

The Sercos logo, with 'sercos' in white lowercase letters and a red 's'.

Issue 02/2015

# news

the automation bus magazine

A glowing blue sphere with the words 'OPEN SOURCE' in white, pixelated, digital-style font. The sphere is surrounded by faint, glowing lines and patterns, suggesting a network or data flow. The background is a dark blue gradient with a faint image of a hand holding the sphere.

## Innovative Automation

with Industrial Ethernet and Open Source

### OSADL

A license conquers  
the world of automation

### Sercos SoftMaster

INtime enables software-  
based Sercos Master on  
Windows PCs

### Bosch Rexroth

Maximum availability  
and synchronization with  
Sercos SoftMaster

Dear readers,

### Innovative Automation with Industrial Ethernet and Open Source

Sercos International has operated as a user organization since its establishment in 1990 for an open and manufacturer-independent real-time communication technology.

The specifications are disclosed and are continuously incorporated into international standards. The technology is freely usable without the need for a membership or a license. To implement the technology cost-effective and powerful controller modules from different manufacturers as well as driver libraries, partly as open source software, are available. In addition, the certification of Sercos® devices is carried out by an independent testing laboratory.

The easy integration and use of Sercos on standardized PC-based hardware is facilitated by the Sercos SoftMaster. In this case, a specific Sercos hardware is not required. Instead, a standard Ethernet controller is used and the Sercos hardware functions are emulated in software. With this implementation approach an adequate real-time performance is ensured for a large number of applications. When using an Ethernet controller with multiple queues and message scheduling (such as the Intel® I210), a real-time performance in the area of hardware-based master can be achieved.

At this year's SPS IPC Drives a Sercos SoftMaster implementation will be released as Open Source software. This will make it much easier for manufacturers to develop a Sercos Master and at the same time to participate in future improvements and extensions of the software. With this, control systems can be realized simpler, more compact and cheaper in future. This is a very important criteria not only for the Asian market. In the latest issue of Sercos News we report on the latest developments and trends "around the Sercos automation bus."

Have fun reading!



*Peter Lutz*

Peter Lutz  
Managing Director  
Sercos International e.V.

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# Sercos launches Japanese website

Sercos has launched its Japanese website at [www.sercos.jp](http://www.sercos.jp), offering great depth of information on the Sercos automation bus for the Japanese community.

The Technology section was expanded to offer more detailed information related to the automation bus, its functioning, and its design principles. The advantages of real-time Ethernet are also presented as well as implementation and certification of the automation bus. There is extensive information on older Sercos® generations such as I and II, the migration to Sercos III, and the Sercos roadmap.

Detailed information on certification, the certification process, vendor codes and certified products can be found under the Certification menu.

A new product filter allows a fast and easy product search by vendor, product category, master, slave, safety,

certification or Sercos generation, to help users find the right solution for any application.

Application reports describe the challenges companies were confronted with prior to using Sercos-capable products and describe how the solutions were implemented as well as the benefits they brought to the companies.

The Organization section was redesigned to provide more information on Sercos membership and its benefits. The Download section provides an extensive list of tools, forms, brochures and webinar recordings that are available for free download.





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**Booked out!**

## Machine Communication Forum: Presented by Sercos International and the SPS-MAGAZIN

Sercos International welcomed around 130 users and providers from the machine and plant engineering sector as well as equipment and automation manufacturers to the Machine Communication Forum at the Marienberg Fortress, Würzburg, on October 20, 2015. The media partner was the SPS-MAGAZIN from the TeDo publishing firm.

**T**he keynote speech on the topic "The Secure Networks Myth – What Lessons the Industry Must Learn from Stuxnet and NSA Scandal" was presented by Thomas Elsasser of the Bavarian State Office of Constitutional Protection.

Elsasser advises financial firms in the areas of expertise protection and information security. Particularly in SMEs, the consequences that an espionage attack can entail are quickly overlooked.

