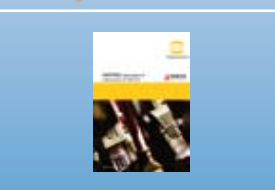


SERCOS interface



Product and Manufacturer's Guide SERCOS III



SERCOS III – The universal Real-Time Ethernet Technology for Motion, Safety and I/O



Launched at the beginning of the 90s, SERCOS has reached worldwide acceptance in all large automation markets as the de-facto standard for demanding applications with high requirements for dynamics and precision. The basis for its success in all kinds of industries and applications lies in its efficient and deterministic communication protocol. However, SERCOS not only specifies a real-time communication system, but also

more than 500 standardized parameters, which define the interaction of controls and peripheral devices in multi-manufacturer systems. This is the basis for interoperability of devices from different manufacturers. Today, more than 2.5 million SERCOS real-time nodes are in use.

SERCOS III is the third-generation technology that combines SERCOS with Industrial Ethernet. This results in a number of advantages:

- Universal network for the entire spectrum of industrial automation applications
- Standardized solution defined in IEC 61158, 61784 and 61800-7
- Worldwide connectivity – from the office to the field level
- Flexible and cost-effective thanks to industrial Ethernet technology
- Compatible with the established SERCOS drive profile
- Proven and innovative real-time communication mechanisms
- Ease of use extends from upfront engineering right through to ongoing maintenance

Implementation of SERCOS III

Manufacturers can easily integrate SERCOS III into their own systems. Various hardware and software options are available for this. SERCOS III connectivity is provided by a communication controller based on an FPGA logic chip, or a general-purpose multi-protocol Ethernet controller, or on a standard Ether-

net controller (soft master). FPGA devices of the major FPGA manufacturers are supported. The SERCOS III IP core is licensed from SERCOS International and is provided either as a bitstream or as a netlist. The later option allows the combination of the SERCOS III IP core with other IPs (e.g., CPU core, PCI core) to realize SoPC (System on a Programmable Chip) solutions.

Hilscher's netX multi-protocol Ethernet controller supports SERCOS III master and slave connectivity. The netX controllers are available in a number of versions which cover the performance spectrum from simple I/O controllers and drives to master controllers and control systems.



Fully assembled hardware boards can be used to connect standard PCs to a SERCOS III network. Versions are available with a dedicated CPU (active boards) and without a CPU (passive boards). Cards are integrated via common bus systems such as PCI or SPI. To make the transition to SERCOS III even easier, PCI boards for standard PCs, along with master or slave software, are available for training purposes. Several

companies offer drivers or protocol stack software for master and slave implementations on different operating systems. Furthermore, training, consulting and support are offered.

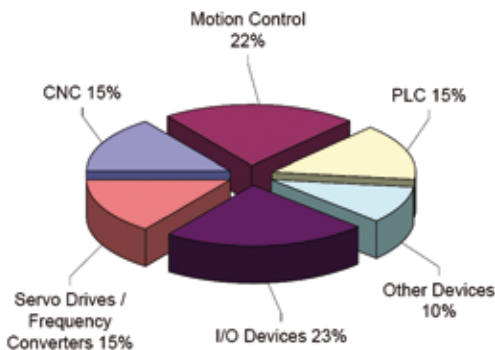
Using a soft master, a SERCOS III master can be implemented without any special hardware. Standard Ethernet controllers are used instead of the specific SERCOS III hardware. SERCOS-specific hardware functions are moved to the hardware-related and real-time capable part of the master driver. Thus, a master can be fully implemented in the software. Such a concept is interesting for PC-based control platforms that have an „onboard“ Ethernet interface.

Certification of SERCOS III devices

SERCOS III devices are tested in the certification laboratory of SERCOS International at the University of Stuttgart. The SERCOS Conformer certification tool is also made available to manufacturers that have an interest in ensuring the best possible quality and conformity of their SERCOS III devices. Twice a year, SERCOS International organizes free plug-fests in which interoperability tests are executed by the device manufacturers.



