loads new device data from corresponding EDS files into the database.

CANopen devices and systems are configured using various client modules with different functionality. Access of the CAN bus is possible via an integrated CANopen client module, which also provides NMT and LSS functionality.

HIGHLIGHTS

- Automated PDO mapping and linking
- Support for network variables according to CiA 302 and CiA 405
- Configuration of CANopen manager devices according to CiA 302
- Structured and simple access to device data
- Prepared for integration with IEC 61131-3 CANopen PLC programming environments
- Fast database-oriented management of all configuration and device data from EDS and DCF files

FUNCTIONALITY

Project window
In the project window, the CANopen system is displayed in a concise tree structure in which devices can be grouped according to their respective functionalities. The project window also starts the corresponding client modules for a selected device, device group, or network. It is also possible to work on any number of project windows simultaneously.
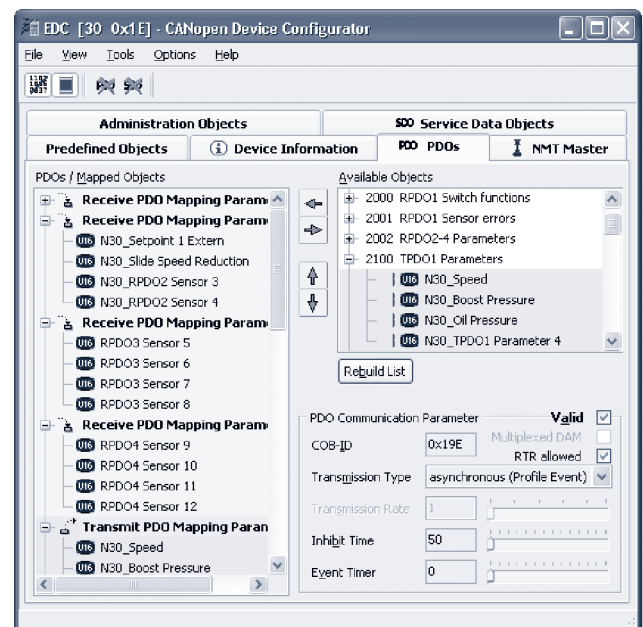
CANopen Device Configurator

Editing individual device records

To manually edit the configuration data for a CANopen device, the program provides two client modules, the object dictionary browser and the device configurator.

The device configurator presents the communication area (1000h-1FFFh) data in concise and easy to use input masks. The user no longer has to know the index and sub index designations or data formats of individual records. Instead, the desired values can be entered directly via radio buttons, check boxes and sliders. PDO mapping is accomplished with a drag & drop feature.

The object dictionary browser displays the object dictionary of a selected device in an easy to understand tree structure with index, sub index and object names. When an object is selected, all associated attributes are displayed, and the current value of the object can be modified.

Automatic PDO mapping and PDO linking

When dealing with larger systems, special knowledge is required for manual PDO mapping and linking, and the careful selection of PDO connections becomes very time-consuming. The object linker offers a significant improvement by supporting fully automated mapping/linking of PDOs in only a few steps. All devices used in the project are presented in a matrix, sorted according to input and output data. The desired connections between input and output devices are presented in the matrix with flags and are automatically calculated by the object linker.
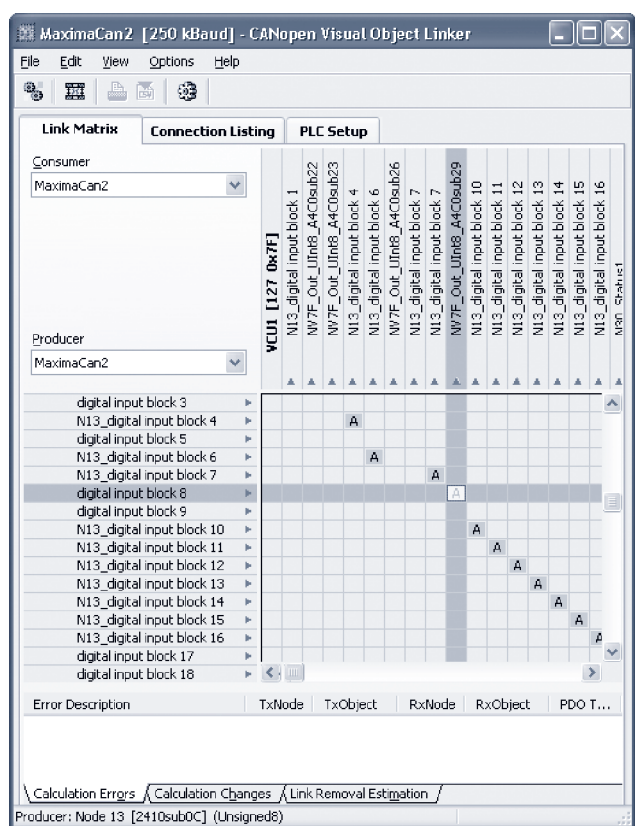
CANopen Visual Object Linker

Network variables according to CiA 302 and CiA 405

Another feature of the object linker is the support for devices implemented according to CiA 405. These devices constitute CANopen PLCs with programming environments according to IEC61131-3. The object linker allows any network variable definition according to the dynamic channel descriptions contained in the EDS files. Network variables provide the interface between the data contained in the CANopen system and the actual program within the control. Network variables can be created manually or by using the drag & drop functionality. The defined network variables may be connected with actual input and output data in the matrix. In this case, the object linker is also responsible for calculating PDO mapping of the control.

Integration of PLC programming environments according to IEC61131-3

You can integrate PLC programming environments in one of two ways: either by exchanging DCF and NVX files as defined in CiA 405, or, by directly connecting the programming environment with the database server. The second solution requires modification to the programming environment, but, it has the advantage that the programming tool can immediately read and write the necessary data to and from the database. In addition, the tool can save its own data, such as source code, binary code or project information, in the database.

Bus access, NMT and LSS functionality

CANopen network access is used to download device and system data. This client module establishes a connection between the ConfigurationStudio and the CAN network via an IXXAT CAN interface card. This enables you to load data that has been edited offline into the CANopen devices on the CAN bus. You can also load the current configuration of a device connected to the bus into the database, or compare it with the configuration contained in the database.
Also available are functions for starting and stopping a system, performing system scans to determine existing nodes, functions for calling on the store, restore function of a device, functions to start/stop/reset PLC programs, and LSS functions for parameterization of bit rate and node number of a CANopen device are available.

HARDWARE REQUIREMENTS

- IXXAT CAN interface card and VCI V3 CAN driver

CONTENTS OF DELIVERY

- Software for Windows 2000/XP/Vista
- Single-user license
- Manual

ADDITIONAL INFORMATION

A free demo version of the of the ConfigurationStudio is available on the IXXAT homepage.

ORDER NUMBER

1.02.0162.00000	CANopen ConfigurationStudio

![IXXAT]

CANopen Configuration Framework

▶ **Component for integration of a projecting and configuration function for CANopen systems in OEM tools**

The CANopen Configuration Framework allows for the integration of projecting and configuration functionality into OEM tools such as PLC programming environments while maintaining a uniform look and feel.

The framework provides all the necessary components and mechanisms required for creation and management of configuration data of a CANopen project. The framework itself is shipped without user interface components which have to be provided by the user. This offers the following advantages: all system data is centrally accessible in the interface and may be centrally edited, the OEM tool has a uniform look and feel, and, CANopen-relevant configuration data can be displayed to the user at system level in abstracted form.

The CANopen Configuration framework is based on fast, database-oriented management of all configuration and device data. Data of new devices is either taken from a device catalog or imported into the database from the CANopen device description files (EDS files) via a fast import function and is then available in binary form. The advantage of this concept is the fast availability of all configuration data which is normally only stored in independent device description files.

HIGHLIGHTS

- Automatic PDO-mapping and PDO-linking
- Support of network variables in accordance with CiA 302/CiA 405
- Clear and simple access to the device data
- Fast, database-based management of all configuration and device data from device description files
- Management of any number of device description files in one catalogue
- COM-based interface for integration in OEM tools

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DESCRIPTION OF FUNCTIONS

Catalog

A catalog system enables device description files to be imported and stored in a database. This is useful if CANopen devices are used repeatedly in projects as they can then be selected directly in the catalog and added to a project. It is also possible for an OEM to define which CANopen devices the customer may use in OEM systems, thus preventing the customer from using unauthorized devices.

Project database

Projects are managed in the form of a database. This means that the data and descriptions of the individual devices are stored in binary form, allowing for faster access to this data when opening the projects or when opening projects with a large number of devices. In addition, the project database insures consistency of the data.
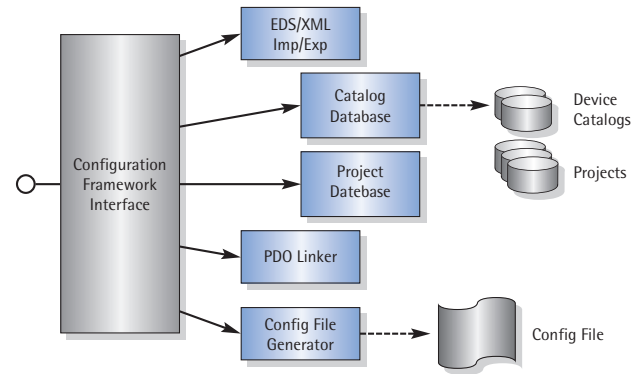
Automatic PDO-mapping and PDO-linking

For larger systems, the specialized knowledge required for PDO-mapping/linking and the time-consuming, careful selection of the individual PDO links requires great effort. The CANopen Configuration Framework supports the creation of PDO mappings and correct allocation of PDOs to the devices (PDO linking) by means of an automated system. This allows to create I/O links without detailed knowledge of CANopen.

Network variables in accordance with CiA 302/CiA 405

Another function provided by the CANopen Configuration Framework is the definition and management of network variables in accordance with CiA 302 or CiA 405. Network variables are used by devices that provide data of an application running on the device to the CANopen system in the form of a process data interface. With network variables it is possible to link the data (variables) of the application program with data of other devices. Based on these links, the Configuration Framework can then automatically calculate the PDO-mapping and PDO-linking.

Import/export of device description files (EDS/DCF)

A powerful and fast import and export of device description files enables importing and exporting of devices to and from the catalog and exporting of configuration data of individual devices from a project. Even very large device description files are processed quickly and, the file size is not limited.

Generation of configuration data files

After completion of projecting or configuration of a CANopen system, the CANopen Configuration Framework creates a configuration data file. This configuration data file is then normally sent to the CANopen manager (master). Based on the configuration file the CANopen manager configures itfelf and passes the embedded configuration data on to the individual devices in the CANopen system during the system boot-up. The configuration data file is created in the Concise DCF format.

Programming interface

The programming interface of the CANopen Configuration Framework is implemented as a COM interface. It provides various interfaces for the management of the catalogue, of the projects and of the individual devices in a project. This enables simple integration of the CANopen Configuration Framework in OEM tools.

System requirements
- Windows 2000 with SP4 or Windows XP with SP2

ORDER NUMBER

On request	CANopen Configuration Framework

47

IXXAT

CANopen Device Manager

▶ **Powerful service and diagnostics tool for service staff and developers**

The IXXAT CANopen Device Manager is a versatile and upgradeable tool aimed at device test, diagnostics, and field service tasks. Built around a central component that manages the CANopen services while serving as the primary entry point for network definition, the CANopen Device Manager covers functionality like NMT node and error control, SDO client (including block transfer with CRC), PDO producer and consumer, SYNC and time stamp producer. It also offers concise DCF and firmware download according to CiA 302, LSS master according to CiA 305, and, as an optional add-on, a Python-based scripting engine that allows the development of powerful test applications.
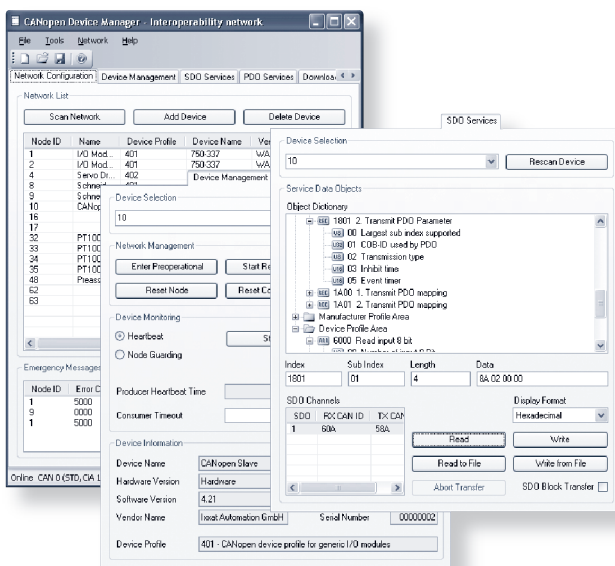
CANopen Device Manager

HIGHLIGHTS

- Comprehensive CANopen functionality including NMT node and error control services, SDO client, PDO consumer and producer
- Support for SDO block transfer
- LSS master functionality according to CiA 305
- Configuration and firmware download according to CiA 302
- Customized plug-in modules covering dedicated diagnostics or service functionality
- Optional Python based scripting engine that allows the implementation of even the most complex user applications

PLUG-IN MODULES

The highlight of the IXXAT CANopen Device Manager is the support for plug-in modules that can be tailored to specific requirements of CANopen devices and systems. Plug-in modules can be dynamically installed at run time and can integrate seamlessly with CANopen Device Manager. They may either implement a high-level abstraction of functionality as described in the CiA device profile specifications, or, provide an entirely customized graphical user interface optimized for the specific requirements of device commissioning or maintenance tasks performed by a service staff.

SDO SERVICES

Direct device access is supported by means of SDO (normal, expedited, and block transfer). From the user point of view, SDO access to the device is considerably simplified by an object dictionary browser. Large data blocks can be directly written to or read from a file, and can be optionally displayed in a separate dialog with both ASCII and hexadecimal representation.

PDO SERVICES

The CANopen Device Manager supports PDO read and write services as specified in CiA 301. During a device or a network scan, all possible PDOs of the detected devices are uploaded and both communication and mapping parameters are displayed in the form of a summary list. To allow for diagnostics and testing of synchronous PDO transmission, the CANopen Device Manager supports single-shot or periodic generation of SYNC message according to CiA 301, with adjustable time periods of 1ms.

SCRIPT ENGINE

One of the most prominent features of CANopen Device Manager is the availability of an optional script engine supporting Iron-Python. IronPython is an implementation of the widely used Python language that supports full integration with Microsoft's .Net Framework. This allows the user to implement complex, graphical user interface-based test or service applications.

SYSTEM REQUIREMENTS

- Microsoft Windows 2000/SP4, Windows XP/SP2
- Microsoft .Net Framework 2.0
- IXXAT CAN interface card and VCI V3 CAN driver

CONTENTS OF DELIVERY

- Software for Windows 2000/XP as single-user license
- CodeMeter USB License key
- User Manual

ORDER NUMBER

1.02.0157.00000	CANopen Device Manager
1.02.0158.00001	Python Script Engine for CANopen Device Manager

Device Description Editor

▶ **Tool for the easy creation and maintenance of CANopen or Powerlink device description and configuration files**
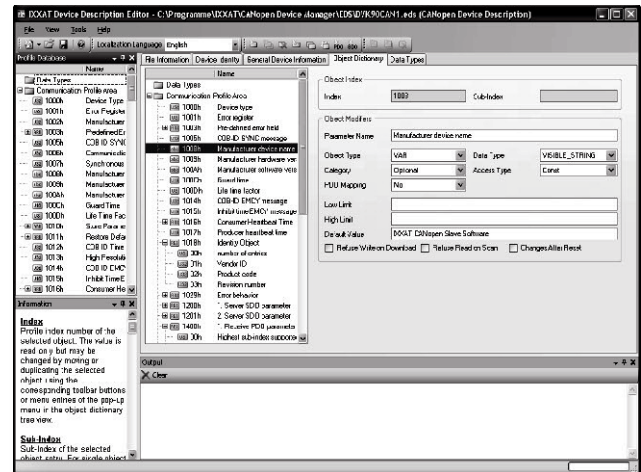

Device Description Editor

OVERVIEW

The IXXAT Device Description Editor is a software tool that allows the easy generation and maintenance of CANopen device description or configuration files according to the well established CiA 306 Electronic Data Sheet specification as well as the new CiA 311 CANopen Device Description specification, which has been published in 2007. Also supported is the processing of Powerlink device description and configuration files according to EPSG DS 1311. An effective user interface provides device suppliers and system integrators with all functions required to create or edit existing EDS or XDD files. All inputs are evaluated for compliance with the CANopen respectively Powerlink specifications, to prevent generation of incorrect device description or configuration files.