In his lecture, he presented the methods of attackers using example cases and discussed the following questions: 'In addition to technology, what are the requirements for a high level of safety? What data is actually worth protecting? And how does one ensure due attentiveness among

one's own staff?' When it comes to the topic of data and access security, it is not just the correct technology on which major importance should be placed. An effective security strategy and knowledge regarding digital attackers and their intentions are also required.

Prof. Jörg Wollert from Aachen University of Applied Sciences presented the subsequent main lecture on the topic "Decentralized, Fast, Effective, and Secure – Is That the Solution for Smart Automation Networks in the Cloud?" The primary focus was on the question of how much cloud a company needs, since the road to the factory of the future and to Industry 4.0 is to be paved above all by IT technology. The key words are Internet of Things, big data and the cloud itself. However, must automation in the smart factory necessarily go through the computer

cloud? And if so, what could sustainable cloud solutions for industry look like? What requirements and consequences does this entail for engineering? The participants received answers to these questions during the presentation.

The morning was concluded with three presentations focusing on trends, including a presentation on the topics of OPC UA and the development of Industrial Ethernet in China. In his presentation, Jürgen Lange, Senior Account Manager at Softing Industrial Automation, discussed the issue of how OPC UA is changing the traditional communication structures. In this framework, he compared the current use of OPC UA with the potential for the future and highlighted the most important features of the standard.

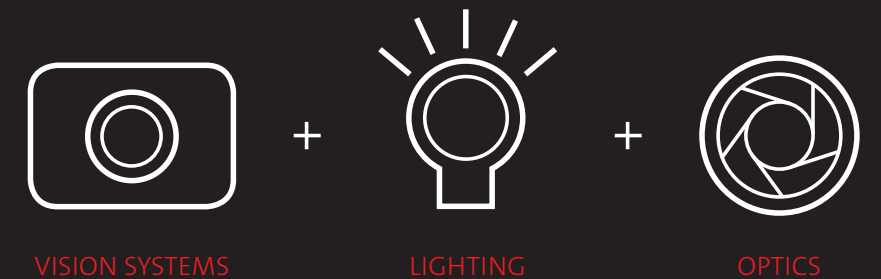
Jan Zhang, Senior Manager APAC Industrial Automation Group at IHS Technology in China, gave a presentation on Industrial Ethernet's opportunities in the Middle Kingdom. Here, Zhang discussed trends such as Industry 4.0, Internet+, and "Made in China 2025." Her market consideration focused on industrial communication.

The afternoon began with an interesting podium discussion led by Mathis Bayerdörfer, editor-in-chief of the SPS-MAGAZIN. Representatives of Bosch Rexroth, HMS Industrial Networks, Rockwell Automation, Schneider Electric Automation, and Softing Industrial Automation engaged in dialog on the topic "To the Revolution Together or Everyone for Them-

selves? How Does Industrial Ethernet Work in the Smart Factory?," after which the participants could choose between nine different break-out sessions.

Peter Lutz, Managing Director of Sercos International, said: "We are pleased about the success of the event and the lively discussions. This shows that we, together with the SPS-MAGAZIN, are in tune with the times."

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## Sercos webinars in a new format

Technical webinars were the focus of online events in 2015. In addition to introducing topology, the functioning of a hotplug and the service channel, there were also presentations on the configuration of real-time data and diagnosis opportunities with Sercos® tools.

As topology is a rather extensive topic, the webinar was split into two presentations. The first session focused on Sercos devices with two ports and two connectors, it explained the difference between physical and logical topologies, examples of physical topologies were also presented.

The second presentation looked at the internal topology of a Sercos slave, the signaling of the internal topology in the device status as well as on topology properties of multi-slave devices to name but a few topics covered.

In addition, Peter Lutz, Managing Director of Sercos International, held two more generic presentations. One webinar explained Sercos certification, its benefits, the certification process and authorized test labs, while the other presentation was "Machine Communication in the context of Industry 4.0."