Distribution of SERCOS III products by percentage



Product Overview

Over 100 SERCOS III products and components are currently offered from more than 40 manufacturers. These products cover a broad range:

- complete automation solutions (package of controls, drives and/or I/O peripherals)
- automation devices (control systems, drives, I/O devices, other devices such as sensors)
- tools (development, configuration, diagnosis)
- hardware and software components (controllers, drivers, stacks)
- active and passive infrastructure components (switches, cables, plugs)

List of manufacturers and their offered products and services: Pages 4-9

Several innovative products are offered that support the integration of non-SERCOS III devices into a SERCOS III network. Examples of such products are:

- real-time switches to interconnect SERCOS III and Ethernet networks
- gateways to interconnect SERCOS III and other fieldbuses or RTE networks
- axis control modules that allow the connection between analogue axes and SERCOS III networks
- modular I/O systems for SERCOS III that offer a broad range of functions and interfaces

Selected connectivity products: Page 10

Several service providers offer consultation and support for device manufacturers that do not intend to develop and integrate a SERCOS III interface completely on their own. The range of services covers development support, training, consultation, testing and even certification of SERCOS III devices.

Profiles of service providers and services offered by them: Pages 11-15

Product Guide SERCOS III

Manufacturer	Co-Exhibitor SERCOS Booth	Booth @ SPS/IPC/DRIVES	Automation Package	CNC / Soft CNC	Motion Control / Soft Motion	PLC / Soft PLC	Drives / Frequency Converter	Modular & Compact I/Os	Other Devices (e.g., Sensors, Lasers)
3S-Smart Software Solutions GmbH www.3s-software.com		7-530		■	■	■			
acontis technologies GmbH www.acontis.de		7A-261							
Altera GmbH www.altera.com		6-430							
AMK Arnold Müller GmbH & Co. KG www.amk-antriebe.de		4-210			■	■			
andron GmbH www.andron.de	■		■	■			■		
Automata GmbH & Co. KG www.automata.de	■				■	■			
AxySystems Ltd. www.axy-systems.com							■		
B&R Industrie Elektronik GmbH www.br-automation.at		7-206						■	
Beckhoff Automation GmbH www.beckhoff.com		7-406						■	
Bosch Rexroth AG www.boschrexroth.com	■	7-450	■	■	■	■	■	■	■
Cranfield Precision www.cranfieldprecision.com				■					
Distributed Systems Engineering GmbH www.distributed-systems.de	■								
EBV Elektronik GmbH & Co. KG www.ebv.com									
Ernst & Engbring GmbH & Co. KG www.eue-kabel.de									
Eckelmann AG www.eckelmann.de		7-320	■	■	■	■	■	■	■

	Gateways / Switches	Development Tools / Software Tools	Controllers / HW Boards / Eval. Kits	Drivers / Stacks	Cables / Plugs	Engineering / Training / Testing Services	Booth @ SPS/IPC/DRIVES	Co-Exhibitor SERCOS Booth	Manufacturer
		■					7-530		3S-Smart Software Solutions GmbH www.3s-software.com
				■		■	7A-261		acontis technologies GmbH www.acontis.de
		■	■				6-430		Altera GmbH www.altera.com
							4-210		AMK Arnold Müller GmbH & Co. KG www.amk-antriebe.de
								■	andron GmbH www.andron.de
		■	■	■		■		■	Automata GmbH & Co. KG www.automata.de
									Axsystems Ltd. www.axy-systems.com
							7-206		B&R Industrie Elektronik GmbH www.br-automation.at
							7-406		Beckhoff Automation GmbH www.beckhoff.com
	■	■	■		■		7-450	■	Bosch Rexroth AG www.boschrexroth.com
									Cranfield Precision www.cranfieldprecision.com
		■	■			■		■	Distributed Systems Engineering GmbH www.distributed-systems.de
		■	■						EBV Elektronik GmbH & Co. KG www.ebv.com
					■				Ernst & Engbring GmbH & Co. KG www.eue-kabel.de
							7-320		Eckelmann AG www.eckelmann.de

No responsibility is taken for the correctness of this information.

