SERCOS.NEWS The Real-Time Ethernet Magazine

Automation with SERCOS III Future belongs to real-time Ethernet systems



Application: Schleicher Electronic banks on SERCOS III



Product-Announcement: netTAP – the SERCOS III transition into the world of fieldbus



Product-Announcement: Axis control module for SERCOS III





In the current economic crisis, there is only one sensible strategy for machine manufacturers and industrial users to pursue: that is to boost the profitability of their machines and systems as soon as possible with innovative ideas and concepts, and thereby gain a significant competitive advantage. Ethernet-based real-time systems are now reaching enormous dynamics for this reason, since they allow a huge degree of freedom for new automation solutions that incorporate future-proof technology for survival in the future.

A little hindsight reveals that machine manufacturers and users must carefully weigh up exactly what system they will fall

Security of Investment for Innovations

back on during precisely this kind of situation. It is especially important, as experience in this matter has shown, to fall back on those solutions that combine openness with innovation and long-term feasibility. The way I see it, there are three factors that tip the scales: the customer's independence from individual manufacturers, the efficiency of the communications architecture, and wide acceptance in different branches of mechanical engineering.

The number of controller, drive and field equipment manufacturers who support SERCOS III Ethernet-based protocol is steadily growing. That makes SERCOS an inestimable advantage particularly in these unpredictable times, regardless of economic developments and decisions of individual suppliers. At the same time, SERCOS III can be linked with more and more open standards such as FTD/DTM, thereby further simplifying the integration of field equipment from different manufacturers. Added to this is the high performance of the real-time mechanisms that have proven themselves time and again in more than 2.2 million nodes. The number of machine manufacturers making use of this

advantage is continuously rising: As well as being used in machine tools, SERCOS III is also being used in packaging, converting, printing machines, material handling as well as in high-speed robotics. More information on this and other topics can be read up in this issue of SERCOS News.

I conclude on a personal note: After six years as Chairman of SERCOS International, I now take my leave, and thank all of you who have given us your support. I am more convinced than ever that the real-time Ethernet system SERCOS III will continue to promote innovation with its openness, and, with its wide base, will be a protector of investments far into the future. I will also continue to be closely involved in the matter in my new position.

Enjoy reading!

Kar

Dr. Karl Tragl, **U** Chairman of Sales, Bosch Rexroth AG

Quick-Info 1-0901 🔺





Additional functions in the machine engineering process will no longer have to be bought as extra equipment. High-performance solutions allow you to use the data network for production tasks that have so far had to be done by separate hardware. This increases the economy of engineering and the efficiency of systems operation.

On the 6th of May 1840, the Royal Mail in England revolutionized the postal system. Until that time, it was the unquestioned norm to pay an individual charge for each letter or parcel based on how far it was to be sent, and you wouldn't know what that charge was until you asked. That made the postal service expensive, cumbersome and staff-intensive, and resulted in a chronically failing business.

In 1839, Sir Rowland Hill (1795–1879) made two important changes: First, he invented uniform postal rates for standard letters; and second, he introduced the first self-adhesive postage stamp, called the "One Penny Black", so that customers could stamp their own letters. The reform met with controversy, since traveling a long distance would naturally incur greater costs than would

One cable is all you need

a simple delivery within London. What the critics failed to notice, however, was the enormous efficiency boost this unification brought with it. Given the affordable rates, more customers started using the postal services; the staff no longer had to calculate the cost of each letter separately; the uniform pricing system created new services, and the Royal Mail was being worked to fuller capacity than ever. The failing business promptly grew into a booming enterprise, the revolutionary methods of which we still use worldwide today.

The moral of the penny stamp is a typical lesson in the study of efficiency: consistent standardization and simple rules make systems easily adaptable and implementable without having to suffer any loss. And the more players adopt the basic rules and join in the game, the greater the benefit for all. The so-called network effect explains the rapid spread of the Internet as soon as this, originally academic, network was opened to the public.