The program window serves as central workspace, where parameters that need to be specified are categorized in dedicated tab pages according to the related device description information. In the object dictionary tab page the description of individual object entries is supported by dedicated input masks and a template library that may be preloaded with profile database files as used by the official CiA EDS checker. Additional tab pages assist with the description of file and device information sections. Also supported is the efficient localization or creation of multi-lingual device description files, a feature that became available with the new XML based CiA 311 specification.

Additionally, device description files may be converted between the traditional EDS file syntax, as specified in CiA 306, and the new XML based syntax, introduced with CiA 311.

The IXXAT Device Description Editor is an indispensable software tool for all suppliers and users of CANopen or Powerlink systems, who are involved in the creation and maintenance of device description files.

SYSTEM REQUIREMENTS

- Microsoft Windows 2000/SP4, Windows XP/SP2
- Microsoft .Net Framework 2.0

CONTENTS OF DELIVERY

- Software for Windows 2000/XP
- CodeMeter USB License key
- User Manual
- Single-user license

ORDER NUMBER

1.02.0165.00000	Device Description Editor

DeviceNet
Slave Protocol Software

▶ **Software Package for the Development of DeviceNet Slave Devices**

FUNCTION OVERVIEW

The DeviceNet Slave Protocol Software allows an easy and quick development of DeviceNet devices. All communication mechanisms defined in the DeviceNet Specification are supported, allowing the developer to concentrate entirely on the actual application.

The modular structure of the protocol software allows an optimum implementation into the target system. The software package can be adjusted to the application requirements through the use of a configuration file. The available DeviceNet objects and functions can be extended individually, new user-defined objects can be created and specific device profiles can be developed.

A separate module contains all the CAN interface functions required to access the CAN controller, allowing the user simple adaptation to CAN controllers that are currently not supported by the software. The data transfer to and from the CAN controller is managed through the use of queues in order to separate the interrupt level from the program level.

The DeviceNet Slave Protocol software is delivered as C source code. Each version is tested for compliance by using the most current ODVA DeviceNet Protocol Conformance Test Software.

The comprehensive documentation and sample program provided allow users to quickly become comfortable utilizing the DeviceNet software. The sample program will immediately run on a reference platform (i.e. CPU manufacturer evaluation board or IXXAT PC/CAN interface). By referencing the sample program, any adjustment of the code to meet the requirements of the target hardware can usually be achieved within a few days.

FEATURES

The DeviceNet Slave Protocol Software supports the development of Group-2-Only Servers and Group-2 Servers according to the ODVA DeviceNet Standard.

Classes
- Identity Object Class
- Message Router Object Class
- DeviceNet Object Class
- Assembly Object Class
- Connection Object Class
- Acknowledge Handler Object Class

DeviceNet Message Body Format
- 8/8 (8-bit Class ID and 8-bit Instance ID)

Fragmentation Protocol
- Support of the Fragmentation Protocol for all Explicit Messages and I/O Messages

Predefined Master/Slave Connection Set
- Explicit Messages
- I/O Messages
  - Poll
  - Bit-Strobe
  - Change of State/Cyclic (unacknowledged/acknowledged)

Unconnected Message Manager Port (UCMM Server)
- Dynamic Explicit Messages in Message Group 1 and 3

Peer to Peer I/O Nachrichten
- Dynamic I/O Messages in Message Group 1

Further Message Types
- Device Heartbeat Message (Producer)
- Device Shutdown Message (Producer)
- Offline Connection Set

User-specific Hardware Interface
- Switches for MAC ID and baud rate
- Module Status LED, Network Status LED or combined MN Status LED as well as I/O LED

The resources of the target hardware must include a timer interrupt for the protocol timing as well as a CAN controller interrupt.

SUPPORTED TARGET SYSTEMS

The DeviceNet slave protocol software is available for various microcontrollers from Infineon, Intel, NXP, Atmel, Freescale and others.

A list of the currently supported microcontrollers and development tool chains can be found under
www.ixxat.de/devicenet_stack_available_versions_en.html

An adaptation of the DeviceNet software to other target systems can be done by using the standard C code within a few days. This adaptation can also be done by IXXAT.

CONTENTS OF DELIVERY

- Source Code
- Company license (limited to company location or business units)
- Extensive manual
- Sample program
- Technical support

Please request our expanded "DeviceNet Software Description".

(not included in contents of delivery)

Service Contract
In addition to the software package IXXAT offers a service contract. During the contract period IXXAT provides the following services:

- Free updates and bug elimination
- Technical support via telephone, including answering all questions regarding general DeviceNet issues.

Code Introduction
One or two days of detailed introduction to the code. Interfaces, flow charts and data exchange inside the DeviceNet software will be explained. In addition, any questions addressing possible adaptation issues will be answered and, if necessary, code will be modified accordingly.

Supporting the Conformance-Test
We will conduct preliminary DeviceNet Protocol Conformance Test using the official ODVA software within IXXAT. Potential errors can be detected and corrected prior to the official test at the ODVA test labs.

Technical Consulting
Support during the specification of the DeviceNet device or system prior to the actual development. Our clients benefit from our applied expertise in regard to DeviceNet, helping them to avoid errors and achieve superior solutions in a shorter period of time.

Implementation Support
IXXAT offers adaptation, implementation and testing of DeviceNet software to meet the requirements of both your hardware and application.

Seminars
IXXAT offers a DeviceNet-Seminar. If requested, the seminar can also be held on-site.

ORDER NUMBER

1.02.0118.TTDDC	DeviceNet Slave Protocol Software (Variants on request)

DeviceNet
Master Library (DML)

▶ **Software Package for the Development of DeviceNet Master and I/O Scanner Devices**

FUNCTION OVERVIEW

The DeviceNet Master Library is a software package offered by IXXAT as a Value Added Design Partner (VADP) of Allen-Bradley / Rockwell Automation.

The software facilitates the development of DeviceNet Master and I/O Scanner devices used in industrial controls for DeviceNet. The configuration of the scanner with RSNetWorx for DeviceNet is supported.

The modular structure of the protocol software allows an optimum implementation into the target system. A separate module contains all CAN interface functions in order to access the CAN controller, thus providing the user easy adaptation to CAN controllers that are currently not supported by the software.

The DeviceNet Master Library is delivered as source code. The documentation allows a quick start using the software.

FUNCTIONALITY

Master/Scanner-Functions
- Simultaneous Operation of Master and Slave
- Background Polling for low-priority nodes
- Flexible Bit-Mapping of I/O Data on up to 4 Memory Segments
- Shared Inputs between several scanners allows shared access to the input data of a node without additional I/O connections
- Supports multiple Identity Object Instances and Applications Objects on the host side

User-specific Hardware Interface
- Prepared interface for various CAN controllers

Configuration and Diagnosis
- Supports Generic Scanners
- Configuration with RSNetWorx for DeviceNet by means of EDS File
- Access to internal data structures possible from both the host and network side
- Firmware Upload and Download

CONTENTS OF DELIVERY

- Software package in source code
- Original Allen-Bradley documentation
- Company license
- Technical support

ORDER NUMBER

1.04.9240.00001	DeviceNet Master Library (DML)

IXXAT

ODVA DeviceNet
Conformance Test Driver

▶ **Driver for ODVA DeviceNet Protocol Conformance Test Software**

FUNCTION OVERVIEW

The driver enables the use of the ODVA DeviceNet Protocol Conformance Test Software on the IXXAT PC/CAN interfaces. It is supplied as an add-on to the universal IXXAT CAN driver VCI (Virtual CAN Interface). A list of the supported IXXAT PC/CAN interfaces can be located at
www.ixxat.de/overview_software_support_en.html

SYSTEM REQUIREMENTS

- Windows XP or Vista
- IXXAT VCI V3
- ODVA DeviceNet Protocol Conformance Test Software
  (available at the ODVA http://www.odva.org)

CONTENTS OF DELIVERY

- Driver software on CD-ROM

ORDER NUMBER

1.02.0260.00000	Driver for ODVA DeviceNet Protocol Conformance Test Software

SAE J1939
Protocol Software

▶ Software Package for the Development of J1939 Devices

The SAE J1939 protocol software enables a simple, fast development of SAE J1939 devices. All communication mechanisms defined in the SAE J1939 specification are available (except for the bridge functionality), so that the developer can concentrate fully on his or her application.

As the user interface is designed as a universal message-based function interface, the protocol stack can be universally used and is therefore also the basis for other protocols such as NMEA 2000 and ISO 11783 (ISOBUS). In addition, it is possible to adapt the stack to the message defined in the standard J1939/71 and therefore to work on variable/signal level via generatable mapping functions and macros.

This is made possible via a graphic configuration tool which, in addition to generation of the mapping functions, permits the complete configuration of the stack as well as the generation of a template file for the application. In addition, a plausibility check of all configuration parameters ensures that configuration errors of the user are avoided.

The documentation and sample programs provided enable a fast start-up with the SAE J1939 software. All sample programs are directly executable on a reference platform (evaluation board of the CPU vendor or IXXAT PC/CAN interface card). Normally, porting can be carried out on the target hardware within a few days.

The modular structure of the protocol software based on the OSI layer model allows an optimum adaptation to the individual target system.

FUNCTIONALITY

- Transmission and reception of application-specific messages (acknowledged and unacknowledged).
- Treatment of transport protocols for large data blocks (message- and subscriber-oriented).
- Simultaneous communication to several subscribers
- Support of the "address claiming" process for the dynamic definition of the node address
- Support of cyclic transmission and reception of messages with time-out supervision

The target hardware has to provide one free timer interrupt for time monitoring of the protocol as well as an interrupt line of the CAN controller.

VARIANTS OF THE SAE J1939 SOFTWARE

The SAE J1939 software is available in two variants:

The Micro variant is optimized for use on 8-bit CPUs with very limited RAM resources. Here the software is configured completely statically by generated files via the configuration tool. As in this case all configuration parameters can be placed in the Flash memory, the RAM requirement for the SAE-J1939 software is substantially reduced.

The standard variant allows the dynamic configuration of the SAE J1939 software via the function interface and therefore during run-time. This variant supports several software instances (CAN channels) and is also prepared for use with a real-time operating system. However, the software can also be used in an application without an operating system.

SUPPORTED PROCESSORS / CAN CONTROLLERS

The SAE J1939 Software is independent of hardware and can be used on a large number of micro controllers and CAN controllers. For processors of the following manufacturers (valid at time of printing of this catalog), IXXAT supplies reference implementations:

- Atmel
- Freescale
- Infineon
- Microchip
- x86 Architecture

A complete overview of all available versions can be found on the web page under the following link
www.ixxat.com/j1939_stack_available_versions_en.html

Adaptation to SAE J1939 software on processors not directly supported can be carried out with the aid of the standard C code in a few days. IXXAT will be pleased to carry out the adaptations of the SAE J1939 software for you.

CONTENTS OF DELIVERY

- Source code
- Configuration tool with graphic user interface
- Company license (restricted to company location and business field) detailed manual
- Detailed manual
- Sample programs
- Technical support

FURTHER SERVICES
(not included in contents of delivery)

Maintenance contract
IXXAT offers a maintenance contract to supplement the software package. The maintenance contract includes the following services during the contractual period:

- Free updates and troubleshooting
- Technical support

Introduction to the code

One-day introduction to the code. Interfaces, processes and data flows are explained. Direct questions concerning the adaptation to be carried out can also be answered and adaptations to the code can be made.

Implementation support

IXXAT handles adaptation, implementation and testing of the SAE J1939 software to your hardware or application.

J1939 Module

The J1939 module for the IXXAT canAnalyser provides powerful functions for recording, interpretation and analysis of J1939 messages.

ORDER NUMBER

1.02.0285.TTDDC	SAE J1939 Protocol Software (Versions on request)
1.02.0286.TTDDC	SAE J1939 Micro Protocol Software (Versions on request)

SAE J1939
API for Windows

▶ **Windows–DLL with COM interface for the development of J1939 test applications**

FUNCTION OVERVIEW

The J1939 API is a programming interface that enables fast development of J1939 applications on a PC with Windows.
The programming interface is based on the IXXAT VCI (Virtual CAN Interface) driver and is therefore available for all CAN interface cards of IXXAT. The programming interface contains the IXXAT J1939 protocol software and therefore enables full simulation of J1939 applications on the PC.
The COM interface enables the user to program J1939 applications with C/C++ and also all .NET languages. Examples for C++, VB, C# and Python are included in the content of delivery.

Based on the programming interface, several applications can be implemented on one CAN interface which can also communicate with each other. This allows simulation of complete J1939 networks on one PC and is therefore ideal for testing and the commissioning of control units.
The signals of a message (parameter groups) are interpreted based on a configuration file, which can be generated by a configuration program. The configuration program, which is also part of the J1939 protocol software, allows a selection of default messages and also definition of application-specific messages.

FUNCTIONS

- Transmission and reception of J1939 messages (PGs) with up to 1785 bytes payload (Broadcast Announce Message, Connection Mode Data Transfer)
- Automatic conversion of received messages to signals and vice versa
- Use of the database from the J1939 configuration program for signal interpretation
- J1939 plug-and-play functionality via Address Claiming mechanisms
- Support of several CAN channels and therefore J1939 networks possible

HARDWARE REQUIREMENTS

- PC with Windows 2000/XP/Vista
- IXXAT CAN interface card and CAN driver VCI V3

CONTENTS OF DELIVERY

- J1939 API software
- J1939 configuration program
- Single license
- Manual, example applications in C++, C#. VB and Python
- Technical support

ORDER NUMBER

1.02.0287.00000	J1939 API for Windows

CAN Accessories
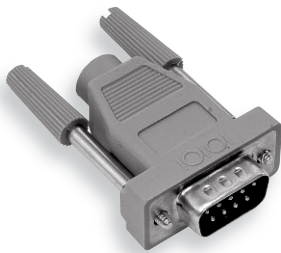
▶ Sub-D9 Connector with CAN Termination

120 Ohm for High-Speed CAN systems according to ISO 11898-2;
SUB-D9 connector; Male to female; Pin assignment 1-to-1;
R_T between pin 2 and 7

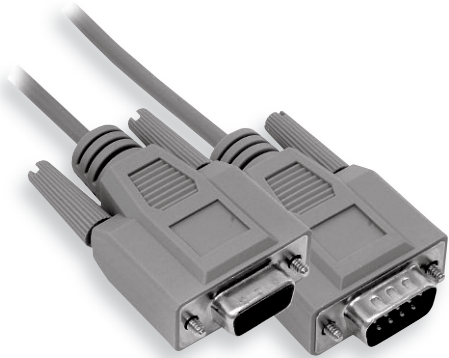| Order number	1.04.0075.03000

▶ CAN Termination (Plug)

120 Ohm for High-Speed CAN systems according to ISO 11898-2;
Male; R_T between pin 2 and 7

Order number	1.04.0075.02000

▶ CAN Termination (Socket)

120 Ohm for High-Speed CAN systems according to ISO 11898-2;
Female; R_T between pin 2 and 7

Order number	1.04.0075.01000

▶ CAN cable

All pins connected; Length 2.0 m;
Sub-D9 plug (1 x F / 1 x M); Shield

Order number	1.04.0076.00180

▶ Y CAN cable

All pins connected; Length 22 cm;
Sub D9 socket to sub D9 socket/plug; Shield

Order number	1.04.0076.00001

IXXAT

▶ Nullmodem cable

Serial cable for CAN@net, CANbridge, LIN2CAN and K2CAN;
2 x Sub D9 socket; Length 2.0 m; Shield

Pin assignment

```
P 1        P 2
 1 ────┐── 7
       └── 8
 2 ─────── 3
 3 ─────── 2
 4 ─────── 6
 5 ─────── 5
 6 ─────── 4
 7 ────┐── 1
 8 ────┘
Shield ──── Shield
```

Order number	2.09.0000.00524

▶ Laplink cable

Serial cable for CANlink II and CANcorder; 2 x Sub D9 socket;
Length 3.0 m; Shield

Pin assignment

```
P 1        P 2
 1 ─────── 4
 2 ─────── 3
 3 ─────── 2
 4 ─────── 1
 5 ─────── 5
 7 ─────── 8
 8 ─────── 7
 9 ─────── 9
Shield ──── Shield
```

Order number	2.09.0000.00168

▶ T bus connector

T bus connector for creating star / tree topologies
in combination with the IXXAT CAN Repeaters

Order number	1.04.0073.00000

▶ Glass fiber cable F–SMA

Duplex; For FO repeater and star coupler; With 2 plugs on each
side; Wavelength 820 nm; Glas fiber 50/125 µm; Attenuation
3 dB/km
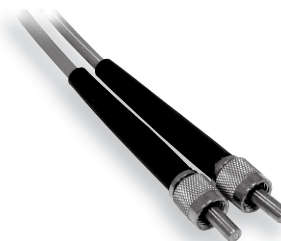
Order number	1.04.0003.01012 (2 meter)
Order number	1.04.0003.01015 (5 meter)
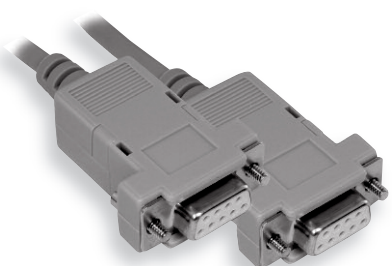
▶ Glass fiber cable ST

Duplex; For FO repeater and star coupler; With 2 plugs on each
side; Wavelength 820 nm; Glas fiber 50/125 µm; Attenuation
3 dB/km

Order number	1.04.0003.01022 (2 meter)
Order number	1.04.0003.01025 (5 meter)

IXXAT

Industrial Ethernet Module

▶ **Flexible and cost-effective solution for the integration of Industrial Ethernet**

Industrial Ethernet Module – Block Diagram
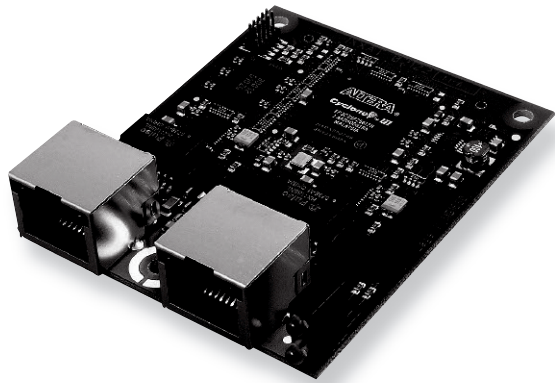
HIGHLIGHTS

The Industrial Ethernet Module provides customers with a universal interface for the integration of various Industrial Ethernet technologies into their products. The area of application is wherever intelligent devices such as drives, frequency converters, IO-modules, valves and other components of automation technology are to be equipped with Industrial Ethernet and for which flexibility and extendibility in conjunction with transparent costs are important.