Product Guide SERCOS III

Manufacturer	Co-Exhibitor SERCOS Booth	Booth @ SPS/IPC/DRIVES	Automation Package	CNC / Soft CNC	Motion Control / Soft Motion	PLC / Soft PLC	Drives / Frequency Converter	Modular & Compact I/Os	Other Devices (e.g., Sensors, Lasers)
Fagor Automation S. Coop. www.fagorautomation.com		4A-406	■	■	■		■		
FOBA Technology + Services GmbH www.foba.de									■
Gleichmann Electronics Research GmbH & Co. KG www.ge-research.com		7-290							
Harmonic Drive Antriebstechnik GmbH www.harmonicdrive.de		4-309					■		
Harting GmbH & Co. KG www.harting.com	■	10-130							
Hilscher GmbH www.hilscher.com		6-120							
HMS Industrial Networks GmbH www.anybus.com	■	6-222							
Industrial Indexing Systems, Inc. www.iis-servo.com			■		■	■	■		
Industrielle Steuerungstechnik GmbH www.isg-stuttgart.de		2-259		■	■				
Institut für Steuerungstechnik www.isw.uni-stuttgart.de	■								
IXXAT Automation GmbH www.ixxat.de		6-335							
KEBA AG www.keba.at		7-470	■		■	■	■		
KW-Software GmbH www.kw-software.com		7-540			■	■			
Lapp Holding AG www.lappgroup.com		6-350							
Leoni AG www.leoni.com		6-361							

	Gateways / Switches	Development Tools / Software Tools	Controllers / HW Boards / Eval. Kits	Drivers / Stacks	Cables / Plugs	Engineering / Training / Testing Services	Booth @ SPS/IPC/DRIVES	Co-Exhibitor SERCOS Booth	Manufacturer
							4A-406		Fagor Automation S. Coop. www.fagorautomation.com
									FOBA Technology + Services GmbH. www.foba.de
		■	■	■		■	7-290		Gleichmann Electronics Research GmbH & Co. KG www.ge-research.com
							4-309		Harmonic Drive Antriebstechnik GmbH www.harmonicdrive.de
					■		10-130	■	Harting GmbH & Co. KG www.harting.com
	■	■	■	■		■	6-120		Hilscher GmbH www.hilscher.com
			■				6-222	■	HMS Industrial Networks GmbH www.anybus.com
									Industrial Indexing Systems, Inc. www.iis-servo.com
						■	2-259		Industrielle Steuerungstechnik GmbH www.isg-stuttgart.de
						■		■	Institut für Steuerungstechnik www.isw.uni-stuttgart.de
			■	■		■	6-335		IXXAT Automation GmbH www.ixxat.de
							7-470		KEBA AG www.keba.at
		■					7-540		KW-Software GmbH www.kw-software.com
					■		6-350		Lapp Holding AG www.lappgroup.com
					■		6-361		Leoni AG www.leoni.com

No responsibility is taken for the correctness of this information.

Product Guide SERCOS III

Manufacturer	Co-Exhibitor SERCOS Booth	Booth @ SPS/IPC/DRIVES	Automation Package	CNC / Soft CNC	Motion Control / Soft Motion	PLC / Soft PLC	Drives / Frequency Converter	Modular & Compact I/Os	Other Devices (e.g., Sensors, Lasers)
LTi DRIVES GmbH www.lt-i.com	■	4-240					■		
Manz Automation AG www.manz-automation.com					■				
Phoenix Contact GmbH & Co. KG www.phoenixcontact.com	■	9-341						■	■
Prima Electronics S.p.A. www.primaelectronics.com		8-420		■	■	■			
Profimatics GmbH www.profimatics.de	■								
Rovema Verpackungsmaschinen GmbH www.rovema.com	■				■				
Sartorius AG www.sartorius.com									■
Schleicher Electronic GmbH & Co. KG www.schleicher-electronic.com	■	7-330	■	■	■	■	■	■	■
Schneider Electric / Elau GmbH www.elau.de		4-310	■		■		■		
SERCOS International e.V. www.sercos.de		6-110							
SMI S.p.A. www.smigroup.it					■	■	■	■	
Sybera GmbH www.sybera.de									
Wago Kontakttechnik GmbH & Co. KG www.wago.com	■	7-130						■	
Xilinx Inc. www.xilinx.com									
Yamaichi Deutschland GmbH www.yamaichi.eu									