The Internet protocol has found its way into production in the form of Industrial Ethernet. It uses the same protocol – TCP/IP – but addresses the special nature of a raw factory environment. Anyone who wishes to have precise control, to within a fraction of a millimeter, over an array of axes must not be influenced by dust, vibrations or electric fields. Another capability indispensable in machine engineering is a guaranteed realtime connection with short cycle times, whereas no office will suffer if an e-mail arrives a few milliseconds late.

Industrial Ethernet allows a uniform infrastructure for communication across all levels of the automation pyramid. Vertical integration from sensors to bookkeeping software opens up new possibilities in operations management. At the same time, modern networks allow greater flexibility in the structuring and expansion of controller topologies along the production chain than do conventional field busses. "SERCOS III helps Bosch Rexroth achieve that extra boost in the economy and efficiency of its solutions," says Dr. Karl Tragl, Chairman of Bosch Rexroth AG. "Thanks to its flexible design, we can use the same data in a machine, in the production chain or in the global network for maintenance and diagnosis without breaking the system continuity."

Unlike field busses, real-time Ethernet solutions such as SERCOS III also allow



One cable is all you need. SERCOS III meets all the requirements of future automation concepts.

safety-related data relay over the same network. A certified safety protocol eliminates the need for extra hardware, since system-critical messages such as pushing the emergency stop button are guaranteed to go through. Just as a single postal rate was all it took for England, all it takes for SERCOS III is a single cable to cover all of the communication needs of machine engineering efficiently and economically.

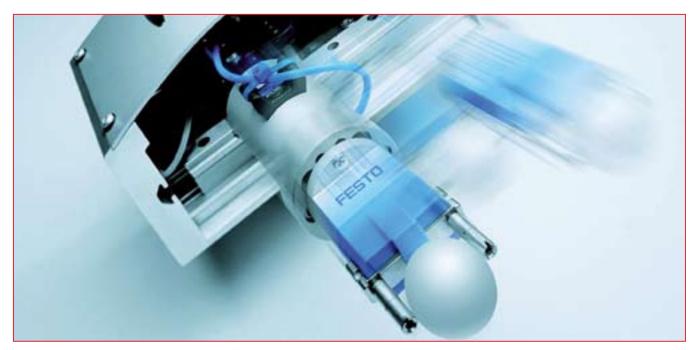
This is possible because SERCOS III unifies all critical aspects into one standard, and does not recognize different terminology characteristics for different applications. The basis for this is the high reliability and performance of the mature real-time Ethernet solution. SERCOS III unifies fast data transfer of 100 Mbits per second with an extremely short cycle time of 31.25 microseconds. Alongside realtime (RT) data, non-real-time (NRT) data can be simultaneously sent over the same network, even though both methods use the Ethernet protocol transparently. In a SERCOS III network, a service technician could therefore connect a notebook to a SERCOS node using a conventional Ethernet cable, for example, and use the network without proprietary hardware or software.

The same consistency applies to the transfer of safety-related data. If a sensor detects overheating or a blocked transport path, then the information must be relayed with absolute reliability to the controller so that the program can initiate the predefined measures. A certified safety protocol guarantees reliable data transfer.

SERCOS safety is based on the CIP Safety protocol of ODVA (Open DeviceNet Vendor Association). It is supported by various communications standards such as DeviceNet, ControlNet and Ethernet/IP, and allows users to use the same safety mechanisms on different platforms. SERCOS safety fulfills the requirements of the safety standard IEC 61508 at up to Safety Integrity Level 3 (SIL 3). This means it covers risks that, in the event of a system failure, could endanger workers or the environment.

In mechanical engineering, safety data is traditionally relayed over separate lines. SERCOS III uses existing data lines, since it has integrated measures against faults such as cable rupture or data transfer errors. Eliminating the need for additional hardware reduces costs without sacrificing safety.

An affordable, integrated communication chip gives every SERCOS III device all the intelligence needed for a largely selforganizing network. It allows cross communication between controllers and between drives, for example. The autonomous nodes make the communication network independent of central controllers, giving engineers greater flexibility in their designs. It also eliminates the need for expensive control units such as hubs and switches in the network setup.