The following technologies are supported:

- EtherCAT (Slave Controller)
- EtherNet/IP (Adapter Device)
- Powerlink (Controlled Node)
- PROFINET RT (IO-Device)

Other technologies are planned:

- SERCOS III (Slave Device)
- Modbus/TCP (Server Device)

DISCRIPTION OF FUNCTIONS

The Industrial Ethernet Module is based on an Altera Cyclone III FPGA. An integrated CPU is responsible for processing the Industrial Ethernet protocol and data exchange via the host interface. It also has 8 MB RAM to run the protocol software and 2 MB FLASH from which the software and the FPGA design are loaded.

Support of the various protocols is implemented universally and flexibly. In the FPGA, an Industrial Ethernet Controller which is ideal for the relevant technology is used for this.

The two Ethernet interfaces are fed out independently of each other, so that different topologies can be implemented in accordance with the various Industrial Ethernet standards:

- Line topology for EtherCAT, Powerlink and SERCOS III
- Star topology for EtherNet/IP, Modbus/TCP and PROFINET

Due to the flexibility which the FPGA technology offers the customer and the universal implementation of the Ethernet interface, the Industrial Ethernet Module can be easily extended to future standards such as line topology for EtherNet/IP and PROFINET.

Using the open programming interface on the host CPU, the Ethernet Module Interface (EMI), customers can easily integrate the module into their existing systems. The counterpart on the module is the Bus Protocol Wrapper (BPW), which abstracts the functions of the Industrial Ethernet protocol to such an extent that users can implement their applications via the EMI independently of the underlying network. In addition, they can also use protocol-specific features on the application side.
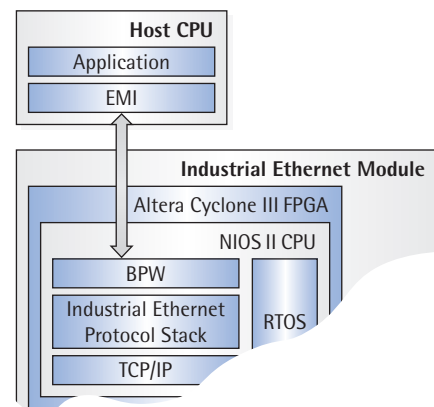
Programming Interface – Block Diagram

The host interface is implemented as a general µC interface. Alternatively, a Serial Peripheral Interface (SPI) is available. The module and the host CPU have up to 16 KByte shared data memory. The data memory is physically implemented in the FPGA as a real Dual-ported RAM in order to ensure the efficiency of the interface even for high-performance applications such as servo drives or fast IOs.

With the also available Evaluation Kit, the Industrial Ethernet Module can be directly connected to the processor module of Phytec (phyCORE-XC161). This solution is therefore ideal for rapid prototyping.

On request, the Industrial Ethernet Module can be fully implemented as a design-in in the customer's device. This enables customized adaptations or the integration of further components or interfaces in the FPGA.

The technical details and functions of the Industrial Ethernet Module may change. Up-to-date information is available on our website.

TECHNICAL SPECIFICATIONS

|	
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
Displays	1 x yellow and 1 x green LED installed in the RJ45 sockets for display of the Ethernet states; 2 x bi-coloured (red/green) LEDs for display of the protocol-specific states
Power supply	3.3 V, approx. 1 W
Temperature range	-40° C to +85° C (industrial temperature range)
Certificates	Conformity with the relevant Industrial Ethernet standard and CE
Protection class	IP20 with installation in corresponding housing
Dimensions	72.2 x 57.5 x 16 mm

SUPPLEMENTARY PRODUCTS

- Evaluation Kit for the Industrial Ethernet Module

ORDER NUMBER

On request	Industrial Ethernet Module for EtherCAT
On request	Industrial Ethernet Module for EtherNet/IP
On request	Industrial Ethernet Module for Powerlink
On request	Industrial Ethernet Module for PROFINET RT

Evaluation Kit for the Industrial Ethernet Module

▶ The enabler to development
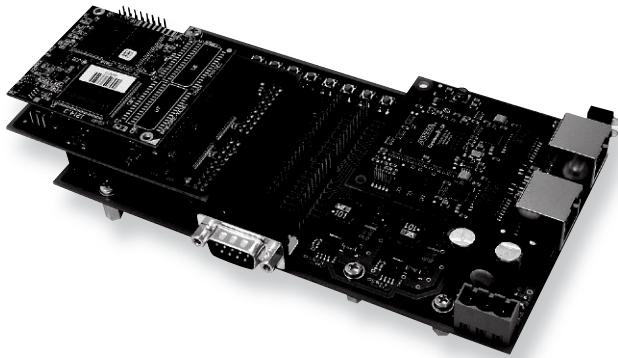
The Evaluation Kit for the Industrial Ethernet Module provides customers with the opportunity for the development of devices with Industrial Ethernet. Beside the Industrial Ethernet Module, the kit includes a carrierboard, which holds the Industrial Ethernet Module mechanically and provides the electrical signals on standard headers. Different CPU modules can be mechanically and electrically connected to the carrierboard via individual adapterboards.

The CPU module phyCORE-XC161 from PHYTEC is directly supported. Other CPU modules on request.

On the CPU module, customers develop their applications which then access the Industrial Ethernet Module via the host interface and the EMI.

DESCRIPTION OF FUNCTIONS

Carrierboard

The universal carrierboard holds the Industrial Ethernet Module and, via the adapterboard, the CPU module. All signals of the Industrial Ethernet Module are additionally fed out on the carrierboard on headers in order to be able to carry out measurements on the host interface.

For the development of simple applications, the CPU module has 8 discrete inputs (buttons) and 8 discrete outputs (LEDs) for direct activation on the carrierboard. These signals can also be picked up on headers.

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 carrierboard from 9 – 32 V DC input voltage.

Adapterboard

The CPU module and the carrierboard are connected physically and electrically with the adapterboard. It makes the necessary adaptations for the CPU module (e.g. power supply, level adjustment or debugging interface). Customers can also make an individual adapterboard for their systems.

The technical details and functions of the Evaluation Kit may change. Up-to-date information is available on our website.

TECHNICAL SPECIFICATIONS

|	
Host interface	One double-row 50-pin plug connector in 1.27 mm grid for connection of the Industrial Ethernet Module; Four double-row 10-pin headers in 2.54 mm grid for connection of an adapterboard to CPU module or for customized solutions; All signals of the host interface are also fed out on headers in 2.54 mm grid
Peripherals for adapter board with CPU module	8 discrete inputs implemented as buttons (make contacts); 8 discrete outputs implemented as LEDs (green); 9-pin Sub-D connector for the serial port
Power supply	9 – 32 V DC, max. 10 W (depending on the CPU module) Connection via Phoenix Contact COMBICON plug connector (power supply not included in scope of delivery)
Temperature range	0°C to +70°C
Dimensions	165 x 90 x 15 mm (without modules)

CONTENTS OF DELIVERY

- Industrial Ethernet Module
- CPU module phyCORE-XC161
- Carrierboard for the Industrial Ethernet Module
- Adapterboard for the CPU module
- Technical documentation of the host interface
- CD-ROM with EMI in C source code, sample programs and manual

ORDER NUMBER

On request	Evaluation Kit for EtherCAT
On request	Evaluation Kit for EtherNet/IP
On request	Evaluation Kit for Powerlink
On request	Evaluation Kit for PROFINET RT

IXXAT

Industrial Ethernet Module for Powerlink

▶ **Flexible and cost-effective solution for the integration of Powerlink**

ETHERNET
POWERLINK
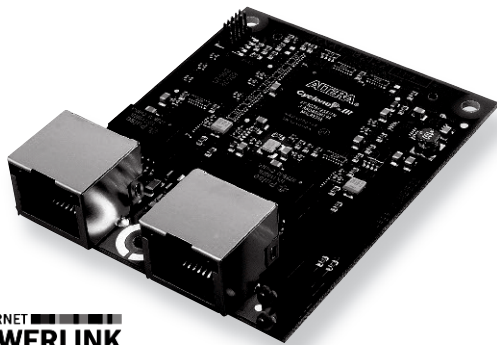
HIGHLIGHTS

The Industrial Ethernet Module for Powerlink provides the customer with a complete controlled node in accordance with the Powerlink standard. The area of application is wherever intelligent devices such as drives, frequency converters, IO-modules, valves and other components of automation technology are to be equipped with Powerlink and for which flexibility and extendibility in conjunction with transparent costs are important.

DESCRIPTION OF FUNCTIONS

The basic functions of the Industrial Ethernet Module are described on the page "Industrial Ethernet Module".
The Industrial Ethernet Module for Powerlink provides customers with a complete Controlled Node for integration into their own device. The following functions are supported in accordance with the Powerlink specification V2:

- Controlled Node with two active Ethernet interfaces and integrated hub
- Isochronous real-time data exchange with cycle times ≥ 500 µs and fast response times ≤ 3 µs
- Asynchronous data exchange
- Dynamically extendable object directory via the host interface and dynamic PDO mapping
- Display of STATUS and ERROR

The exchange of IO data of the host application with the Industrial Ethernet Module for Powerlink is performed separately for input and output data via a configurable memory image in the DPRAM of the module.

The technical details and functions of the Industrial Ethernet Module for Powerlink (controlled node) may change. Up-to-date information is available on our website.

CONTENTS OF DELIVERY

- Industrial Ethernet Module for Powerlink (Controlled Node)

ORDER NUMBER

On request	Industrial Ethernet Module for Powerlink (Controlled Node)

PL-IB 300/PCI

▶ **Powerlink interface board for PCI bus systems**
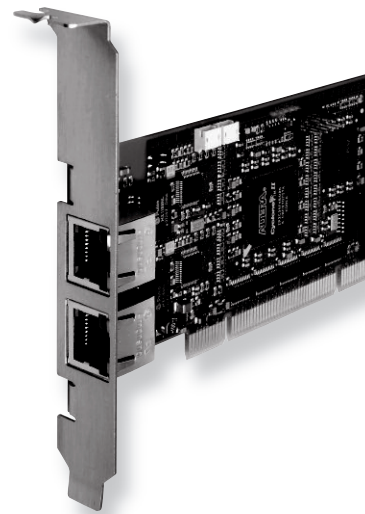
The Powerlink interface board enables the connection of PC host systems to Powerlink systems via the PCI bus. The Powerlink functionality runs completely on the FPGA of the interface board. The Powerlink interface board can work as a managing node (MN) and controlled node (CN) and has extremely fast response times (< 2µs). The synchronization message (SoC) is transmitted in MN mode with a jitter below 50 ns.
The interface provides process data to the host via the PCI bus. The board is able to process large quantities of data from systems with up to 240 CNs. It also supports cycle times down to 200 µs. The board is delivered including a driver for Windows and an API. Adaptation to other operating systems (e.g. RTX or VxWorks) is possible and can be performed by IXXAT.

TECHNICAL SPECIFICATIONS/FEATURES

- FPGA-based Ethernet controller with Powerlink acceleration
- Two port hub with two RJ45 connectors
- Direct synchronization of several cards via separate SYNC line
- Response times as MN/CN less than 2 µs
- PCI in accordance with specification 2.2 (32 bit / 33 MHz, 5 / 3.3 Volt)
- Temperature range 0 to +70 °C. Extended temperature range (-40 to +70 °C) on request

FIELDS OF APPLICATION

- Host interface for PC based control applications (PLC)
- PC interface for analysis, diagnostics and tests
- Gateway for hierarchical Powerlink systems in connection with a control application

CONTENTS OF DELIVERY

- PL-IB 300/PCI – Powerlink PCI interface board
- Driver and API for Windows 2000/XP
- Manual and programming example

ORDER NUMBER

1.01.0109.00011	PL-IB300/PCI (Standard PCI)
1.01.0109.00021	PL-IB300/PCI (Low profile PCI)

Powerlink MN and CN Protocol Software

▶ **Software package for the development of managing nodes (MN) and controlled nodes (CN)**

- Scope of functions based on the current Powerlink DS 1.1.0 specification
- Operation speed optimized, modular software structure
- Allows for simple and rapid development of Powerlink devices (managing nodes and controlled nodes)
- Comprehensive configuration and scaling possibilities
- Clearly structured programming interface for connection of the application program
- "C" source code can be used with any target system
- Capable of operating either with or without operating system
- Adaptable to various Ethernet controller architectures and hardware architectures (e.g. 1-CPU, 2-CPU) via internal interfaces
- Dynamic modification of the Object Dictionary during operation
- Multi-channel capability
- Configuration manager for automatic network configuration
- Certified component as used in the Evaluation Kit for the IEM/Powerlink and other OEM products
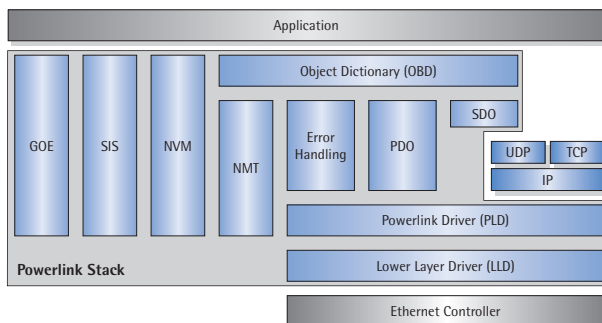
OVERVIEW OF FUNCTIONS

The Powerlink protocol software contains all necessary functions to implement managing (MN) and controlled nodes (CN) in accordance with the Powerlink specification. A UDP/IP stack that is required to run the SDO protocol via UDP can be supplied as an extra option. Integration of a UDP/IP stack by the user is greatly simplified by the internal interfaces of the Powerlink protocol software.

Encapsulation of hard real-time tasks and hardware specific adaptation

The lower layers of the Powerlink software are specifically designed to guarantee fast response times of real-time events on the Powerlink bus as well as the efficient processing of the Powerlink cycle on the MN. Therefore, the access to and the handling of the Ethernet controller is encapsulated within a separate module, the lower layer driver (LLD). For an adaptation of the Powerlink software to a specific CPU or hardware platform, this module needs to be modified. This abstraction between hardware-dependant routines and the higher layers of the Powerlink software makes it possible to provide a high degree of scalability and adaptability. A configuration tool delivered with the software allows optimum adaptation of the Powerlink functionality provided by the protocol stack to the given application which guarantees an extremely resource-efficient implementation. Compared with the CN version, the MN/CN version allows to switch the MN/CN functions during runtime. MN specific functions and objects are not available in the CN only version which saves system resoures.