	Gateways / Switches	Development Tools / Software Tools	Controllers / HW Boards / Eval. Kits	Drivers / Stacks	Cables / Plugs	Engineering / Training / Testing Services	Booth @ SPS/IPC/DRIVES	Co-Exhibitor SERCOS Booth	Manufacturer
							4-240	■	LTi DRIVES GmbH www.lt-i.com
									Manz Automation AG www.manz-automation.com
	■				■		9-341	■	Phoenix Contact GmbH & Co. KG www.phoenixcontact.com
							8-420		Prima Electronics S.p.A. www.primaelectronics.com
				■				■	Profimatics GmbH www.profimatics.de
								■	Rovema Verpackungsmaschinen GmbH www.rovema.com
									Sartorius AG www.sartorius.com
							7-330	■	Schleicher Electronic GmbH & Co. KG www.schleicher-electronic.com
							4-310		Schneider Electric / Elau GmbH www.elau.de
		■	■	■		■	6-110		SERCOS International e.V. www.sercos.de
									SMI S.p.A. www.smigroup.it
		■		■		■			Sybera GmbH www.sybera.de
							7-130	■	Wago Kontakttechnik GmbH & Co. KG www.wago.com
		■	■						Xilinx Inc. www.xilinx.com
					■				Yamaichi Deutschland GmbH www.yamaichi.eu

No responsibility is taken for the correctness of this information.

Connectivity – Product Highlights

A number of innovative products are available from various manufacturers that allow the integration of non-SERCOS III devices into a SERCOS III network.



*netSWITCH and netTAP:
Switch and Gateway Devices for SERCOS III*

Hilscher Gesellschaft für
Systemautomation mbH ▾

www.hilscher.com

The netTAP for SERCOS III is used as a gateway between SERCOS III and other field buses (e.g., Profibus, CAN) or other Real-Time Ethernet protocols (e.g., Profinet, EtherNet/IP). The netTAP is integrated in a modular, top hat housing. The associated Firmware is loaded via a USB interface and configured via a universal Windows tool per "Drag and drop." A quick diagnostic is provided by several LED displays. For purposes of simple servicing or exchange of devices in the field the software and the configuration can be saved and recreated on a MM Cans SD card.

The netSWITCH for SERCOS III is a switch that allows the transmission of Standard Ethernet frames via the NRT (Non-Real-Time) channel of SERCOS III. The Ethernet frames of the NRT channel are forwarded by the netSWITCH to the standard Ethernet ports, making these frames available to nodes outside the SERCOS III network. Likewise standard Ethernet frames that are received by the netSWITCH are inserted into the NRT channel of the SERCOS III network for delivery to SERCOS III components.



Phoenix Contact
GmbH & Co. KG ▾

www.phoenixcontact.com

*Axis control module: Integration of
analogue axes into SERCOS III*

The Axis control module from Phoenix Contact can be connected to two drive amplifiers and two incremental encoders for position sensing, together with digital I/Os for end position and reference switches. This makes the module especially suitable for controlling motion where there are no control electronics available with an integrated SERCOS III interface. In practice these include servo valves for pneumatic or hydraulic cylinders, drive amplifiers for electric motors with low power ratings or simple frequency inverter-controlled axes.



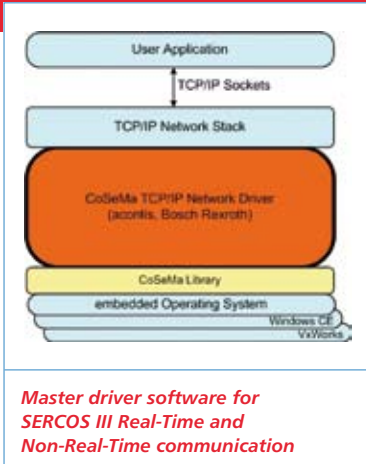
Wago Kontakttechnik
GmbH & Co. KG ▾

www.wago.com

*Modular I/O system gives access to a broad
variety of modules and functions*

Modular I/O systems are available from Wago and several other manufacturers. Using a bus coupler with a SERCOS III interface, these systems can be used as local or distributed I/O within SERCOS III networks. They offer access to a broad range of different I/O modules, such as digital and analogue functions as well as special function modules, such as counter modules, pulse width modules and stepper controllers. Even modules to link to subordinate buses, such as AS-Interface or IO-link are available.