SERCOS III relieves processes and reduces the effort and costs.



Motion and I/O: Together with SERCOS III



SERCOS III Coupler for the WAGO-I/O-SYSTEM

- Full support for SERCOS III V 1.1.1 protocol
- Compatible with the SERCOS III I/O profile
- Device description via SERCOS Device Description Meta Language (SDDML)
- Additional I/O fieldbus no longer required
- I/O nodes synchronous with SERCOS cycle
- Redundancy possible through ring topology
- 100 Mbit/s
- Additional standard Ethernet TCP/IP channel with TCP/IP, HTTP, FTP, BootP, DHCP, SNTP, Web Based Management



Available March 2009!



Standardized interfaces ensure that all components work together and ensure high rates of first-run with minimal power consumption.

That also reduces system costs, making it an attractive option for users to employ SERCOS III as a single system for all communication tasks.

"SERCOS III points the way to greater efficiency and economy in mechanical engineering," says Dr. Tragl. "It eliminates the need for diverse, costly additions, since the fast network performs all functions without added costs. At the same time, the technology allows a reliable communication infrastructure to be established with little effort, in order to keep the investments small. That way, plant operators and engineers both gain a double benefit."

The high degree of standardization makes the transition from the world of field bus to SERCOS III extremely easy. IEC standard 61491 has defined the SERCOS drive profile since 1995. With Industrial Ethernet, IEC 61800-7 (drive profile and communication) has become more important. Again, the proven drive profile on which all three SERCOS generations are based is laid down in this standard.

SERCOS International (SI), a neutral association of users and manufacturers, oversees the technical development and certification of the SERCOS family. This guarantees the highest possible degree of compatibility. By adding more device profiles (e.g. for local sensors), solutions from different vendors can be integrated without necessitating enormous development costs. The reduction of the system interfaces and the degree of standardization are other ways that SERCOS III keeps the costs of engineering down.

With SERCOS III, one solution covers the entire communication requirements in production, be it vertical integration with the office systems or synchronous controlling of multiple-axis systems, the data transfer between local controllers or guaranteed relay of safety-related information. SERCOS III accomplishes all tasks with a single standard and over a single cable. This sustains the efficiency that is demanded for the economical development of modern machines and systems. After all, companies do not need to train their workers in different network technologies, but can build up a common pool of knowledge for their future benefit instead. Logistically, only one standard type of cable needs to be stocked, which keeps down the price of spare parts storage and supply.

170 years ago, Sir Rowland Hill set an example that a uniform and simple system increases profitability. The advantages of a common standard outweigh all doubts and questions of detail. Thanks to SERCOS III, those who wish to develop engineering solutions economically and simply can limit themselves to a single solution and a single cable for all applications without any loss in flexibility and safety.

More information at: www.sercos.de

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High-performance controller XCx 1100 with SERCOS III interface

Schleicher Electronic banks on SERCOS III

Electronics expert Schleicher has been using Sercos technology for more than a decade. The latest project of the Berlin-based company was to integrate a SERCOS III interface into its high-performance controller XCx 1100. In a time frame of one year Schleicher Electronics progressed from the prototype to a standard feature.

Schleicher's XCx 1100 is a high-speed control system that can be used for a wide range of very demanding applications. The controller runs two operating systems in parallel: the high-precision real-time operating system VxWorks executes the control tasks while Windows XP Embedded is available for applications with an integrated user interface. Applications requiring a very powerful controller and no visualization benefit from the unit's high computing power. The basic XCx 1100 model is equipped with a Celeron M 1.5 GHz, but the controller can be upgraded up to an Intel 2 Core Duo. Featuring a solid state disc with 4 GB memory or more, the XCx 1100 does not require mass storage with rotating mechanical parts and operates without ventilation. Thus, safe and reliable operation is ensured even in rugged environments. The system combines motion control, CNC, and PLC functions according to IEC 61131. The CNC software coordinates up to 64 interpolating axes; another 64 axes can be controlled by the motion control modules. The controller is installed as a plug-in module on a rack. Its functional range can be expanded by digital and analog I/Os, function and communication modules, rack extensions and additional modules for customized configuration. The system can be connected