Object dictionary and programming interface

The object dictionary is the interface between application and communication. Each object dictionary entry can be directly allocated a reference to a variable with application data. PDOs and SDOs access these application variables directly. Therefore, no modifications to an existing CANopen application are necessary to integrate the Powerlink protocol software for example.

User-specific call-back functions can be linked to every application object and enable an event-controlled notification of the application in the event of accesses to these objects. This mechanism allows a direct, application-specific reaction on modifications to the application data caused on the bus side. In addition, saving and recovery of configured data is also supported. The application is also able to build or modify parts of the Object Dictionary during operation.

Process (PDO) and Service Data Objects (SDO)

The Powerlink protocol software supports both dynamic and static PDO-mapping and allows a true producer/consumer communication.

In addition to PDO communication, the SDO protocol necessary for configuration and diagnostics is also implemented in the PL protocol software. It allows safe transmission of non-real-time-critical data. The SDO protocol can be run via UDP/IP or via ASend (Powerlink frames).

Multi-channel support

The Powerlink-protocol software enables the implementation of several independent Powerlink interfaces in one device. Managing node or controlled nodes can be configured independently as well as with independent object dictionaries in each case. In this way, gateways can be developed that are connected to a higher order Powerlink network with one Powerlink channel as a CN and control a Powerlink sub-network as a MN with the second Powerlink channel.

Network management

One important task of the MN is network management, which includes start-up and monitoring of the network nodes. The MN capable version of the protocol software supports the complete boot-up procedure for mandatory and optional CNs as defined in the Powerlink DS 1.1.0 specification.

Software updates of CNs by the managing node are also supported. The Powerlink protocol software includes the configuration manager which allows for device configurations to be checked and updated during the boot-up process. With the aid of the configuration manager it is easy to replace defective devices while a network is in operation without interaction of the application. In this case no manual configuration of the replacement device is required before installation by the service technician.

Redundant MN

Optionally redundant MNs according to EPSG WDP 302-A V 1.0.4 can be implemented based on the Powerlink MN/CN protocol software. Redundant MNs are typically used in applications where a high availability of the systems is required. If the active MN fails, the next redundant MN takes the role of the active MN and provides seamless communication among all Powerlink nodes.

Operating system support

The Powerlink stack can be used with or without an operating system. The software has an internal scheduler which insures the optimal allocation of the available process time resources. By using an operating system, the Powerlink stack is executed as one task. Only basic operating system functions like semaphores and tasks are required. These functions are encapsulated by an abstraction layer (GOE - Generic Operating Environment) and can be easily adapted to the operating system.

Reference platform

The provided "C" source code can be used on any target system. Besides the generic version, the delivered software package includes a reference implementation, which work on Freescale Coldfire 523x and Altera NIOSII based systems without the need of additional adaptation. Evaluation boards with wiring diagrams (reference schematics) are also available.

CONTENTS OF DELIVERY

- "C" source code
- Reference implementation for Coldfire 523x and NIOSII
- Software license
- Manual
- Technical support

SUPPLEMENTARY SERVICES

Service Contract

In addition to the software package IXXAT offers a software service contract. During the term of the contract, IXXAT provides the following services:

- Free updates and bug fixing
- Technical support via telephone including answering questions regarding general Powerlink issues.

Code Introduction

IXXAT offers comprehensive one- or two-day detailed introductions to the code. Interfaces, sequences and data flows within the Powerlink software are explained. Questions are also answered concerning the adaptation to be carried out, and adaptations to the code can be made.

Technical support

Support in the specification of the Powerlink device or system to be implemented. Here the customer benefits from our comprehensive Powerlink applied expertise, allowing errors to be avoided and better solutions to be developed within a shorter period of time.

Implementation support

IXXAT handles adaptation, implementation and testing of the Powerlink protocol software for your hardware or application.
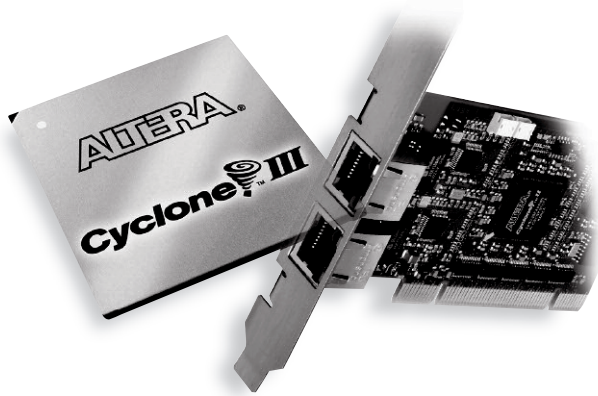
Seminars

IXXAT offers a seminar on Powerlink. The seminar can also be held in-house on request.

ORDER NUMBER

1.02.0290.00000	Powerlink Software for CN (Product license)
1.02.0291.00000	Powerlink Software for CN (Product line license)
1.02.0293.00000	Powerlink Software for MN/CN (Product license)
1.02.0294.00000	Powerlink Software for MN/CN (Product line license)

Powerlink Managing Node IP Core for Design-In Solutions

- PC independent Powerlink MN implementation
- Extension of any host controller with powerful Powerlink MN functionality
- Implementation of customer specific Powerlink MN solutions at a reasonable price

TECHNICAL DATA / FEATURES

- Design-in solution for Altera Cyclone 2C20 or higher
- Support of MN/CN functionality according to the Powerlink specification DS 1.1.0
- PCI slave according to the specification 2.2 (32 Bit / 33 MHz)
- Synchronous SRAM interface
- 2 port hub
- MII interface for lowest possible Ethernet delay times
- Synchronization of several MN IP cores via external sync line

CONTENTS OF DELIVERY

- Reference circuit diagram
- Encrypted net list
- 10 runtime licenses for prototype implementations
- Powerlink software as binary code
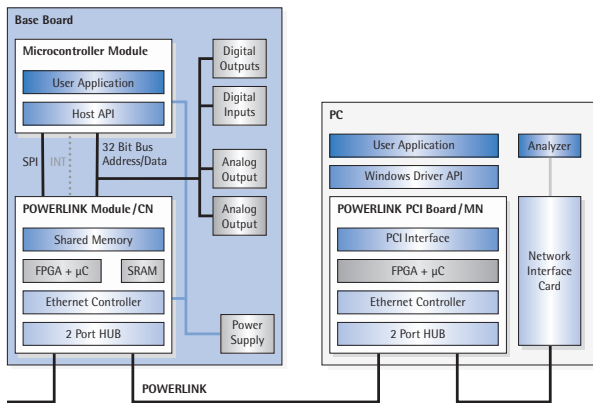- Host API in ANSI-C source code
- Manual

FURTHER INFORMATION

Besides the Powerlink MN IP Core and the Powerlink PCI board, IXXAT offers the development of customer specific Powerlink MN adapters, consulting services and training.

By using IXXATs Powerlink FPGA IP Core, the Powerlink Managing Node (MN) functionality can be implemented rapidly and cost effective into any kind of host system. The MN IP Core combines the Powerlink functionality and can be implemented, as hardware and software functional unit, into any target system without any risk and with guaranteed performance.

The major advantages of the FPGA-based implementation are the flexibility, the vendor independency, the reduced development time and the low development costs. Furthermore, the reconfiguration possibility of the FPGA solution allows the implementation of various real-time Ethernet based protocols on the same hardware platform.

Besides the Powerlink functionality, the MN IP Core includes a standard Ethernet controller, an Ethernet hub and a PCI controller for the host communication.

The MN IP Core was already successfully implemented on the Powerlink PC interface from IXXAT. The board offers a powerful and cost effective solution to set-up PC-based automation systems based on Powerlink.

The MN IP core board ensures response times in the range of the Ethernet interframe gap, independent of the number of network nodes. The synchronization by the start of cycle frames is done with a jitter of less than 50 ns. Therefore it is possible to operate systems with cycle times of 200 µs or with up to 240 controlled nodes.

The PCI interface provides a simple application programming interface including process image to the host application and a control and status interface. Based on that, it is easy to connect PC applications to the Powerlink network, like a soft PLC.

IXXAT

Powerlink Starterkit

▶ The fast introduction to the Powerlink world

The Powerlink Starter Kit is a complete set of devices for building a Powerlink network and enables a quick start with the Powerlink technology. It contains an Evaluation Kit for the Industrial Ethernet Module as well as a Managing Node PCI card and all necessary software packages and drivers for the implementation of a Powerlink system.

APPLICATION FIELDS

- Provides an easy way to explore the Powerlink technology, its performance and features
- To set up a Powerlink reference network to perform tests with user specific Powerlink implementations
- Provides a reference hardware / software design that can be easily integrated into a customer device

COMPONENTS AND FUNCTIONS

Evaluation Kit
The functionality of the Evaluation Kit is described in the chapter "Industrial Ethernet Module".

PL-IB 300/PCI – Powerlink PCI Card
The Powerlink PCI card provides the Managing Node functionality for the network. It is used by the PC-based control demo application. For implementing PC-based applications, the PCI card has a Windows driver API in C-source code.
In addition, a Windows-based control interface and a demo configuration for the Industrial Ethernet Module are included in the scope of supply.

Powerlink Analysis Tool
The analysis tool can be used to trace the Powerlink network traffic and to display the Powerlink specific frame contents in detail. To run the analysis tool, a separate standard Ethernet interface is required.

CONTENTS OF DELIVERY

- Base board for the Industrial Ethernet Module and micro-controller module
- Power pack
- phyCORE XC161 module with circuit diagram and manual
- Industrial Ethernet Module with C-host API on CD, API manual
- PL-IB 300/PCI - Powerlink PCI card with driver for WIN2k/XP and demo program on CD
- Powerlink Analysis Software for Windows

ORDER NUMBER

1.03.0100.00000	Powerlink Starterkit

Powerlink Configuration Framework

▶ **Component for integration of a projecting and configuration function for Powerlink systems in OEM tools**

The Powerlink Configuration Framework allows for the integration of projecting and configuration functionality into OEM tools such as PLC programming environments while maintaining a uniform look and feel.

The framework provides all the necessary components and mechanisms required for creation and management of configuration data of a Powerlink project. The framework itself is delivered without user interface, which has to be provided by the OEM tool. This offers the following advantages: all system data is centrally accessible in the interface and can be centrally edited, the OEM tool has a uniform look and feel, and Powerlink-relevant configuration data can be displayed to the user at system level in abstracted form.
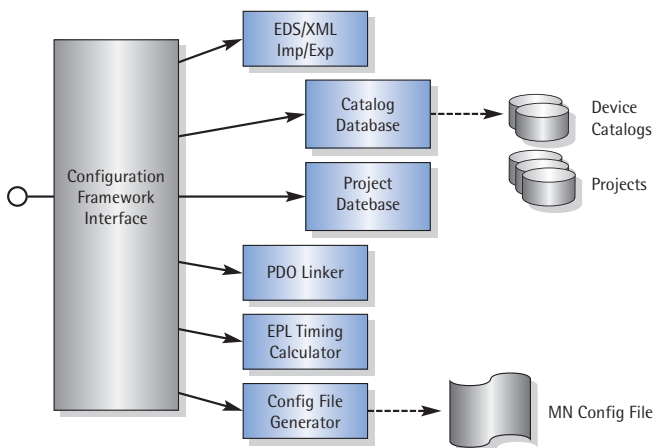
HIGHLIGHTS

- Automatic PDO-mapping and PDO-linking
- Automatic calculation and configuration of the Powerlink network timing parameters
- Support of network variables in accordance with CiA DS302/DS405
- Clear and simple access to the device data
- Fast, database-based management of all configuration and device data from device description files
- Management of any number of device description files in one catalogue
- COM-based interface for integration in OEM tools

DESCRIPTION OF FUNCTIONS

Catalog
A catalog system enables device description files to be imported and stored in a database. This is useful if Powerlink devices are used repeatedly in projects as they can then be selected directly in the catalog and added to a project. It is also possible for an OEM to define which Powerlink devices the customer may use in OEM systems, preventing the customer from using unauthorized devices.

Automatic PDO-mapping and PDO-linking
For larger systems, the specialized applied expertise required for PDO-mapping/linking and the time-consuming, careful selection of the individual PDO links requires great effort. The Powerlink Configuration Framework supports the creation of PDO mappings and the correct allocation of the PDOs to the devices (PDO linking) by means of an automated system. This allows to create I/O links without detailed knowledge of Powerlink.

Network variables in accordance with CANopen CiA 302/405
Another function provided by the Powerlink Configuration Framework is the definition and management of network variables in accordance with the specifications DS302 or DS405 of CAN-in-Automation. Network variables are typically used by PLCs because of the possibility to link the data (variables) of the application program with data of other devices. Based on these links, the Configuration Framework can then automatically calculate the PDO mapping and linking.

Automatic calculation of the Powerlink communication cycle
Depending on the timing data of the individual Powerlink devices and the lengths of the individual PDOs, the calculation of the Powerlink communication cycle and the configuration values for the timing parameters of both the managing node and the controlled nodes is performed. This function is automatically carried out by the Powerlink Configuration Framework.

Import/export of device description files (EDS/DCF)
A powerful import and export of device description files enables importing and exporting of devices to and from the catalogue as well as the exporting of configuration data of individual devices from a project.

Generation of configuration data files
After completion of projecting or configuration of a Powerlink system, the Powerlink Configuration Framework creates a configuration data file. This configuration data file is then normally sent to the managing node. The configuration data file is created in the Concise DCF format.

Programming interface
The programming interface of the Powerlink Configuration Framework is implemented as a COM interface. It provides various interfaces for the management of the catalogue, of the projects and of the individual devices in a project. This enables simple integration of the Powerlink Configuration Framework in OEM tools.
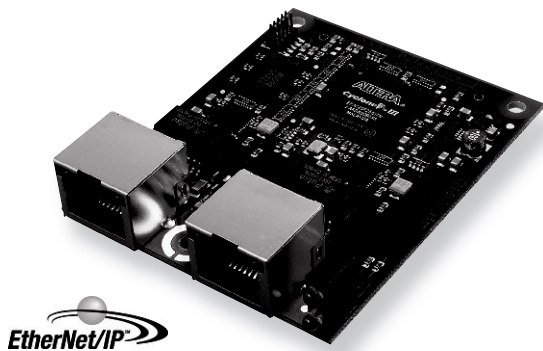
SYSTEM REQUIREMENTS

- Windows 2000 with SP4 or Windows XP with SP2

ORDER NUMBER

On request	Powerlink Configuration Framework

IXXAT

Industrial Ethernet Module for EtherNet/IP

▶ **Flexible and cost-effective solution for the integration of EtherNet/IP**

HIGHLIGHTS

The Industrial Ethernet Module for EtherNet/IP provides the customer with a complete adapter device in accordance with the EtherNet/IP standard. The area of application is wherever intelligent devices such as drives, frequency converters, IO-modules, valves and other components of automation technology are to be equipped with EtherNet/IP and for which flexibility and extendibility in conjunction with transparent costs are important.

DISCRIPTION OF FUNCTIONS

The basic functions of the Industrial Ethernet Module are described on the page "Industrial Ethernet Module".

The Industrial Ethernet Module for EtherNet/IP provides customers with a complete adapter device for integration into their own device. The following functions are supported in accordance with the EtherNet/IP standard:

■ Communications adapter profile with one active Ethernet interface
■ Class 1 (connected) IO server for cyclical real-time data exchange with an EtherNet/IP scanner device with cycle times ≥ 2 ms
■ Class 3 (connected) and UCMM (unconnected) message server for configuration and diagnostics
■ Display of module status (MS) and network status (NS)

The exchange of IO data of the host application with the Industrial Ethernet Module for EtherNet/IP is performed separately for input and output data via a configurable memory image in the DPRAM of the module.

The technical details and functions of the Industrial Ethernet Module for EtherNet/IP (adapter device) may change. Up-to-date information is available on our website.

EtherNet/IP Scanner Software

The EtherNet/IP Scanner Software enables developers of PC based or embedded products to quickly add EtherNet/IP Scanner Class functionality to a product's feature set.

Applications for the EtherNet/IP Scanner Software are EtherNet/IP-capable controllers (PLC) as well as devices which must provide client functionality in the network.

The EtherNet/IP Scanner Software provides I/O Server and I/O Client, Message Server and Message Client capability as well as an Application Programming Interface (API) for the application.