All webinars are available as a free download in German and English via <http://www.sercos.org/downloads/webinar-recordings>.

Webinars in the second half of 2015 will now be available as .MP4 files, as this format is easier to deal with for many users.

## EVENTS 2016

### March

Sercos Conference  
03/02/2016, Milano - Italy

### April

Automation Summit  
04/05-07/2016,  
Boeblingen - Germany

### Hannover Fair 2016

04/25-29/2016, Hanover - Germany

### May

17th PlugFest  
05/11-12/2016, Esslingen - Germany

### SPS IPC Drives Italia

05/24-26/2016, Parma - Italy

### June

Industrial Technology Efficiency  
Date + location tbd

### July

Industrial Open Network  
Roadshow

07/19/2016, Tokyo - Japan

### August

Automation

08/22-25/2016, Mumbai - India

Industrial Open Network Roadshow  
08/24/2016, Nagoya - Japan

### September

Industrial Automation North America  
09/12-17/2016, Chicago - USA

Forum Machine Communication

09/20/2016,  
location tbd.

### October

18th PlugFest

10/05-06/2016, Blomberg - Germany

### November

Industrial Automation Show

Date tbd, Shanghai - China

SPS IPC Drives

Date tbd, Nuremberg - Germany





# Open Source in automation: A license conquers the world

Many people are unaware that “Open Source” is a short way of designating a specific type of software license. This short expression is a technical term which cannot be translated into other languages.

The long way of stating “This is Open Source software” is “The copyright owners of this software have chosen one or more licenses for using this software which exclusively satisfy the criteria established by the Open Source Initiative (OSI) in the Open Source Definition (OSD).” It is therefore understandable why the short form is preferred in practice. The OSD is available at <http://opensource.org/definition>. Essentially, a license must grant four main rights to be Open Source. The license must grant the rights to unrestrictedly

- use,
- analyze,
- modify, and
- pass on the software modified or unmodified.

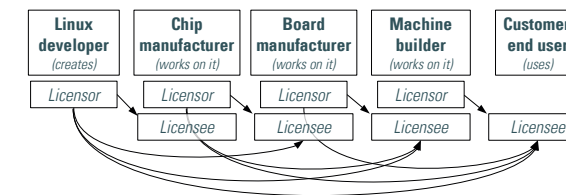
It is entirely permissible to require compliance with specific license conditions for passing on the program such as notification, licensing, and publication requirements. These Open Source license conditions have enabled the pursuit

of software projects involving several thousand developers around the world, and have allowed a previously inconceivable level of quality to be achieved based on the principle of unrestricted access. This does not happen without effort, however. The superior quality of Open Source software is not automatically ensured. A number of favorable factors must be present. For example, the personality of the maintainer plays a decisive role.

## Will I be forced to disclose business secrets by using Open Source software?

This is probably the most frequently posed question in regard to Open Source software. The answer to this question is, “No, of course not, but only if Open Source software is properly used.” It must be borne in mind that many components of Open Source software are subject to a special licensing feature, the so-called “copyleft,” which governs modifications to or expansions of the originally licensed software. The unique expertise of a company should not be associated with Open Source software subject to a

copyleft license. In this case, closed source software with proprietary licensing remains the only option. However, Open Source is almost always the best choice in regard to those functions needed for a project that can be developed with other companies and therefore do not involve any business secrets. Examples of such software are operating systems, compilers, browsers, e-mail clients and statistics programs. The use of Open Source software is even more compelling for software features used jointly by independent parties such as communication protocols or cryptographic programs. In this case, there is apparently no alternative to Open Source.