to a wide range of standard drive systems and major fieldbuses. The XCx 1100 also features a CANopen interface, SERCOS III On Board, three Ethernet ports, an integrated switch, an RS 422 interface, and an RS 232 interface for connecting operator devices, scanners etc. The Ethernet interface, in particular, is an all-rounder. It allows users to connect the controller, enabling integration into company networks as well as visualization, programming, and diagnosis. Peripherals such as mouse devices, keyboards, or printers can be easily connected via four USB ports, which also allow for easy software updates via USB stick, sparing the service technician an extra trip. When using the Windows functions of the XCx 1100, a USB port and the DVI interface can be used to connect the display to the integrated graphic card.

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DIL32 housing

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SERCOS III for IOs, valve terminals and welding tongs

The netIC of the company Hilscher, offered for integration within a device, comes as a plug-in module in the form of a DIL32-IC with dimensions of 21 x 42 mm. For connection to the SERCOS network only the RJ45 double socket with integrated transformer and LEDs is additionally provided. The module is based on the netX 50 with a SERCOS III slave stack in Version 1.1.

An UART with MODBUS RTU protocol, SPI or I2C is available as serial host interfaces. Other protocols can be implemented on customer request. As an alternative, direct digital I/Os can be actuated via serial shift registers. There is an easy to use tool available for configuration.



Quick-Info 1-0905 🔻



Infrastructure components for industrial and automation environment

SERCOS III Cabling System and Components

HARTING offers the complete range of cabling components for the installation of passive infrastructure according SERCOS III in industrial and automation environments. The wiring solution is continuous 4- or 8-wired, screened cabling for the connection of automation solutions and controllers suitable in switch cabinets (IP20) as well as in harsh IP 65/IP 67 environments.

Basically RJ45 connectors and M12 connectors in D-coding are used. The product range consists of outlets and distribution modules, panel feed-throughs, made-up system cords, connector sets to make-up cables on site, as well as cables for fixed and flexible installation. All components are designed to

be modular and can therefore be combined as required by the special installation requirements. System cords and connecting cables can be purchased either as ready made-up and tested or as on-site self assembly sets.



Quick-Info 1-0906 🔻

www.harting.de



without a direct SERCOS III interface

www.phoenixcontact.de

Axis control module for SERCOS III

In addition to the three SERCOS III modules from the Inline I/O product line from Phoenix Contact, the new SERCOS III module from the Inline Block product line for controlling axes allows two motion axes with different drive technology to be even more flexibly and cost effectively controlled. The axis control module, which also includes an I/O for autonomously controlling the motion axes, 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, in addition to servo valves for pneumatic or hydraulic cylinders, drive amplifiers for electric motors with low power ratings or simple frequency inverter-controlled axes. This means that motion functions without a direct SERCOS III interface can be coupled in real time to your PLC or motion

control system. For the axis control module, the device description files (SDDML), which are required for user-friendly parameterization, can be downloaded.





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IEC 61131-3 SoftPLC with SERCOS III interface

www.kw-software.com

ProConOS supports SERCOS III

ProConOS, the IEC 61131 runtime system of KW-Software, now supports SERCOS III in the field of Ethernet-based communication and field bus systems. For many years ProConOS has been used as part of the control system of packaging machine builder Rovema. The Ethernet-based realtime communication system SERCOS III has been added to Rovema's new generation of P@ck-Control. VPL260, their first tubular bag machine of this type, was shown at the Interpack 2008. It was not only equipped with SERCOS III but also featured continuous volumetric filling. ProConOS, in combination with SERCOS III, takes control of the speed-controlled drives and the digital inputs and outputs.

Two high-speed, high-precision linear motors, which drive the longitudinal sealing tools, put the realtime performance of the field bus system to the test.