The EtherNet/IP Scanner Software is delivered as complete source code – E**therNet/IP Scanner Developers Kit (ESDK)** or as DLL for Microsoft Windows XP/2000/NT – **EtherNet/IP Scanner Communication Driver (EIPS)**.

The EtherNet/IP Scanner Software is offered as a royalty-free company site license.

GENERAL FUNCTIONS

- **Scanner Class Functionality**
  - UCMM (unconnected) Message Server and Client
  - Class 3 (connected) Message Server and Client
  - Class 1 (connected) I/O Server and Client

- **Resource Utilization and Management**
  - All resources are initialized at startup
  - No dynamic memory or thread allocation
  - Only one thread utilized

- **Supported Objects according to CIP Standard**
  - Identity Object
  - Message Router Object
  - Assembly Object
  - Connection Manager Object
  - Connection Configuration Object
  - TCP/IP Interface Object
  - Ethernet Link Object

SUPPORTED TARGET SYSTEM

The EtherNet/IP Software is delivered for Microsoft Windows XP/2000/NT and Microsoft Visual Studio and is already running on this system with the demo application.

An adaptation to other systems is possible using the EtherNet/IP Scanner Developer's Kit (ESDK) which is delivered completely in source code.

This adaptation can also be done by IXXAT.

A suitable operating system as well as TCP/IP protocol stack must be already available for the target system, as they are not part of the delivery content of the EtherNet/IP Scanner Software.

EtherNet/IP Scanner Developers Kit (ESDK)

SPECIFIC FUNCTIONS

- Basic functionality of EtherNet/IP Scanner Software
- Platform Compatibility and Portability
  - Example projects for Windows XP/2000/NT and WINCE 4.2/5.0
  - Platform-dependent utilities isolated in a separate module for easier porting to other platforms

CONTENTS OF DELIVERY

- EtherNet/IP Scanner Class source code, include files, DLLs and Runtime components for Microsoft Windows
- Scanner (Client) demo application with source code for Microsoft Visual Studio
- User manuals
- STC-File for ODVA EtherNet/IP Protocol Conformance Test Software
- EDS-File for configuration with Rockwell Automation RSNetWorx for EtherNet/IP

EtherNet/IP Scanner Communication Driver (EIPS)

SPECIFIC FUNCTIONS

- Basic functionality of EtherNet/IP Scanner Software
- Platform Compatibility
  - Example projects for Windows XP/2000/NT

CONTENTS OF DELIVERY

- EtherNet/IP Scanner Class include files, DLLs and Runtime components for Microsoft Windows
- Scanner (Client) demo application with source code for Microsoft Visual Studio
- User manuals
- STC-File for ODVA EtherNet/IP Protocol Conformance Test Software
- EDS-File for configuration with Rockwell Automation RSNetWorx for EtherNet/IP

ORDER NUMBER

1.02.0230.00000	EtherNet/IP Scanner Developers Kit (ESDK)
1.04.0121.00000	EtherNet/IP Scanner Communication Driver (EIPS)

IXXAT

EtherNet/IP Adapter Software

The EtherNet/IP Adapter Software enables developers of PC based or embedded products to quickly add EtherNet/IP Adapter Class functionality to a product's feature set.

Applications for the EtherNet/IP Adapter Software involve EtherNet/IP-capable devices like I/O-Modules, encoders, valves, simple drives and other components used in factory automation.

The EtherNet/IP Adapter Software provides I/O Server and Message Server capability as well as an Application Programming Interface (API) for the application.

The EtherNet/IP Adapter Software is delivered as complete source code – **EtherNet/IP Adapter Developers Kit (EADK)** or as DLL for Microsoft Windows XP/2000/NT – **EtherNet/IP Adapter Communication Driver (EIPA)**.

The EtherNet/IP Adapter Software is offered as royalty-free company site license.

GENERAL FUNCTIONS

- **Adapter Class Functionality**
  - UCMM (unconnected) Message Server
  - Class 3 (connected) Message Server
  - Class 1 (connected) I/O Server
- **Additional Functionality**
  - UCMM (unconnected) Message Client
- **Resource Utilization and Management**
  - All resources are initialized at startup
  - No dynamic memory or thread allocation
  - Only one thread utilized
- **Supported Objects according to CIP Standard**
  - Identity Object
  - Message Router Object
  - Assembly Object
  - Connection Manager Object
  - TCP/IP Interface Object
  - Ethernet Link Object

SUPPORTED TARGET SYSTEMS

The EtherNet/IP Software is delivered for Microsoft Windows XP/2000/NT and Microsoft Visual Studio and is already running on this system with the demo application.

An adaptation to other systems is possible using the EtherNet/IP Adapter Developer's Kit (EADK) which is delivered completely in source code.

This adaptation can also be done by IXXAT.

A suitable operating system as well as TCP/IP protocol stack must be already available for the target system, as they are not part of the delivery content for the EtherNet/IP Adapter Software.

EtherNet/IP Adapter Developers Kit (EADK)

SPECIFIC FUNCTIONS

- Basic functionality of EtherNet/IP Adapter Software
- Platform Compatibility and Portability
  - Example projects for Windows XP/2000/NT and WINCE 4.2/5.0
  - Platform dependent utilities isolated in a separate module for easier porting to other platforms

CONTENTS OF DELIVERY

- EtherNet/IP Adapter Class source code, include files, DLLs and Runtime components for Microsoft Windows
- Adapter (Server) demo application with source code for Microsoft Visual Studio
- User manuals
- STC-File for ODVA EtherNet/IP Protocol Conformance Test Software
- EDS-File for configuration with Rockwell Automation RSNetWorx for EtherNet/IP

EtherNet/IP Adapter Communication Driver (EIPA)

SPECIFIC FUNCTIONS

- Basic functionality of EtherNet/IP Adapter Software
- Platform Compatibility
 - Example projects for Windows XP/2000/NT

CONTENTS OF DELIVERY

- EtherNet/IP Adapter Class include files, DLLs and Runtime components for Microsoft Windows
- Adapter (Server) demo application with source code for Microsoft Visual Studio
- User manuals
- STC-File for ODVA EtherNet/IP Protocol Conformance Test Software
- EDS-File for configuration with Rockwell Automation RSNetWorx for EtherNet/IP

ORDER NUMBER

1.04.0120.00000	EtherNet/IP Adapter Developers Kit (EADK)
1.04.0122.00000	EtherNet/IP Adapter Communication Driver (EIPA)

EtherNet/IP Scanner Simulation Test Tool (EIPScan)

EtherNet/IP Scanner Simulation Test Tool (EIPScan) is a Microsoft Windows-based software application that simulates a simple EtherNet/IP Scanner to allow developers to test and debug their EtherNet/IP products.
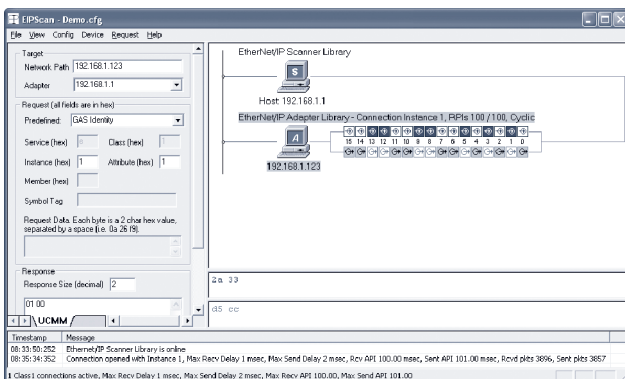
EIPScan provides I/O Server and I/O Client, Message Server and Message Client functionality. EIPScan is capable of originating a variety of I/O connections to exchange I/O data with the network.

EIPScan is compatible with Rockwell Automation RSNetWorx for EtherNet/IP.

The EtherNet/IP Scanner Simulation Test Tool is offered as per node license.

FUNCTION OVERVIEW

- **Scanner Class Functionality**
  - UCMM (unconnected) Message Server and Client
  - Class 3 (connected) Message Server and Client
  - Class 1 (connected) I/O Server and Client

- **Scanner simulation**
  - View and modify I/O data
  - Automated test of Class 1 and Class 3 connections

- **Platform Compatibility**
  - EIPScan supports Microsoft Windows XP/2000/NT

CONTENTS OF DELIVERY

- EtherNet/IP Scanner Class executable program for Microsoft Windows
- Manual
- EDS-File for configuration with Rockwell Automation RSNetWorx for EtherNet/IP

ORDER NUMBER

1.04.0123.00000	EtherNet/IP Scanner Simulation Test Tool (EIPScan)

69

Industrial Ethernet Module for PROFINET RT

▶ **Flexible and cost-effective solution for the integration of PROFINET RT**
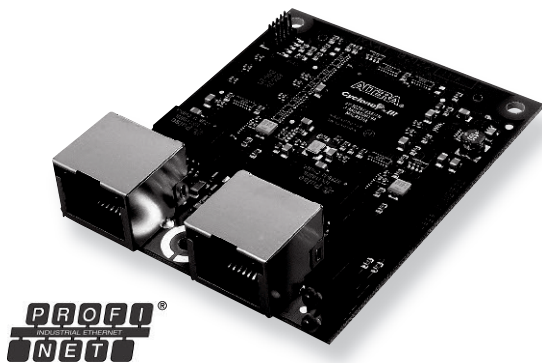
HIGHLIGHTS

The Industrial Ethernet Module for PROFINET RT provides the customer with a complete IO-device in accordance with the PRO-FINET RT standard. The area of application is wherever intelligent devices such as drives, frequency converters, IO-modules, valves and other components of automation technology are to be equipped with PROFINET and for which flexibility and extendibility in conjunction with transparent costs are important.

DESCRIPTION OF FUNCTIONS

The basic functions of the Industrial Ethernet Module are described on the page "Industrial Ethernet Module".
The Industrial Ethernet Module for PROFINET RT provides customers with a complete IO-device for integration into their own device. The following functions are supported in accordance with the PROFINET RT standard:

- IO-device as per PROFINET conformance class level A with one active Ethernet interface
- Cyclic real-time data exchange with cycle times ≥ 2 ms
- Acyclic TCP/IP communication
- Transmission and reception of diagnostic and process alarms, plug and pull alarms
- Allocation of IP addresses and device names via Ethernet
- Display of system faults (SF) and bus faults (BF)

The exchange of IO data of the host application with the Industrial Ethernet Module for PROFINET RT is performed separately for input and output data via a configurable memory image in the DPRAM of the module.

The technical details and functions of the Industrial Ethernet Module for PROFINET RT (IO-Device) may change. Up-to-date information is available on our website.

CONTENTS OF DELIVERY

- Industrial Ethernet Module for PROFINET RT (IO-Device)

ORDER NUMBER

On request	Industrial Ethernet Modul for PROFINET RT (IO-Device)

PROFINET IO-Developer's Kit

The PROFINET IO-Developer's Kit enables developers of embedded products to add quickly PROFINET IO-Device functionality to a product's feature set.

FUNCTION OVERVIEW

PROFINET IO-Device functionality:
- Cyclic and acyclic data exchange with a PROFINET IO-controller
- Sending and receiving of diagnostic and process alarms, and plug and pull alarms
- Assignment of IP addresses and device names via Ethernet

SUPPORTED TARGET SYSTEMS

The PROFINET IO-Developer's Kit is delivered for NetSilicon® NS9360 Development Kit and is instantly running on this system with the demo application.

An adaptation to other systems is possible for the PROFINET IO-Developer's Kit. A suitable operating system as well as TCP/IP protocol stack must be already available for the target system, they are not content of delivery of the PROFINET IO-Developer's Kit.

This adaptation can also be done by IXXAT.
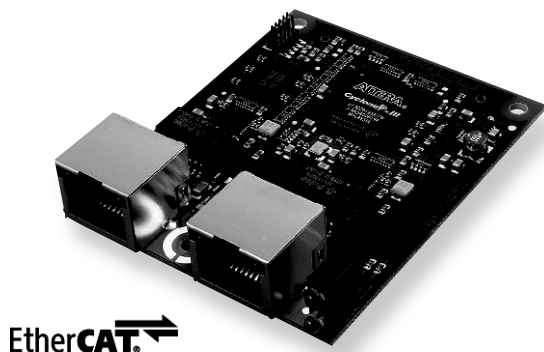
CONTENTS OF DELIVERY

- PROFINET IO-Device source code and include files
- Demo application for NetSilicon® NS9360 Development Kit
- Manual
- GSD-File for integration with Siemens STEP 7

ORDER NUMBER

1.04.0300.00000	PROFINET IO-Developer's Kit

Industrial Ethernet Module for EtherCAT

▶ **Flexible and cost-effective solution for the integration of EtherCAT**

EtherCAT.

HIGHLIGHTS

The Industrial Ethernet Module for EtherCAT provides the customer with a complete slave controller in accordance with the Ether-CAT standard. The area of application is wherever intelligent devices such as drives, frequency converters, IO-modules, valves and other components of automation technology are to be equipped with EtherCAT and for which flexibility and extendibility in conjunction with transparent costs are important.

DESCRIPTION OF FUNCTIONS

The basic functions of the Industrial Ethernet Module are described on the page "Industrial Ethernet Module".

The Industrial Ethernet Module for EtherCAT provides customers with a complete slave controller for integration into their own device. The following functions are supported in accordance with the EtherCAT standard:

- Full slave device (data link layer) with two active Ethernet interfaces
- Enhanced slave device (application layer) with object directory dynamically extendable via the host interface and dynamic PDO mapping
- Display of RUN and ERR

The exchange of IO data of the host application with the Industrial Ethernet Module for EtherCAT is performed separately for input and output data via a configurable memory image in the DPRAM of the module.

The technical details and functions of the Industrial Ethernet Module for EtherCAT (slave controller) may change. Up-to-date information is available on our website.

NicheStack IPv4 & NicheLite TCP/IP

NicheStack and NicheLite are both fully functional and easily portable TCP/IP stacks that contain all basic protocols for Internet-, Intranet- and LAN-connections. They are supplied as source code (ANSI-C) together with a socket API and comprehensive, detailed online documentation.

Both stacks contain the following protocols and services:

- Address Resolution Protocol (ARP)
- Internet Protocol (IP)
- Internet Control Message Protocol (ICMP)
- Dynamic Host Configuration Protocol Client (DHCP-Client)
- Trivial File Transfer Protocol (TFTP)
- Transport Control Protocol (TCP)
- User Datagram Protocol (UDP)
- NicheTask (on request)
- Nichetool: System optimization and online debugging tool

Additionally, the NicheStack also includes:

- File Transfer Protocol (FTP)
- TELNET
- IP Multicast

SPECIFIC FEATURES

- **Easy integration:** NicheStack and NicheLite can be used in connection with RTOS as well as being integrated in super-loop systems. Special multitasking capabilities are not required.

- **Versatile, flexible memory management:** memory is used economically and available again immediately after use.

- Memory allocation via macros allows the adaptation to different compilers.

- **RTOS-independent:** both stacks provide an "Application Process Interface" for major operating systems, simplifying integration into these operating systems.

- **Network interfaces:** both stacks support Ethernet, Token Ring, SLIP and PPP.

- **Zero-Copy-Stack:** for the exchange of data between various protocol levels, a single memory buffer is used.
The buffer is passed by reference, not copied, from one protocol level to the next,providing maximum performance with minimal memory requirement.

- 12 months support and warranty included in the package.

MEMORY REQUIREMENTS

The two stacks differ in some functional features and especially in different codesize: NicheLite is extremely slim and requires only about 12 kByte of code. However, it supports only one interface (Ethernet-Controller, PPP, etc.), does not allow routing or multicasting, and has only a mini-socket with BSD-subset. While NicheStack does not have these limitations, it does require more code memory: A standard application on a 32-bit processor with ARP, IP, ICMP, UDP, DHCP, TCP with a socket-API results in a code size of approximately 50 kBytes.

OVERVIEW PROTOCOLS/SERVICES

	NicheLite Mini-IP	NicheStack
Code size	4 kB	15 kB
UDP	x	x
IP	x	x
Routing	–	x
ICMP	x	x
ARP	x	x
Network	1 Interface	Unlimited
Multicast	–	x

	NicheLite Mini-TCP	NicheStack
Code size	6 kB	31 kB
TCP	x	x
Sockets	Mini (BSD Subset)	Full BSD

NicheStack IPv6 & NicheStack Dual IPv4v6

The products NicheStack v6 and NicheStack Dual v4v6 are a logical further development of the NicheStack for the new Internet standard IPv6. NicheStack v6 supports the new Internet standard IPv6. NicheStack Dual v4v6 supports both IPv4 and IPv6. Data processing is done at package level, where it is possible to use both protocols (IPv4 and IPv6) in parallel on one network.
The NicheStack IPv6 is optimized for embedded systems, requiring only 80 kBytes code for a typical application. Memory requirements are identical to the NicheStack IPv4.