## Open Source is successful because it is profitable

Many years ago, when the conditions of Open Source licenses were initially made known, many economists were baffled. Precisely how could a profit be made with such a license? Is a business model possible for such a license? Indeed it is. This is because only the software itself is free. The services associated with the software, however, must be purchased as is the case with proprietary software. Over the course of the last 20 years, a rapidly growing ecosystem around Open Source software has come into being. One of the companies that specializes in Open Source software and Linux in particular, Red Hat Corporation in North Carolina, USA, achieves sales of more than \$1 billion a year exclusively through services provided in the context of Open Source software. The unique profitability of Open Source software results from the development model which is enabled by the license:

- Joint development across the globe
- Unrestricted access to source code
- Anyone can participate for free
- There are a large number of developers, designers, testers, and users

Joint development, including by companies in competition with each other, is generally termed “Open Innovation.” In the context of developing basic software technologies, Open Source software could therefore be seen as a special type of Open Innovation. Open Innovation, like Open Source software, is successful because it is profitable.

## What does Open Source have to do with the Internet of Things?

A particular challenge of the “Internet of Things” is for separate devices to communicate with each other in previously unknown ways, which includes exchanging sensitive data. It is obvious that this state of affairs requires open cryptographic methods. This is the only way to make sure that the intended parties are exclusively entitled to access. It also goes without saying that such procedures, even when developed by the best in the world, are not absolutely immune from errors. In the future, we still will regularly learn of recently discovered security bugs. Devices that are used in this context must always be able to be updated in the field. In this case as well, there is unanimity that this must be accomplished with Open Source components. It is therefore not surprising that all current projects relating to the Internet of Things mandate the use of Open Source software. It can therefore be assumed that the Internet of Things will be an important catalyst for the dissemination of Open Source software.

## Why are Open Source projects, and Linux in particular, so suitable for the automation industry?

There are several reasons why Open Source projects are gaining acceptance in the automation industry.

### Because license management is no longer an issue

Doing away with license management eliminates potential headaches from malfunctioning development system dongles, lost license stickers, and clauses in contracts granting the right to unannounced inspections of your own production facilities. License-compliant designing and the ability to create unlimited copies of the program for use within the company also contribute to a high-level of acceptance of Open Source.

### Because Open Source software can never be discontinued

For two reasons, proprietary software is bothersome for products with a long service life, which is routine in the automation industry. On the one hand, the software supplier may close shop or lose interest in the software product. This disadvantage may be softened by contractually establishing the archiving of source code, but the distance from accessing outside source code to actively developing it can be long and laborious. On the other hand, the software can always be discontinued. This can force a company to switch to a new version or a different program, which is commonly associated with a great deal of effort even though, from a purely technical perspective, such a switchover may be unnecessary.

Because debugging and bug fixing are easier and faster Proprietary software generally comes in a special runtime

version either with or without a limited debugging functionality. If there is a problem, this makes it relatively difficult for software developers to provide the necessary information for a bug fix. With Open Source software, a debugging version can be easily created on site, which allows the user and developer to communicate with each other on a common basis.

In regard to the Linux kernel, the following considerations apply:

#### Because Linux is so scalable

The fact that Linux can be used within such a wide performance bandwidth makes it possible to use a single operating system despite a great variety of models. This renders the program easier to reuse, which protects investment.

#### Because Linux supports such a wide variety of processor architectures

Like the flexible scalability of the Linux kernel, the fact that Linux presently supports more than 30 processor

increasingly partitioned into two levels. At the higher level, development will probably continue as before; that is, proprietary methods will be programmed which will implement the manufacturer's expertise in close conjunction with automation hardware, and thereby enable successful products in the market. In this context, at most copyleft-free Open Source components will be used.

The situation is entirely different at the lower level where system software such as operating systems, drivers, protocols and interfaces are developed. Since there is no secrecy requirement in this context, cross-company development can proceed in Open Source communities. To ensure that individual companies maintain Open Source requirements and apply them to new functions, collaboration on relevant software components is essential. This is accomplished by temporarily releasing individual employees for work in an Open Source community, or by financially supporting user organizations so that they can pursue development activities in lieu of the company itself. Such user organizations include the North American Linux Foundation,

home to key developers of the Linux kernel, and the Open Source Automation Development Lab (OSADL) in Germany which takes care of Linux components for the automation industry on behalf of its members. Currently, the most important OSADL project is the development, maintenance, and mainline consolidation of real-time Linux.