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Quick-Info 1-0907 🔻

netTAP with USB diagnostics and MMC card

www.hilscher.com

netTAP - the SERCOS III transition into the world of fieldbus

netTAP is a gateway for mounting on the DIN rail and its modular design enables the transition of devices with fieldbus interfaces to SERCOS III. Through its master capability, the integration of an entire network segment with several slaves to SERCOS III succeeds. Currently the exchange on the cyclical IO data and the device status is lim-

ited, noncyclical services are planned. Configuration is done using SYCON.net, based on FDT/DTM standards. Using the standardized user interface and the support of all important fieldbusses, this system solution is especially interesting for the most varied applications in automation technology.



Quick-Info 1-0909 V



passive PCI module

www.automata.de

Automata presents SERCOS III PCI board with DMA capability

Automata has expanded its product range of SERCOS III PCI boards by a version with DMA capability. Thanks to this feature the fast data exchange between application and communication board required by real-time Ethernet protocols can be guaranteed. The board is available with one or two real-time Ethernet interfaces. Both interfaces are compliant to the SERCOS III, EtherCAT and Powerlink standards. Beside the DMA capability 8 MB FLASH, 4 MB SDRAM and 512 kB NVRAM are present onboard. The core of the board is formed by a FPGA, in that way a high degree of flexibility is achieved. As an option the SERCOS III master and/or slave IP core can be combined with an embedded CPU. The proven AUTOMATA master or slave communication stacks are running

on this active board variant. The data exchange between communication stack and system CPU takes place via a DPRAM interface. In that way a separation between real-time software and non time-critical software parts is possible without any problems.





Strongly Represented

SERCOS International made an inviting, bright and modern appearance on the newly designed booth at the SPS/IPC/DRIVES tradeshow in Nuremberg. Manufacturers of controllers, drives and other automation components, as well as machine manufacturers and research institutes, presented products, components and system solutions for the real-time Ethernet interface SERCOS III.

The cubes bearing the SERCOS logo were clearly visible from afar. They guided the visitors to the stand awaiting them in its welcoming, fresh red and white colors. A red carpet leads the visitors diagonally through the stand and straight through to the inviting bar and into the petite catering area, where the guests were given refreshments and information. Uniformly designed and lit exhibition walls were the background for product presentations. The various manufacturer-specific exhibits were presented using a proprietary modular system developed by booth builder Bluepool, which can also be used for further trade fairs in future. In addition numerous multi-vendor demonstrations in the field of machine tools, robotics, printing and packaging, as well as general automation were shown. Come and see SERCOS International at the Hannover Trade Fair 2009 in Hall 9, Stand D23.

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netIC - serial COM Interface

Real-Time Ethernet in the format of the industrial standard

Interface connections using a serial host or shift register interface have become a standard on the market. With netIC, Hilscher offers compatible hardware for all real-time Ethernet systems equipped with two ports and with integrated PHYs, hubs andswitches.

- Modbus RTU protocol as a host interface
- UART, SPI, I2C, shift register interface
- Direct connection to two RJ45 ports and LEDs
- 3.3V power supply, 32 pin DIL socket, 21 x 42 mm





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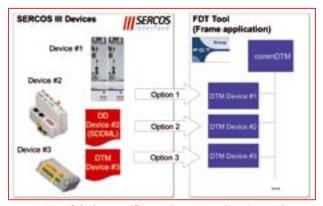


Configuration and enhanced diagnosis with FDT/DTM

With the decision to further develop the standardized drive interface SERCOS into a universal, real-time automation network the user organization SERCOS International e.V. paved the way for the future in 2003 and began the development of SERCOS III. In the meantime this high-performing real-time Ethernet solution has been recognized as an international standard and is already used in numerous applications (including robotics, as well as packaging, tool and printing press machinery).

SERCOS has been used up to now almost exclusively as a pure drive bus for linking controls and drives; with SERCOS III though a huge number and variety of different automation devices can be linked. So that the SERCOS III network's growing demands on configuration and diagnosis capability can be fulfilled, a device and profile description language was developed and an offline configuration interface and FDT/DTM interface were defined.