Protocols contained in NicheStack v4 and NicheStack Dual v4v6: see NicheStack IPv4.

SPECIFIC FEATURES

- Specifically optimized for embedded applications (code size, memory requirement and performance)
- Easily portable via ANSI-C source code
- Prepared for real-time operating systems (upcalls) or Super-loop (contained as a template in the source code)
- Stack works in blocking mode or non-blocking mode
- Supports MIB-II statistics (number of packages transmitted/-received, retransmits, collisions, ...) for troubleshooting and optimization
- Easy to switch from NicheStack IPv4 to IPv6 as both stacks use the same application interface

Add-ons for the NicheStacks

▶ NicheStack IPSec/IKE
IPSec/IKE allows encryption of all data contents of IP packages. The keys can be replaced via the Internet (public/private key procedure). Available encryption mechanisms: DES, Triple DES, AES (128, 192, 256 Bit), MDS, SHA-1, SHA-2 (256, 384, 512 Bit).

▶ NicheStack SSL
SSL allows encryption of the TCP data traffic and is often considered to be the standard for encryption of Internet data (e.g. online banking). The encryption mechanisms are available as libraries, e.g.: RC4 (128 bit key), Triple DES, MD5, SHA-1 (160 bit).

▶ NicheStack TELNET-Server
The TELNET-Server is an additional package for the TCP/IP-protocol stacks (already included in NicheStack IPv4 and IPv6) and allows remote access or remote control of the device via a network. It is completely compatible with the standard TELNET-Clients contained, for example, in operating systems such as Windows.

▶ NicheStack PPP
The PPP protocol stack is an additional package for the TCP/IP protocol stacks. It includes the protocols LCP, IPCP, PAP and CHAP and allows the communication via the serial interface. Utilization of a telephone modem is supported by the NicheStack PPP.

▶ NicheStack FTP
The FTP-stack supplements the TCP/IP-protocol stacks by the client and server functions of the File Transfer Protocol FTP. FTP offers the user a standardized file exchange between two systems and checks the integrity of the data. The FTP add-on contains a FTP-Client as well as a FTP-Server.

▶ NicheStack POP3
The POP3 module allows the implementation of the e-mail protocol POP3 on an embedded system, allowing e-mails to be picked up from any POP3 e-mail server.

▶ NicheStack SMTP
NicheStack SMTP allows the implementation of e-mail notification functions on an embedded system. Therefore e-mails can be sent to any e-mail address; for example, to specifically draw attention to faults or in order to transmit production data automatically. It is also possible to send e-mails to several addresses or to include attachments.

▶ DHCP-Server
This software package allows the implementation of a DHCP server on an embedded system. This enables the system to allocate temporary or permanent IP-addresses to Clients. DHCP is the standard method to allocate a temporary IP-address to devices which do not have a permanent one.

▶ NicheStack HTTP-Server
NicheStack HTTP Server enables a full Webserver to be implemented on an embedded system, making it possible to access this system by means of common browsers such as Netscape Navigator or Internet Explorer in the same way as any other server in the network.
All standard features of a web-server, like CGI, SSI, Server Push and authorization of selected webpages are supported.

▶ HTML Compiler
The HTML Compiler is required by the HTTP Server to integrate standard HTML files, pictures (gif, jpg) or Java applets into the webserver project without needing to implement a file system and thus saving system resources. Frames, forms, etc. are also supported by the HTML Compiler.

▶ SNMP v1, v2c or v3 Agent
The Simple Network Management Protocol is the most commonly used protocol for the configuration and maintenance of network components. An SNMP-agent can be implemented with each of the three SNMP-modules.

▶ NicheView
NicheView is a physically accommodating yet extremely efficient WWW-browser for embedded systems.
This product provides an interface for all user inputs such as keyboard inputs, mouse-clicks etc. and for outputs such as text or image displays etc. With a code size of only 35 kByte, NicheView implements HTML 3.2, multiple fonts, plug-ins and JavaScript in one device. It supports frames, animated GIFs, Color and JPEG, as well as tables and forms.

IEEE 1588 PTP
Protocol Software – V2

The IEEE1588 protocol software enables simple, rapid development of IEEE1588 compliant devices. Developed by IXXAT, the IEEE1588 protocol software has a modular structure, insuring fast integration into the target system. For access to the UDP/IP socket, the interfaces to the target platform are compiled in a separate adaptation layer (network interface), considerably simplifying porting to the target system.
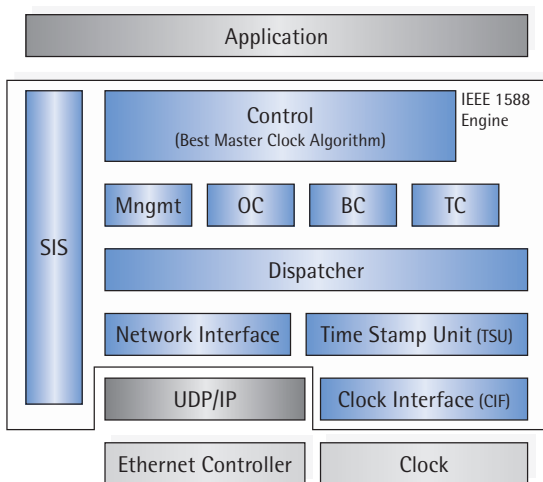
The IEEE 1588 protocol stack V2 is an extended and adapted version of the previous version V1 and supports the functions of the specification IEEE 1588-2008.

The software is completely independent of the operating system and therefore, can also be used in applications without an operating system (superloops). The only requirement is a multicast-compatible UDP/IP stack. The IEEE1588 stack is highly scalable and can be ported to any device. It supports message intervals for up to 2048 packets per second for each message type.

FUNCTIONALITY

The IEEE1588 V2 software is a full implementation of the IEEE 1588-2008 standard with the following features:

- Ordinary / Boundary Clock
- Transparent Clock
- Unicast Messaging
- Best Master algorithm
- One step / two step support
- Peer-to-peer and end-to-end delay mechanism
- Management Protocol / Interface
- Simple API for interfacing the application
- Runs with and without OS
- Easily adaptable to target hardware, UDP/IP stack and OS
- Optimized filter algorithms for the usage in standard Ethernet networks with high bus loads

IEEE 1588 PROTOCOL STACK VERSIONS

The IEEE 1588 protocol stack is available in three versions:

- Ordinary Clock (only Slave) with peer-to-peer and end-to-end delay mechanism
- Boundary/Ordinary Clock (Master/Slave) with peer-to-peer and end-to-end delay mechanism and Unicast functionality
- Transparent/Boundary/Ordinary Clock (full functionality) with peer-to-peer and end-to-end delay mechanism and Unicast functionality

SUPPORTED PROCESSORS AND ETHERNET CONTROLLERS

The IEEE protocol stack is available vor various processors and Ethernet controllers with integrated 1588 functionality. A complete overview of all supported targets can be found on the IXXAT webpage.
An adaptation of the IEEE 1588 protocol stack to currently not supported targets can be performed by IXXAT on request.

CONTENTS OF DELIVERY

- Source code
- Software license
- Manual
- Technical support

ADDITIONAL SERVICES
(not included in contents of delivery)

Maintenance agreement
As a supplement to the software package, IXXAT offers a maintenance agreement that includes the provision of the following services for the term of the agreement:

- Free updates and troubleshooting
- Adaptation to the latest standard
- Technical support

Code Introduction
IXXAT also offers a one-day introduction to the code that focuses on interfaces, processes and data flows in the IEEE 1588 software. Specific questions concerning the adaptation can also be answered while direct adaptations to the code can also be carried out.

Implementation support
As an additional program offering, IXXAT can also handle the adaptation, implementation and testing of the IEEE 1588 software on your system.

IEEE 1588 IP Core Module for FPGAs

▶ **IP Core module enables IEEE1588-2008 compliant clock synchronization with high accuracy**

For the clock adjustment between the local real-time clock and the master clock, it is necessary to provide the IEEE1588 telegrams with very accurate time stamps. If the used CPU has no IEEE1588 support, it is necessary to use software time stamping or to use an external IEEE1588 real time clock (RTC) with a time stamping unit (TSU). If the time stamp is generated by software, the clock synchronization is in the range from several 10 µs up to milliseconds. If done in hardware (FPGA), the accuracy for the time stamp generation corresponds to the FPGA interal clock, which is in the range of 20-50 ns. So a timer synchronization between master and slave clock in the double-digit nanosecond range is possible.
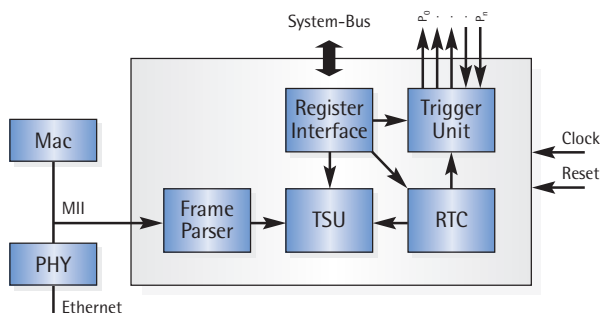
Using the trigger unit, changes of digital input signals can be captured chronological exactly via time stamps. In addition, it is possible to generate digital output signals, at this the starting time and the frequency can be specified exactly.

The IEEE1588 IP Core is intended for:

- Usage with a FPGA internal soft CPU like the Altera NIOS, running the IEEE1588 protocol software (IEEE1588 device as one chip solution)
- Usage with an external CPU running the IEEE1588 protocol software and application software

In both cases no special real-time requirements to the software environment are needed. It is completely sufficient to run the IEEE1588 protocol software cyclically, approx. every 10 – 100 ms. This results in a CPU load of less than 1 %.

Evaluation Kits for IEEE 1588

FlexRay CCM

▶ **PC interface for FlexRay and CAN**

For the fast introduction of the IEEE 1588 technology evaluation kits based on the Freescale and AMCC PowerPC CPUs are available. A complete overview of the available evaluation kist can be found on the IXXAT webpage. The evaluation kits are offered directly by the respective producers.
For test purpose, a fully implemented version of the IXXAT IEEE 1588 protocol stack is in the scope of supply of the starter kits.

In addition, the Industrial Ethernet Module from IXXAT is a platform which allows the test and development of FPGA based IEEE 1588 applications.

The FlexRay CCM is a powerful FlexRay/CAN platform for both PC-based and stand-alone applications. As an open PC interface, it is measuring hardware for comprehensive analysis and simulation tasks for FlexRay and CAN networks. An exact local time enables synchronous logging of FlexRay and CAN messages. The FlexRay analysis is carried out both via the FlexRay protocol module and via an asynchronous bit stream analysis, so that both the start-up behavior and specific errors on the FlexRay bus can be detected.

The powerful micro-controller system (MPC 866, 130 MHz) allows real-time-critical tasks to be performed directly on the hardware in the form of add-on software modules. In this way, real-time rest bus simulations, protocol implementations or emulation functions can be implemented.

The FlexRay CCM can also be used as an autonomous device, which enables use as a FlexRay/CAN gateway, for example.
The interface communicates via Fast Ethernet TCP/IP (10/-100 Mbit/s) and is designed for processing of 100 % bus load on all bus systems.

The interface is connected to FlexRay via the current version of the FlexRay chip (Freescale MFR 4310). Upgrading to new chip generations can be carried out with plug-in modules.
In addition to two 10 Mbit/s FlexRay channels, the interface has two CAN interfaces (ISO/IS 11898-2 high-speed CAN und ISO/IS 11898-3 low-speed CAN).

To control external hardware components, the interface has four trigger outputs, which can be controlled via FlexRay messages or by the FlexRay cycle. In addition, two trigger inputs are available.

The scope of supply of the FlexRay interface includes a driver that provides functions for configuration as well as receiving and transmitting FlexRay and CAN messages. Own PC applications can be easily developed on the basis of the driver.

DUAL CHIP EXTENSION

With the dual chip extension, two FlexRay cold starters can be implemented with one hardware platform. Thus the device can also start FlexRay networks containing integration nodes only.

EMBEDDED PROGRAMMING EXTENSION

An extension package enables the implementation of own software components on the Embedded FlexRay CCM hardware. Thus the implementation of transport protocols, real-time simulations or gateway solutions is possible.

TECHNICAL DATA

- FlexRay 2 x 10 Mbit/s
- FlexRay protocol chip: Freescale MFR4310
- Analysis of the FlexRay start-up behavior (asynchronous analysis mode)
- FlexRay interface: Philips TJA 1080
- 2 x CAN ISO/IS 11898-2 and ISO/IS 11898-3 switchable via software
- Connection to PC with Fast Ethernet 10/100 Mbit/s
- 4 trigger outputs, 2 trigger inputs
- MPC 866 microcontroller system with 130 MHz
- 64 Mbyte RAM, 32 Mbyte Flash
- Power supply with 6.5 to 50 V DC
- Temperature range -40 to +70 ºC

CONTENTS OF DELIVERY

- FlexRay CCM
- Power cable
- Ethernet cable
- Driver CD
- Manual

ORDER NUMBER

1.01.0100.00011	FlexRay CCM
1.01.0100.00014	FlexRay CCM (MFR4310 Dual Chip)
1.01.0100.00016	FlexRay CCM-E (Stackable Case)
1.01.0101.00012	Dual Chip MFR 4310 Extension Kit

FRC–EP150

▶ **PC interface for FlexRay and CAN**

The FRC-EP150 is functional compatible to the FlexRay CCM, except for the four CAN interfaces. Due to this, the device is specially suited for FlexRay/CAN gateway applications where higher data amounts have to be transferred or for the connection of multiple, different CAN systems to FlexRay.

For further information about the general device functionality please refer to the product FlexRay CCM.

TECHNICAL DATA

- FlexRay 2 x 10 Mbit/s
- FlexRay protocol chip: Freescale MFR4310
- Analysis of the FlexRay start-up behavior (asynchronous analysis mode)
- FlexRay interface: Philips TJA 1080
- 4 x CAN interface
  - 2 x ISO/IS 11898-2 and 11898-3, switchable via software
  - 2 x ISO/IS 11898-2
- Connection to PC with Fast Ethernet 10/100 Mbit/s
- 4 trigger outputs, 2 trigger inputs
- MPC 866 microcontroller system with 130 MHz
- 64 Mbyte RAM, 32 Mbyte Flash
- Power supply with 6.5 to 50 V DC
- Temperature range -40 to +70 ºC

CONTENTS OF DELIVERY

- FRC-EP150
- Power cable
- Ethernet cable
- Driver CD
- Manual

ORDER NUMBER

| 1.01.0102.00011	FRC-EP150
1.01.0102.00014	FRC-EP150 (MFR4310 Dual Chip)
1.01.0101.00012	Dual Chip MFR 4310 Extension Kit

Multibus Analyser for FlexRay

Based on the experience made in analyzing automotive bus systems in the CAN area, IXXAT developed it's Multibus Analyser. The Multibus Analyser is operating together with the FlexRay CCM PC interface and provides functions for receiving, transmitting as well as tracing and the interpretation of FlexRay and CAN messages.
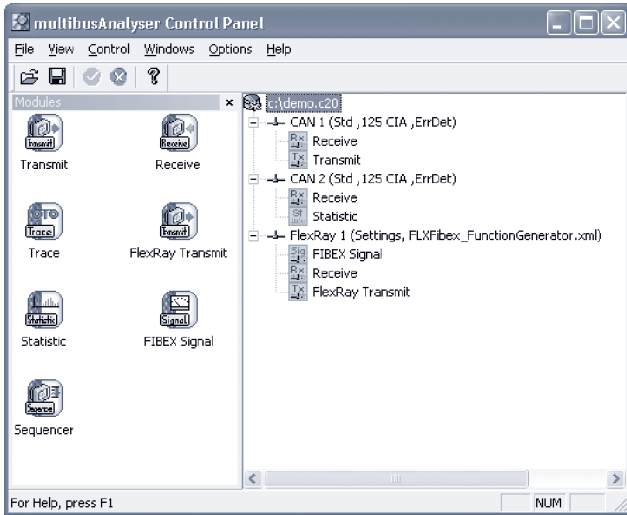
FUNCTION OVERVIEW

▶ Reception and display of messages (receive module)

The receive module of the Multibus Analyser provides the online display of the FlexRay and CAN messages (raw data). The messages can be displayed in scroll and overwrite mode. In scroll mode the FlexRay messages are displayed with timestamp, ID, cycle and channel number. In the overwrite mode the messages are displayed in the order of either the identifier, the channel number or FlexRay cycle at cycle reception and are always updated by the latest received messages.