Sercos International is an OSADL member, which leverages its membership to ensure that Linux will remain able to provide real-time capable network

connections with the Sercos® automation bus.

It can be assumed that user organizations like OSADL will remain a major player in the future and will assume new roles as well. It can also be confidently stated that the importance of Open Source software will continue to grow. However, a natural limit is set to this growth wherever companies are required to maintain their individuality. In the future, automation software will therefore always remain a mixture of Open Source and proprietary software. Part of the success of companies will be tied to correctly gauging this mix.

architectures additionally safeguards software investments. Even when switching to a completely different processor architecture, Linux can still be used practically without any modification. Furthermore, a frequently cited advantage of Open Source software is that it is free. However, this is only relevant for devices for which run-time license costs are a significant percentage of manufacturing costs.

#### What does the future look like for software development within the automation industry?

As can be inferred from what has already been stated, software development within the automation industry will be

# Schneider Electric's PacDrive 3 technology

Schneider Electric's PacDrive 3 technology incorporates the advantages of the latest technologies into a proven concept for controlling modern production, assembly, and packaging machines with a motion/robotic component. PacDrive 3 unifies PLC, IT, and motion functionalities on a single hardware platform and is one of four hardware platforms of MachineStruxure, Schneider Electric's solution package for general machinery applications. PacDrive 3's scalable controller performance allows economical automation of applications ranging from small systems with only a few servo axes to high-performance solutions with up to 130 servo axes including multi robot applications.

With Sercos®, Schneider Electric has created a fully Ethernet-based communication solution for PacDrive applications. Enabling communication with both drives and field devices, Sercos also smoothes the way for the integration of safety automation: In PacDrive 3, standard communication and safe communication merge into one - Sercos is the basis. The Safe Logic Controller Modicon SLC permits programming of the safety functions, the Modicon TM5/TM7 safe I/O system is connecting safety signals to the SLC.



# Schneider Electric™

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# INtime® multicore real-time platform enables Sercos SoftMaster on a standard Windows PC

Today's industrial PCs are capable of performing additional applications and tasks due to increasing multicore capabilities which weren't available until only a few years ago. Real-time applications like a Sercos SoftMaster are viable additional tasks which can replace rather expensive, proprietary hardware controllers by a software solution. Acquisition and maintenance costs of the life cycle can be significantly reduced.

If a Windows PC is supposed to execute real-time applications on the same platform a powerful real-time operating system is needed to enable the combined usage. Such a platform is TenAsys® INtime® RTOS family (which can be configured with and without a Windows environment). On INtime software a complete Sercos® SoftMaster controller can be integrated, and due to its multicore architecture there is the capability to add further real-time applications like for example a motion control engine.

## INtime® software enables real-time and Windows applications on one single PC

The partitioning of available CPU cores between Windows and one or more INtime cores makes it possible to allocate additional, independent processing engines.

A further benefit of the INtime software's partitioning methods is to provide for additional real-time application cores which can be used independently from the SoftMaster implementation. The INtime system partitioning separates the Sercos fieldbus implementation from the higher Windows-based application layers. This ensures meeting the rigorous hard real-time requirements of the Sercos protocol.

Besides these parallel INtime application scenarios you can implement the Sercos SoftMaster on standard, integrated Ethernet controllers – without the need for specific I/O hardware on PCI or PCI Express controller cards which add additional costs and implementation efforts. Due to INtime and its real-time Ethernet support on standard hardware, these costs can be easily avoided.

## INtime low level HPE Ethernet driver integrates standard TCP/IP connections

In this environment, the INtime low level Ethernet driver had

been developed by TenAsys to particularly support Ethernet-based fieldbus applications. With the support of the High Performance Ethernet (HPE) driver, Ethernet data packages can be sent and received within a Sercos-based fieldbus network – hardware near and well supported by a set of function calls. This implementation reduces packet jitter values to a minimum to ensure Sercos timing requirements.