To standardize communication between field devices and software engineering tools SERCOS III uses open and cross-manufacturer FDT technology. FDT (Field Device



Integration of device-specific DTM into an engineering tool.

Tool) is primarily an interface definition, which is independent of the communication protocol. Special tools for the detailed analysis of devices are made available with a graphic user interface by standardized DTM (Device Type Manager) device drivers, which are integrated in a FDT application framework. The DTM device drivers enable the complete configuration and diagnosis of the device by graphic user dialogues. The DTM application offers a uniform user window for the launch, parameterization and diagnosis of field devices. This reduces the complexity in the application and increases transparency

for the users and service technicians. A device manufacturer can deliver a SERCOS III device with a DTM compiled by them and tailored to the device to integrate the DTM directly into the corresponding application framework (Picture, option 1). Furthermore the SD-DML compliant device description data can be converted to the cor-

responding SERCOS III DTM device via a generic (based on general rule) conversion. This approach is totally adequate for many SERCOS III devices, in particular with lower configuration complexity (e.g. with servo drives). A generic SERCOS III DTM device converts the content of a SERCOS III device description into an object data model and from this compiles the device data model. At the same time the device description can already exist as a file (Picture, option 2) or can be generated directly from the parameter set stored in the device and accessible via the bus system (online) (Picture, option 3). A generic SERCOS III DTM device can deal with device description data from the most diverse manufacturers for different types and families of devices and integrate these into a FDT/DTM environment.

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Now also with SERCOS III

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Quick-Info 1-0912 🔻

SERCOS intensifies activities in Asia

In Asia, the demand for integrated automation solutions and greater flexibility in production is continuously increasing. For this reason, SERCOS International intensifies its activities in the Asian region. Already in 1998 SERCOS International has established a subsidiary organization in Japan, named SERCOS Japan. After opening an independent branch office in China in 2008, several activities are planned for this year. SERCOS International is again participating with a joint booth at the automation fair FA/PA in Beijing (May 13-16, 2009). Furthermore workshops on SERCOS III will be organized in China and Japan. Moreover the cooperation with CAMETA (China Association for Mechatronics Technology & Application), a nonprofit organization engaged in the development and fabrica-

tion of mechatronic technologies and products, is strengthened. Technical support is supplied by the Beijing Uni-



versity of Technology (BJUT) under the direction of Prof. Weifu Chen, a recognized expert for motion applications.

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OMAC PackProfile is adapted for SERCOS III

At the world's largest packaging show – the PackExpo in Chicago – the SERCOS vendor organizations have announced the development of a Pack Profile for real-time Ethernet-based SERCOS III. The Pack Profile defines a subset of the SERCOS interface[®] functions for packaging machinery to ease implementation of the standard and improve the multi-vendor interoperability of servo controls and

drives. Products from various vendors that conform to the Pack Profile will provide plug-and-play functionality for packaging machinery. The Pack Profile specification is being developed in consultation with users and suppliers of packaging machinery. In parallel, a conformance test is being developed to ensure interoperability of devices supporting the PackProfile.



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SERCOS and FDT: working together for open systems

The user organisations for the two open standards SERCOS III and FDT agreed to collaborate on drawing up an annex to the FDT specification for SERCOS III. SERCOS III will thus be the first high-performance real-time Ethernet communication standard to support FDT Techno-

Seal their cooperation: Flavio Tolfo, Managing Director of the FDT-Group (left) and Peter Lutz, Managing Director of Sercos International (Source: Magazine Computer & Automation)



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Continued from page 14

logy, used by many manufacturers to connect field devices to a wide range of software environments. The extension of the FDT specification reinforces the flexibility of SERCOS III as a universal bus for real-time systems in the field of automation. The collaboration between the FDT Group and SERCOS is promoting the trend towards open standards in factory automation from the field to machine control. Design engineers and developers are able to combine products from different manufacturers in their automation systems thanks to the clearly defined interfaces.

Impressum

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