As a special feature, the receive module highlights the contents of a message which has changed in order to make the changes obvious.

The message status vector is also displayed and interpreted, static and dynamic messages are tagged. The receive module provides filter functions for selecting and displaying data with respect to message cycle, ID, channel number or message status.
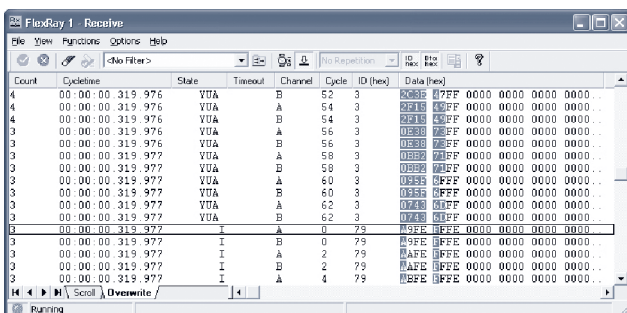

▶ Recording of messages (trace module)

The trace module allows the online logging of the entire communication on hard disk. The received messages (with timestamp, cycle number, ID and channel) as well as relevant errors are recorded for offline evaluation.

The trace module has a manual start/stop function and a trigger/filter mode. Recorded messages can be converted to various formats.

The multibus functionality of the analyser allows the user to analyze FlexRay and CAN systems synchronously.
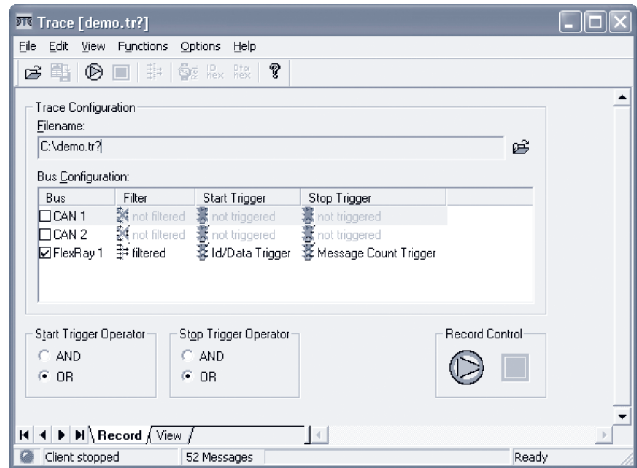

▶ Display and interpretation of physical signals (signal module)

The signal module enables the interpretation of the signals transmitted in a FlexRay or CAN message. Similar to the receive module, a scroll and an overwrite mode is available for displaying the interpreted signals. The display can be completely customized in order to meet the user requirements. Furthermore, the signal module provides a cycle time monitor. The data interpretation rules are provided according to the ASAM Fibex data description standard. This allows the visualisation of the network, whereby the received signals can be assigned to the devices.
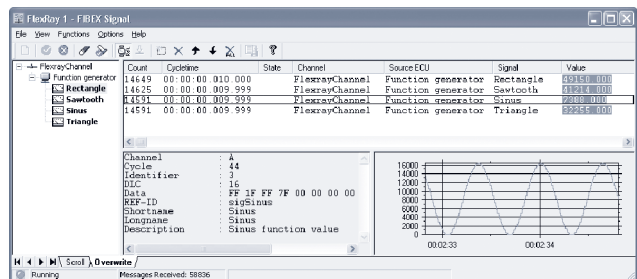
▶ Transmitting of messages (transmit module)

The Multibus Analyser can also be operated as a network node providing the transmission of pre-defined messages.
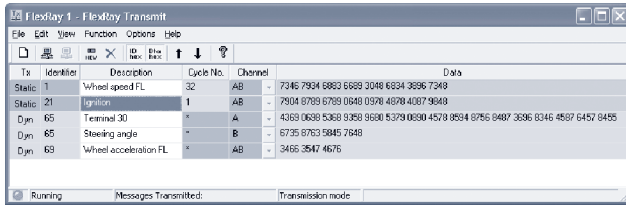
▶ Scripting Host and .net Interface

The scripting host is a powerful interface which allows the user to adapt the Multibus Analyser quickly and easily to specific simulation and analyzation tasks. For test and device simulation the interface provides functions for the transmission and reception of FlexRay and CAN messages.
The scripting host supports the Windows scripting languages C# and Visual-Basic-Spript as well as .NET visual components.

▶ CAN modules

In addition to the FlexRay function modules the Multibus Analyser provides various modules for CAN analyzing and stimulation of the canAnalyser product (see canAnalyser).

IMPORT/EXPORT FUNCTIONALITY

- Data interpretation: CAN IXXAT XML, CANdB, Fibex
- FlexRay: IXXAT INI, Fibex

HARDWARE REQUIREMENTS

- PC with Windows 2000/XP/Vista
- IXXAT FlexRay-CCM or FRC-EP150

CONTENTS OF DELIVERY

- Software package as single user license, including Control Panel, Receive Module, Transmit Module, Trace Module, Sequencer Module, Statistic Module, Signal Module
- Programming samples for the programming interface
- User manual
- USB license key

ORDER NUMBER

1.02.0241.00000	Multibus Analyser FlexRay

IXXAT

Residual Bus Simulation of FlexRay and CAN Systems

With the analysis of FlexRay networks, requirements are made of the measuring hardware that are fundamentally different from the requirements for CAN networks, for example.

Whereas with a CAN analysis system, the use of a communication controller is generally sufficient for bus analysis, in the case of FlexRay additional measures must be taken to be able to analyze start-up processes and errors. A FlexRay communication controller, for example, is not capable of receiving messages during the start-up phase required for establishing the deterministic communication and passing them on to an analysis system. In addition, not all errors relevant for the FlexRay bus analysis can be reported by a FlexRay communication controller.

With its FlexRay/CAN-PC interface "FlexRay CCM" respectively "FRC-EP150", IXXAT pursues the approach of the combined FlexRay analysis consisting of asynchronous bit stream analysis and synchronous analysis with the aid of a FlexRay communication controller. The FlexRay bit stream is thus scanned by an independent system and the FlexRay communication controller is operated at the same time. The results from both sources are compared and results additionally obtained are supplied to the analysis software.
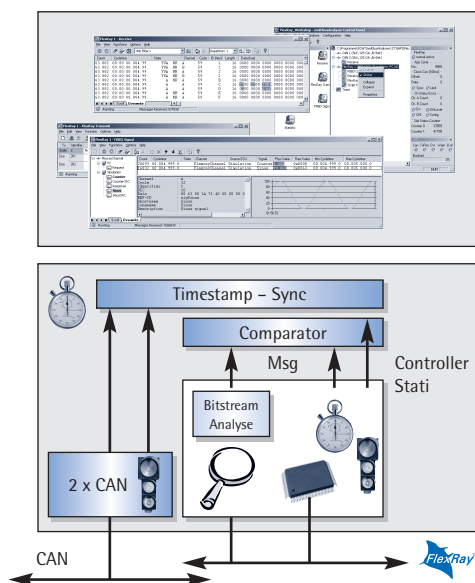
Together with the IXXAT MultibusAnalyser, the FlexRay/CAN-PC interface FlexRay CCM / FRC-EP150 therefore provides a powerful analysis environment for the synchronous analysis of FlexRay and CAN networks. The FIBEX import provided by the MultibusAnalyser allows an analysis both at message level and at signal level. FlexRay and CAN networks can also be stimulated via transmit functions. The open .net interface enables simple implementation of customized function modules, displays as well as node and rest bus simulations. An additional code generator also enables access to FlexRay and CAN messages via application parameters (signals), which are already generated in the form of .net assemblies (see MultibusAnalyser).

The residual bus simulation provides a simulation environment for one or more control devices, so that they can be tested independently of other nodes. This includes the generation of message traffic that is necessary for the device to be tested and reaction to messages. In addition, the FlexRay residual bus simulation ensures that at least two FlexRay cold starters are available so that the FlexRay network can be started. With the dual chip extension of the FlexRay CCM / FRC-EP150, one device can represent two cold starters and thus start a network with FlexRay integration nodes only.

RESIDUAL BUS SIMULATION FOR CAN

In addition to the FlexRay ECUs and Signals, the optional CAN Residual Bus Simulation allows the integration of the CAN ECUs and Signals into the simulation. At this, the Fibex file provides the data for the configuration of the combined simulation range. The CAN Residual Bus Simulation runs in parallel on the FlexRay CCM / FRC-EP150 and supports the simultaneous simulation of FlexRay and CAN signals.

The generation of the FlexRay message traffic for the residual bus simulation is frequently connected with real-time requirements. This means that response data are expected within a specified time, usually within a message cycle, by the control device to be tested and the simulation of the Flexray message traffic must be provided in real time. The IXXAT FlexRay CCM / FRC-EP150 supports real-time residual bus simulation directly on the hardware via a Linux-based embedded programming environment. The code to be processed is dynamically loaded in kernel mode to the FlexRay CCM / FRC-EP150 and processed. FlexRay and CAN messages can be received and processed further and response data can be sent in real time. A framework and C-interfaces are available for this. A GNU compiler with a download tool that runs on Windows translates and loads the program modules to the FlexRay CCM / FRC-EP150, which are stored there on the flash file system. It is also possible to control the embedded residual bus simulation via the PC with data transfer, as is stand-alone operation (i.e. operation of the FlexRay CCMs / FRC-EP150s without a PC). For low real-time requirements i.e. when response times of 10-20 ms are sufficient, the residual bus simulation environment via the .net interface of the MultibusAnalyser is available.

Apart from the residual bus simulation, the embedded programming environment of the FlexRay CCMs / FRC-EP150s also offers the possibility to implement gateways, transport protocols or ECU emulations.

The embedded programming package for the FlexRay CCM / FRC-EP150 consists of support of stand-alone operation, embedded frameworks for FlexRay and CAN with the necessary development and download environment.

ORDER NUMBER

1.02.0243.00000	FlexRay Residual Bus Simulation
1.02.0243.00002	FlexRay and CAN Residual Bus Simulation
1.02.0245.00000	Residual Bus Simulation Runtime Full License for FlexRay CCM and FRC-EP150

CARcorder for
FlexRay, CAN, LIN and K–Line

The CARcorder is a universal, automotive diagnostics and logging unit. It supports all relevant bus systems in vehicles and can be extended with optional hardware extensions for multimedia buses and wireless interfaces. With its two processors, the unit enables loss-free, synchronous logging of all connected buses.
The software provided runs on the PC and is used to create measurement configurations, to download them to the unit, to read out the measurement results in the form of logging data and, where necessary, to convert them into the required target format. It is also possible to carry out an update on all function blocks of the unit.

LOGGING UNIT

The logging unit is based on an embedded PC with 520 MHz. The logging application is executed on Windows CE. Real-time data logging of the fieldbuses is ensured via a separate fieldbus controller. The unit is configured via USB stick or Ethernet.

All fieldbuses are connected to the unit via LEMO© connectors. The necessary terminating resistors can be enabled via software. The received data is time-stamped uniformly for all inputs with an accuracy of 1 μs for FlexRay and CAN. If more than one unit is used (measurement clusters), they can be synchronized via IEEE 1588.

The unit has integrated power management and can therefore reduce its power consumption in deep sleep mode to below 10 mW. The wake-up of the unit is done with the first valid CAN message, which is also logged. Due to the low power consumption, the unit does not need a fan.

CONFIGURATION SOFTWARE

The logging unit can be configured with convenient PC-based configuration software. This tool is also used to define diagnostic jobs and trigger conditions.

The fieldbuses are configured by importing description files (CANdb, FIBEX, A2L, ODX). This also ensures the high level signal interpretation. An open XML format for customized configuration is also supported.

The triggers and filters are defined via a scripting language. An editor supporting syntax highlight and syntax check makes programming considerably easier and helps to reduce errors. The scripting language is compiled via an integrated code generator and transmitted to the CARcorder. This ensures high performance of the unit in case of many parallel trigger conditions. Several measuring tasks can be active simultaneously.

Configuration Tool
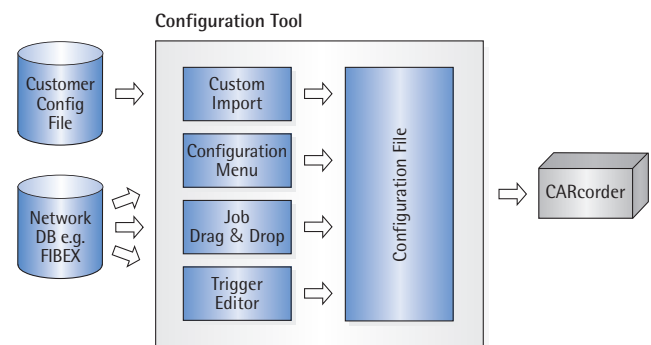
Trigger conditions can be defined based on:

- Signals from received messages and diagnostic data
- System variables (terminal 15, A/D inputs, ...)
- Timers, counters
- Constants, variables (stored during sleep mode)

It is possible to combine several trigger conditions via operators.

Diagnostic jobs can be defined for specific control units via drag-and-drop menu. The diagnostic jobs comprise reading of error memory, measurement data blocks and information memory. The code is generated from the job definition and executed after being downloaded to the logging unit.

The recorded data can be uploaded to the configuration tool or transmitted to USB storage media. The compressed data can be converted to other formats for further processing/analysis (IXXAT Tracefile, ASCII, Vector BLF). The configuration tool can be easily extended to further formats.

IXXAT

DIAGNOSTIC AND TRANSPORT PROTOCOLS

The CARcorder supports a large number of diagnostic and transport protocols. These are available as loadable DLL's and can be installed on the unit if required. With this process it is possible to extend the functional scope of the unit by adding further protocols without having to replace the logging unit in the future .

Current diagnostic protocols/standards:

- TP2.0 (CAN)
- ISO 15765-2 (CAN)
- ISO 14230-2 (K-Line)
- KWP2000
- UDS

Current measurement protocols:

- CCP (CAN)

IXXAT may implement other protocols on request.

UNIT VERSIONS

The CARcorder is available in two versions. The full feature version has the complete range of functions and can be extended with additional options. The basic version does not have FlexRay support and only provides four CAN interfaces. This version is not extendable.

TECHNICAL SPECIFICATIONS

- Main processor: Marvell XScale PXA270, 520 MHz
- 32 MByte Flash
- Up to 256 MByte SDRAM
- Replaceable compact flash card with up to 16 GB memory
- WinCE 5.0 operating system
- 6.5 V to 40 V power supply with reverse polarity and surge protection
- Power consumption in sleep mode < 200 mW
- Power consumption in deep sleep mode < 10 mW
- Battery discharge protection
- UPS for 10 secs. (motor start)
- Energy storage to flash the last recording (terminal 15 off, operation without terminal 30)
- Wakeup via the bus systems and external devices

INTERFACES

- 1 x FlexRay 10 Mbit/sec. 2 channels
- 6 x CAN ISO 11898-2 (high speed) max. 1 Mbit/sec. Alternatively: 4 x CAN ISO 11898-2 & 2 x CAN ISO 11898-3 (low speed) max. 125 kbit/sec.
- 4 x LIN (slave)
- 1 x K-Line
- 4 x RS232 with hardware handshaking
- 8 x digital in/out
- 4 x analog in (10 bit, 5 V)
- 1 x trigger input and output
- 1 x external wake-up
- 1 x Ethernet 10/100Base-T
- 3 x USB 2.0 (host/slave/OTG, 480 Mbit/sec.)
- Serial port for external control unit
- LED displays for the device status

OPTIONS

- Remote control with display, microphone and audio output
- WLAN
- MOST
- GSM/GPRS/EDGE
- GPS

CONTENTS OF DELIVERY

- CARcorder (basic or full feature version)
- Power supply cable
- Ethernet cable
- Compact flash memory card
- Configuration tool
- Manual

ORDER NUMER

1.01.0014.00002	CARcorder Basic Version
1.01.0014.00003	CARcorder Full Feature Version
1.01.0014.00010	CARcorder Remote Control Unit

FlexRay/CAN Gateway

The FlexRay/CAN gateway is a flexible, configurable tool with which FlexRay messages and signals can be transferred to the CAN bus. This works in both directions and is especially useful for applications where existing CAN-based measurement and control technology is to be integrated into new FlexRay environments. Another use is the integration of a FlexRay control unit in the CAN bus of a vehicle. In addition, CAN-to-CAN and FlexRay-to-FlexRay data exchange is possible.