In addition, the XCNT (cross connect) function enables, users to easily combine standard TCP/IP traffic with the Sercos traffic over the same port. This minimizes cabling efforts and allows for the common fieldbus and standard IT networking data traffic. By making use of it the advanced capabilities of the Sercos protocol can be fully realized.

## Intel I210 Ethernet controller enables HPE3 with additional functionalities

The huge potential of the Intel I210 Ethernet Controller has been recognized since it was introduced into the market at the end of 2012. Meanwhile more and more companies use the I210 for industrial applications. In this scenario the enhanced TenAsys low-level driver HPE3 supports the utilization of the available send-and-receive queues of the I210. Hence the HPE3 driver helps prioritizing the fieldbus and standard Ethernet data packages simultaneously. Moreover, the highly precise timing services of the I210 are made available within the HPE3 driver. This allows for Ethernet jitter values well below 100 nanoseconds – a number which typically can only be achieved using special fieldbus controllers.

## Open source project also supports INtime on Windows PCs

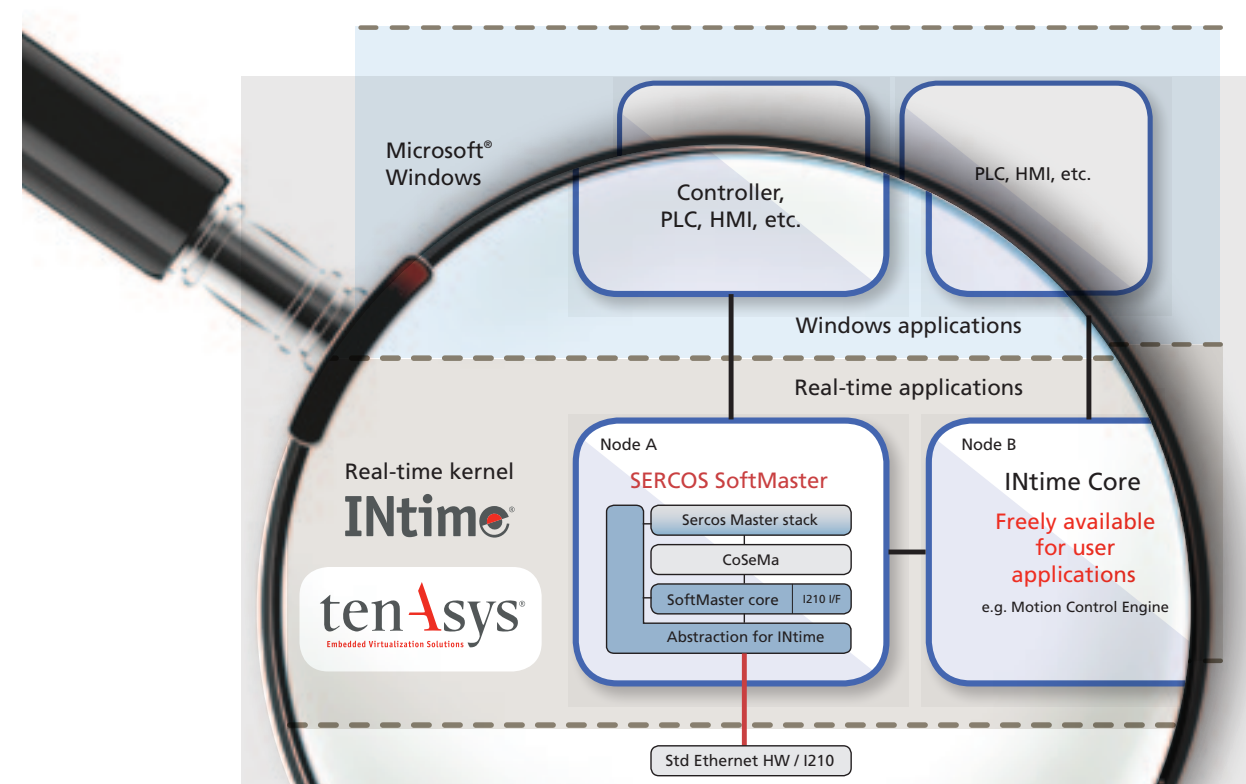
In cooperation with Bosch Rexroth, Sercos International will provide the Sercos SoftMaster core under Open Source license beginning end of 2015 at the latest. Due to the sophisticated low level Ethernet driver architec-