www.acontis.com

Solutions for Industrial Automation and Embedded Technology

Real-time Ethernet products and services as well as Real-time virtualization solutions for Windows and Linux are the company's core business activities. In close co-operation with Bosch Rexroth, acontis provides SERCOS III master software integration services for embedded operating systems like VxWorks or Windows CE – especially with regard to TCP/IP communication in combination with SERCOS III. Professional services also cover standard industrial communication protocols like CAN/CANopen. acontis offers embedded software development for customer-specific bootloaders, board support packages, device drivers and network drivers on various CPU architectures like x86, ARM and PowerPC.



**SERCOS III hard- and software
components**

www.automataweb.com

Components and tools from the leading SERCOS III service provider

Since the introduction of the SERCOS standard, Automata has supported device manufacturers in integration of this communication interface. On the basis of this more than 20-year experience, Automata offers components and services for an easy and cost efficient implementation of SERCOS III master and slave interfaces. Thanks to the status as official SERCOS III FPGA solution center Automata is able to design and implement best possible solutions for their customers. Leading manufacturers of IO systems, drives and other field devices rely on Automata's SERCOS Know-how. Automata offers its OEM customers a wide range of products and services, from hardware and software component design services, up to the production of complete devices with the SERCOS III interface – always tailored to the respective application.





Ethernet Monitor for timing analysis and tracing of Industrial Ethernet protocols

www.distributed-systems.de

Support for Implementation, Diagnostics and Certification

Distributed Systems Engineering GmbH provides expertise and skills to support SERCOS III development and integration. In cooperation with SERCOS International and ISW (University of Stuttgart), DSE is in charge of SERCOS III conformance testing. In addition, DSE offers training and consulting during the entire development process. The Ethernet Monitor represents a flexible modular platform for customized measurement and testing solutions. The basic features are timing analysis and tracing of Industrial Ethernet systems. Based on flexible user-defined trigger conditions, inputs can be captured synchronously to the transmitted Ethernet messages. Each received Ethernet packet is tagged with a precise timestamp and can be forwarded to a PC for detailed analysis of both the packet-content and the timing.



Industrial Reference Platform for SERCOS III prototype implementations

www.ge-research.com

Rapid prototyping of flexible, high-performance motion control applications based on SERCOS III

The GE-Research Industrial Reference Platform (Hpe_IRP) combines the computing power of an Intel Atom™ with the flexibility of a PCI-Express capable FPGA. The Hpe_IRP has been designed as a rapid prototyping platform for the development and evaluation of industrial and automotive systems. Time and money can be saved by getting a system up and running before committing to building your own printed circuit board. Hpe_IRP is a highly configurable platform that comes with many free tools. The Hpe_AIM AMBA IP-Manager can be used to include the SERCOS III IP blocks in the FPGA image and generate a motion control prototype with just a few mouse-clicks.



Hilscher Gesellschaft für Systemautomation mbH ▼



Hilscher has been active in developing industrial communication products and technologies for over 20 years

www.hilscher.com

netX-based products, technology and services for SERCOS III master and slave devices

Hilscher is a ISO 9001 certified manufacturer of fieldbus products headquartered in Germany with subsidiaries in different countries all over the world. Hilscher offers products for many different fieldbus and Real-time Ethernet technologies. The product architecture is truly scalable with a single driver interface for both masters and slave interfaces of all networks and all form factors. A single configuration tool SYCON.net is used to configure the different products. Drivers are available for all versions of Windows, QNX, Linux, and RTX, VxWorks, etc. Hilscher offers a broad range of netX-based hardware and software components for SERCOS III master and slave devices, as well as SERCOS III switch and gateway devices.