The FlexRay/CAN gateway contains configuration software for the PC and a gateway runtime application which executed on the hardware platform. The software on the PC is required to define the gateway configuration. After downloading to the target hardware, the gateway application runs independently of the PC.
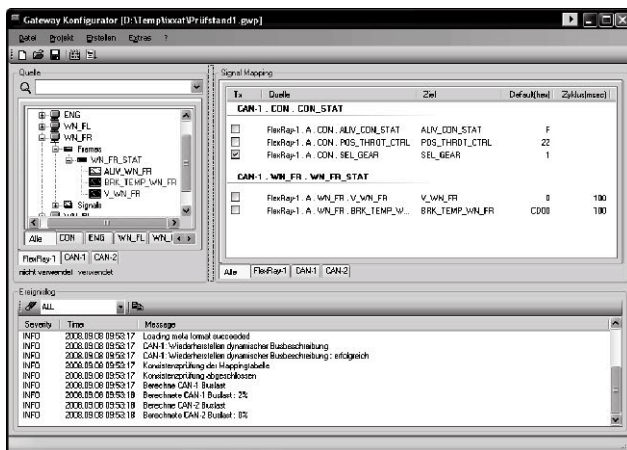
GATEWAY CONFIGURATION SOFTWARE

The configuration software is an application running on the PC which enables simple allocation of signals on the FlexRay bus to signals on the CAN bus (and vice versa) via a graphical interface. The signals specified in the Fibex bus description file or CANdb can be selected and allocated via drag & drop. The software supports user inputs by suggesting signals with relevant names. A description file is optional for the CAN bus. If no description file is available, the user can also specify the messages or signals manually.
The tool checks all allocations for consistency, i.e. the data length and data type of the input and target signal are compared. In the event of inconsistencies, the user is notified of this by means of a warning or error message. All CAN interfaces provided by the hardware platform can be used to transmit signals. Generally, only some of the signals on the FlexRay bus are relevant, so that the bandwidth of the CAN buses is sufficient. If the available bandwidth is exceeded, the user is notified with a message.
After completed configuration, the software calculates the allocation of the signals and provides them in the form of a loadable table. All files of a configuration can be stored in one project and reloaded at a later date for additions or modifications.
With a download dialogue, the necessary files and code can be transferred to the hardware platform. The user can decide whether the configuration is stored in the RAM or in the FLASH memory of the hardware platform. After a successful download, a connection to the PC is no longer necessary.

RESIDUAL BUS SIMULATION

The FlexRay/CAN gateway application is based on the IXXAT residual bus simulation for FlexRay and CAN systems. Based on the Fibex description file normally used for the FlexRay bus, code is generated for the hardware platform used, which transmits the messages required for communication with the necessary CRC checksums and alive counters according to the specified cycle. This ensures the operability of the FlexRay.

GATEWAY APPLICATION

The gateway application is also run on the hardware platform. It interprets the table with the signal allocations and configures the unit accordingly. The CAN bus is provided with messages event-controlled or cyclically. The cycle time is defined by the configuration.

HARDWARE PLATFORM

The hardware platform used for the FlexRay/CAN gateway is the FlexRay CCM or the FRC-EP150. Both units have a robust housing, an extended temperature range and a wide supply voltage range. The units are therefore ideal for use in vehicles or in the rough environment of a test bench.
The FlexRay/CAN gateway configuration can be stored in the Flash memory of the units. In this way it is possible for the units to also start the gateway application independently after a power-on without a connection to the PC. Due to this stand-alone capability, pre-configured units can also be installed in inaccessible places in the vehicle or test bench.
Both units can also be ordered with a dual chip option and can therefore provide the two cold-start nodes required for FlexRay. In combination with the FlexRay/CAN gateway, it is thus possible to connect control units to the vehicle or test bench which do not have a cold-start node themselves.

ORDER NUMBER

1.02.0244.00000	FlexRay/CAN Gateway Configuration Software
1.02.0243.00000	FlexRay Residual Bus Simulation
1.02.0245.00005	Gateway Runtime License Bundle

Automotive Test Platform
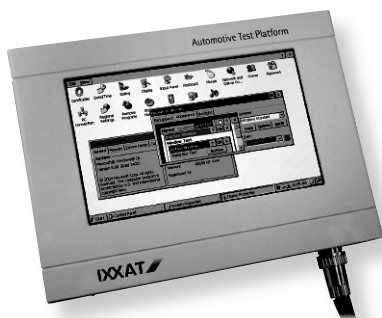
The Automotive Test Platform (ATP) is a powerful hardware platform with interfaces for all conventional fieldbus systems. It is aimed at customers who wish to develop specific application software for the automotive sector but do not have the relevant target hardware.

The hardware is based on a powerful microprocessor and supports a temperature range of -20° C to +70° C. The selected architecture ensures high data throughput via all interfaces with a low load on the main processor. The message packets can be assigned with a timestamp on all automotive bus system interfaces with an accuracy of 1 µs. This also applies to the analog and digital inputs and outputs.

Currently, the ATP is supplied with the necessary software in order to be able to develop custom applications on Windows CE in C, C++ or C#. After successful implementation of the application, IXXAT also offers adaptation or optimization of the ATP design to the specific needs of the customer.

APPLICATION INTERFACE

The Automotive Test Platform is based on a dual processor concept. The fieldbus controller is pre-configured and represents the interface to the supported fieldbuses. The customer's own application runs on the main processor. Exchange of date between both processors is done via an FPGA. This is transparent for the user, as access to the fieldbus controller is mapped via a well-documented API supplied with the platform. The API provides all necessary functions for communicating via the various buses. In addition to functions for initialization, starting and stopping an interface, functions are also available for transmitting and receiving data.

PROGRAMMING ENVIRONMENT

Customers' own applications are implemented on the main processor on Windows CE 5.0. The application communicates with the pre-configured fieldbus controller via the API provided. Microsoft Visual Studio 2005 is used for development of the applications. Based on that, custom C, C++ or C# programs can be written, compiled and tested.
For test purposes, the code is loaded to the target hardware via USB, transparent for the user, and can then be tested with the integrated high level language debugger. After completion of the tests, the program can be stored on the compact flash card and is available every time the unit is switched on. If configured in the launcher, the application is automatically started at boot time after the operating system has started.

DIAGNOSTIC AND TRANSPORT PROTOCOLS

As an option, fully programmed diagnostic and transport protocols can also be purchased for the ATP. These are supplied as loadable DLLs and can be used by the customer's own application. It is possible to use higher protocols for communicating with the control units without the need for detailed knowledge of the protocols.

Diagnostic protocols/standards:
- TP2.0 (CAN)
- ISO 15765-2 (CAN)
- ISO 14230-2 (K-Line)
- KWP2000
- UDS

Measurement protocols:
- CCP (CAN)

IXXAT may implement other protocols on request.

UNIT VERSIONS

The Automotive Test Platform is available with or without a display (standard version / basic version). Apart from the display, the functionality of both is identical.

TECHNICAL SPECIFICATIONS

- Main processor: Marvell XScale PXA270, 520 MHz
- 32 MB flash
- 64 MB SDRAM
- WinCE 5.0 operating system
- 7" graphic display, TFT 16:9, 800x480 pixels with touch-panel (ATP standard only)
- Internal compact flash card 512 MB
- USB host and PC interface
- 10/100Base-T Ethernet
- 4 individual CAN high-speed interfaces ISO 11898-2 with up to 1 Mbaud
- 1 FlexRay interface with 2 channels (A/B) with up to 10 Mbit/sec.
- 2 LIN interfaces (slave)
- K-Line
- 2 RS232 channels with up to 115 kbit/sec.
- Real-time clock with battery power
- 4 analog in channels 10 bit, 0-5 V
- 4 analog out channels 10 bit, 0-5 V
- 6.5 V to 40 V power supply with reverse polarity and surge protection

CONTENTS OF DELIVERY

- Automotive Test Platform (basic or standard)
- Operating system Windows CE 5.0
- Software development kit
- Power supply cable
- USB cable
- Hardware manual
- Software user's manual and programming manual
- Demo applications

ORDER NUMBER

| 1.01.0010.00000 | Automotive Test Platform Basic (without Display) |
| 1.01.0010.00001 | Automotive Test Platform Standard (with Display) |

FlexRay Accessories

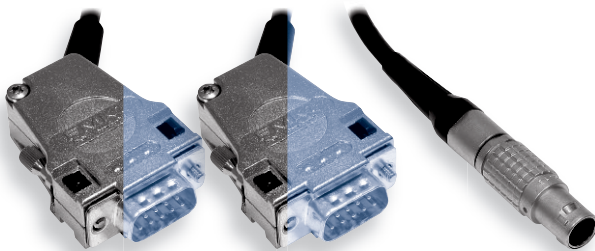## ▶ CAN 1:1 cable for FlexRay CCM & FRC-EP150

Lemo plug (8 pins, type FGC.1B.308) to Sub-D9 plug; 1 meter length; Cable: Nexans, impedance 100 Ohm; Temp. range: -40 to +85 ºC
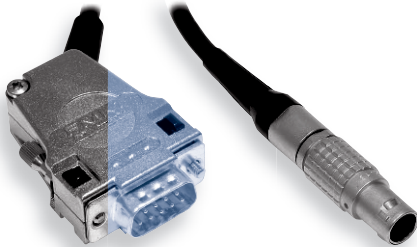
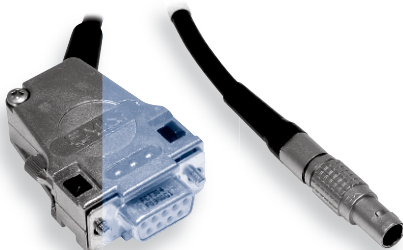| Order number	1.04.0093.00000

▶ CAN Y cable for FRC-EP150

Lemo plug (8 pins, type FGC.1B.308) to two Sub-D9 plugs; each 1 meter length; Cable: Nexans, impedance 100 Ohm; Temp. range: -40 to +85 ºC

Order number	1.04.0093.00001

▶ FlexRay 1:1 cable for FlexRay CCM & FRC-EP150

Cable with integrated 100 Ohm bus termination; Lemo plug (5 pins, type FGB.0B.305) to Sub-D9 socket; 2 meter length Cable: Nexans, impedance 100 Ohm; Temp. range: -40 to +85 ºC
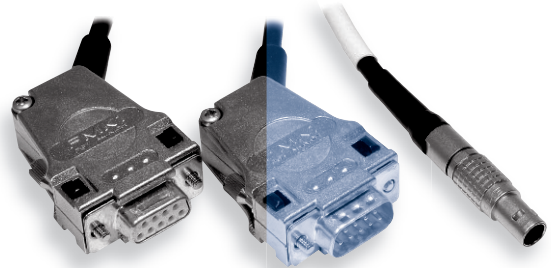
Order number	1.04.0092.00000

* content of delivery of the FlexRay CCM

▶ FlexRay Y cable for FlexRay CCM & FRC-EP150

Lemo plug (5 pins, type FGB.0B.305) to Sub-D9 socket and Sub-D9 plug; 2 meter length; Cable: Nexans, impedance 100 Ohm Temp. range: -40 to +85 ºC

Order number	1.04.0092.00001

▶ Trigger cable for FlexRay CCM & FRC-EP150
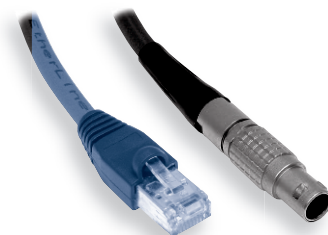
Lemo plug (8 pins, type FGB.1B.308) to 4 BNC plugs; 2 meter length

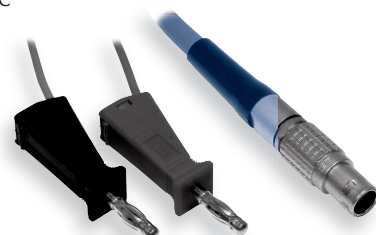| Order number	1.04.0094.00000

▶ Ethernet cross cable for FlexRay CCM & FRC-EP150 *

Lemo plug (8 pins, type FGG.1B.308) to RJ45 plug; 3 meter length Cable: Lappkabel UNITRONIC; Temp. range: flexible -5 to +40 ºC, permanently mounted -40 to +70 ºC
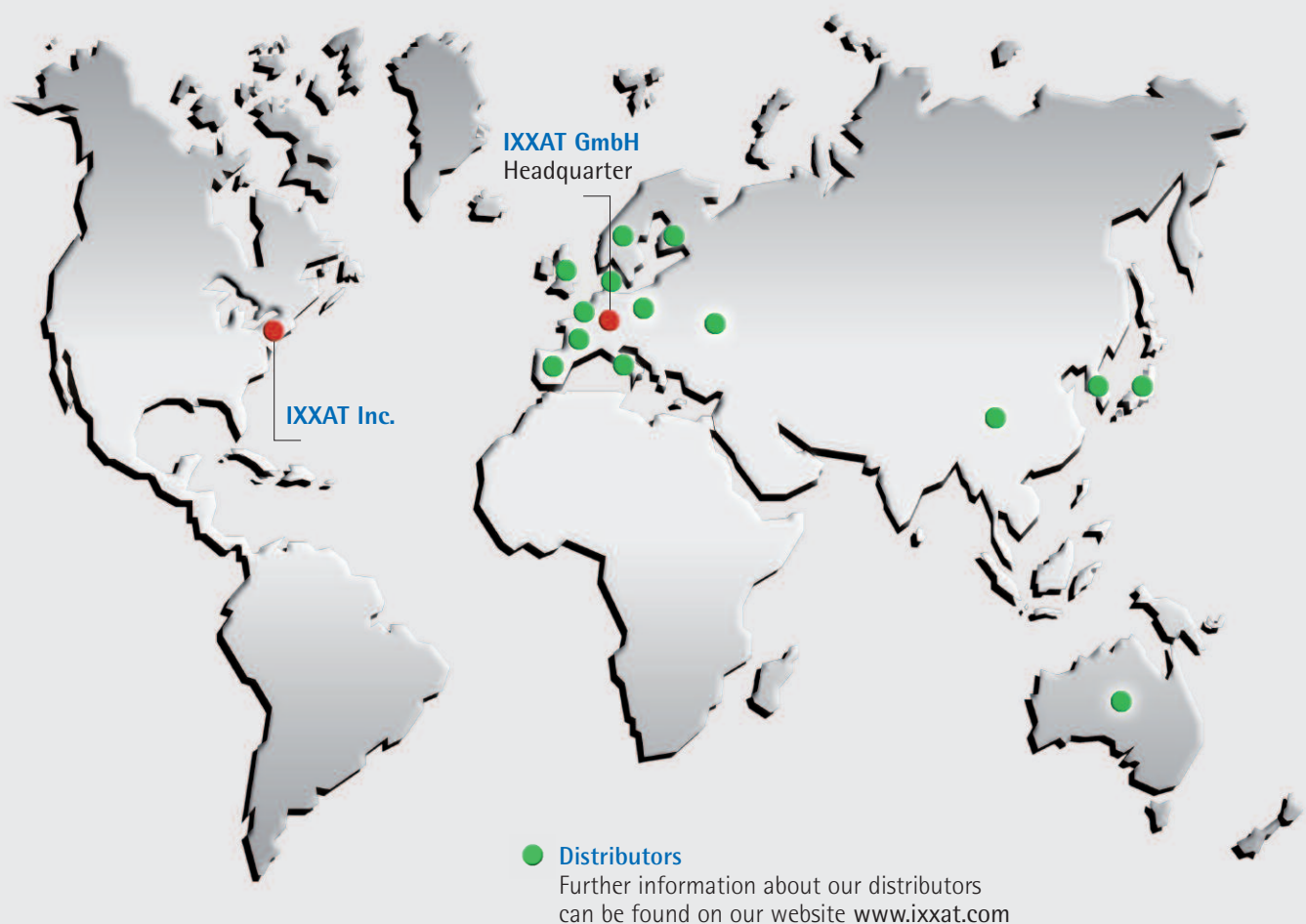
Order number	1.04.0090.00000

▶ Power cable for FlexRay CCM & FRC-EP150 *

Lemo socket (2 pins, type FGJ.1B.302) to two 4 mm banana plugs; 2 meter length; Cable: Lappkabel SILFLEX-SIHF; Temp. range: -40 to +85 ºC

Order number	1.04.0091.00000

IXXAT

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