ture of INtime and the familiar software development of Visual Studio the adaption of the Sercos SoftMaster core for INtime has been proven to be exceptionally easy. The enhancement of the SoftMaster implementation to support the advanced capabilities of the Intel I210 Ethernet Controller by the support of INtime's HPE3 driver yielded stunning results. This SoftMaster implementation realizes nearly the same narrow timing like comparable hardware controllers.

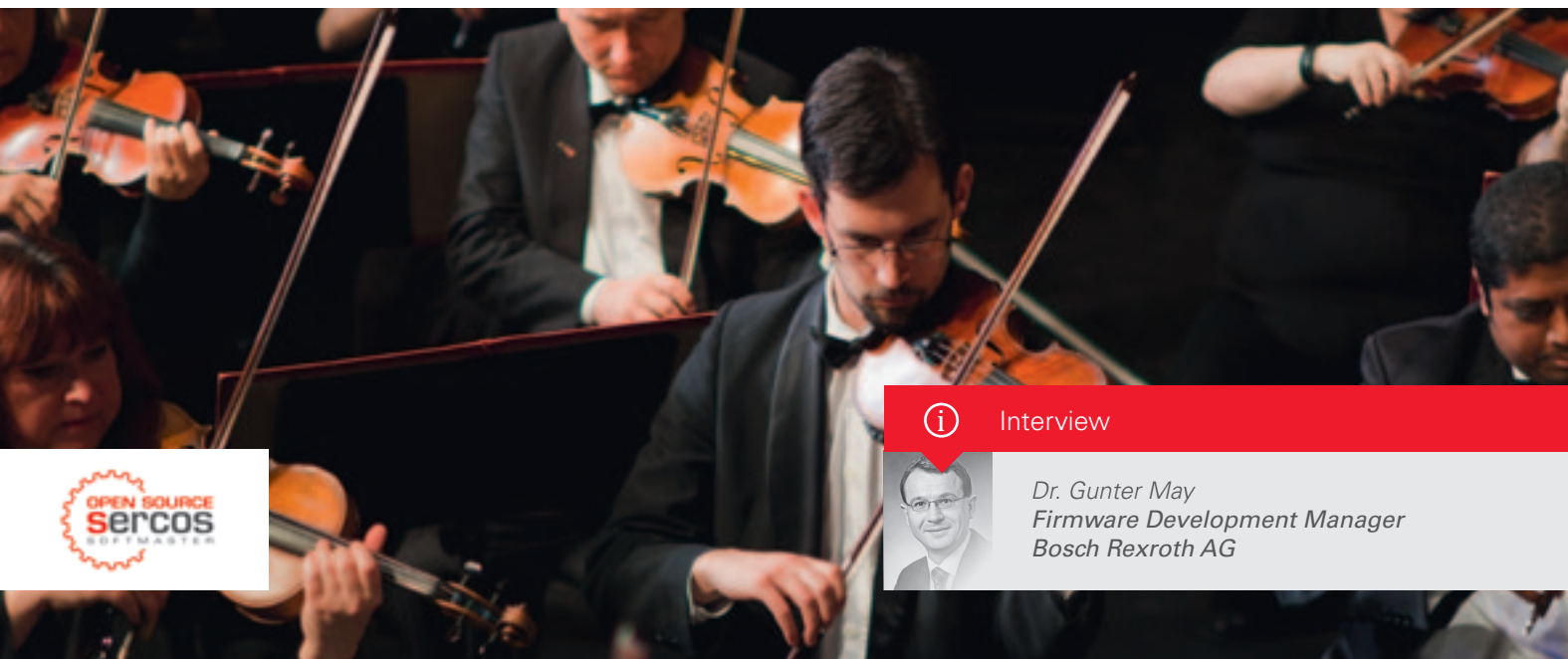
Another option is given with the INtime Distributed RTOS of TenAsys which is a stand-alone version of their real-time operating system platform. This enables the integration of the new SoftMaster into a dedicated control system without the need for changes to the existing INtime based master software. It becomes a configuration effort only to adapt to a new platform. As a result industrial control systems can be integrated in very flexible ways at reduced cost levels.