Institute for Control Engineering of Machine Tools and Manufacturing Units, University of Stuttgart ▼



The SERCOS III Slave Conformizer is a powerful and vendor-independent test and certification tool for SERCOS III slave devices

www.isw.uni-stuttgart.de

Test and Certification of SERCOS III Devices

Certifications at the SERCOS competence centre of ISW at the University of Stuttgart are executed with the new SERCOS III Conformizer. The Conformizer tool developed at ISW can be used by the device manufacturer before sending the device to the testing laboratory for the certification process. This guarantees a quick certification process of SERCOS III devices. The modular and open Conformizer can also be expanded for product- and manufacturer-specific requirements and tests. The tool runs on a conventional PC with a free PCI Slot and Microsoft® Windows. ISW also offers research, development, test and education services, and support in the field of SERCOS and automation systems in general.





The Industrial Ethernet Module (IEM) supports a fast and cost-efficient realization of a SERCOS III interface

www.ixxat.de

Industrial Ethernet Module (IEM) for SERCOS III

IXXAT's IEM enables customers to easily and cost-efficiently connect their devices to SERCOS III or other industrial Ethernet standards. The module is based on an Altera Cyclone III FPGA and in addition to an integrated 32-bit CPU and an Ethernet controller, it comprises the PHYs, the RJ45 jacks and an optional hub or switch. Using the included programming interface, the customer can connect his device using SPI or a standardized μ C-Interface. The Host-API encapsulates the functions of the industrial Ethernet protocol thus the application can be developed independently of the underlying network. In addition, the module is available as a design-in solution. IXXAT offers the development of customer specific hardware and software as well as the implementation of various Industrial Ethernet standards into customer devices.



The SERCOS III SoftMaster uses standard Ethernet controllers to connect to SERCOS III slave devices

www.profimatics.de

SoftMaster for SERCOS III

Profimatics GmbH is an embedded software system house and TenAsys distributor in Germany. Profimatics is specialized in providing consulting services and products in the areas of software design, hardware selection, system implementation, testing and training. Each member of their technical staff has a minimum of ten years experience in the area of real-time and embedded system software and hardware. Profimatics offers a soft master implementation for SERCOS III based on the INtime Real-Time operating system for Windows.



Sybera GmbH ▼



***SERCOS III software stacks
for real-time environments***

www.sybera.de

SYBERA, the company for real-time software and training

The mission of SYBERA is development of real-time software for Industrial Ethernet. With software master stacks for SERCOS III and other Real-time Ethernet protocols, SYBERA offers high-end solutions for developing applications for industrial automation. The SYBERA training center offers developer seminars on all topics related to SERCOS III and real-time control. SYBERA provides modern classrooms equipment and offers internal as well as external training.



SERCOS International e.V. ▼



***SERCOS III – The universal Real-Time
Ethernet technology for Motion,
Safety and I/O***

www.sercos.de

SERCOS International – Vendor-independent training, support and certification

SERCOS International (SI) is the user organization responsible for the technical development, standardization, certification and commercialization of the SERCOS real time communication standard. At present, more than 2.5 million SERCOS real-time nodes have been implemented world-wide in over 350 thousand applications. SI organizes seminars, workshops and plugfests to educate and support vendors and users with regard to applying the SERCOS technology. Furthermore, SI offers conformance testing to help ensure that products built to its specifications operate in multi-vendor systems. The organization, with its headquarters in Germany, presently has more than 70 member companies all over the world as well as regional trade associations in



SERCOS International e.V.

Kueblerstrasse 1
73079 Suessen, Germany
Phone +49-7162-9468-65
Fax +49-7162-9468-66
E-Mail: info@sercos.de
www.sercos.de

SERCOS North America

405 Loblolly Bay Drive
Santa Rosa Beach, FL 32459
Phone (Toll free) 1-800-5-SERCOS (1-800-573-7267)
Phone +1 850 269 0908
Fax +1 850 269 0908
E-Mail: info@sercos.com
www.sercos.com

SERCOS Japan

Nikkei Digital Engineering
2-7-6 Hirakawa-cho, Chiyoda-ku
Tokyo, 102-0093 Japan
Phone +81 3 5210 4457
Fax +81 3 5210 4458
E-Mail: japan@sercos.org
www.sercos.org

SERCOS China

Building No.1 #414
No.1 Jiao Chang Kou Street
De Sheng Men Wai, Xi Cheng District
Beijing, 100011, China
Phone +86 10 62015642
Fax +86 10 82015862
E-Mail: info@sercos.org.cn
www.sercos.org.cn