## Conclusion: INtime enables software-based Sercos SoftMaster on Windows based PCs

The TenAsys INtime real-time platform provides a superb foundation for realizing Sercos SoftMaster – based industrial solutions on affordable, well-known and proven standard PC components. INtime software can be used with and without Microsoft Windows which enables SoftMaster integrations with a high degree of flexibility in deployments. Thanks to the enhanced HPE3 Ethernet driver in conjunction with the Intel I210 network controller, an affordable standard industrial PC with a Sercos SoftMaster installation performs in the same class as dedicated hardware-based controllers. In comparison to these, the INtime-based SoftMaster integration is typically less expensive and much more flexible in terms of integration and programming.







Interview



Dr. Gunter May  
Firmware Development Manager  
Bosch Rexroth AG

# Maximum availability and synchronicity with Sercos SoftMaster and Standard Ethernet

Maintaining functionality and saving costs by using standards.

**S**ercos® attractiveness is based on the excellent characteristics in terms of real-time behavior, performance, and redundancy. Sercos as a standardized, real-time-capable Ethernet bus uses the advantages of the Ethernet for data transmission while simultaneously guaranteeing the deterministic transmission of data. At a transmission rate of 100 million bits per second, cycle times of 31.25 µs can be realized. Until now, the stringent real-time requirements were achieved with the help of special communication hardware, often in the form of a PCI/PCI Express expansion card. Its FPGA circuit created a Sercos synchronization protocol with deviations in the nanosecond range, with which it was possible to achieve the extremely high synchronicity of much less than one microsecond between connected devices. Sercos News spoke with Dr. Gunter May, Firmware Development Manager at Bosch Rexroth in Lohr am Main, about the newest developments.

**Sercos International:** What is the trend in industrial automation?

**Dr. Gunter May:** Controls become increasingly compact, cost-efficient, and standardized. In order to free ourselves from the additional hardware, Bosch Rexroth developed a SoftMaster two years ago, which uses the Standard Ethernet interface for real-time communication and works without additional hardware. It is independent of operating systems and fully compatible with the Sercos specification. These advantages, however, came at a lower synchronicity, because the Sercos protocols must be generated by software through all layers of the ISO/OSI model.

**Sercos International:** What does that mean exactly?

**Dr. Gunter May:** Previously, we had hardware-related inaccuracies of a few 10 ns for sent packages. With the SoftMaster, we now have inaccuracies of a few 10 µs. However, this does not mean that the devices are now more asynchronous by a factor of 1,000 than the hardware-based synchronicity. With the smoothing PLL mechanisms in the Sercos slaves, synchronicity is still in the microsecond

range. This is sufficient in most practical applications. Some applications in the area of machine tools, for example, have higher requirements and thus had to access the hardware master.

**Sercos International:** Which challenges needed to be mastered?

**Dr. Gunter May:** The sending of Standard Ethernet telegrams and the implementation of a redundant ring structure of the net was more difficult due to the timing behavior. Thus, we had the sportsman-like ambition of maintaining the customer's cost advantage while removing the disadvantages.

**Sercos International:** Surely this is not easy?

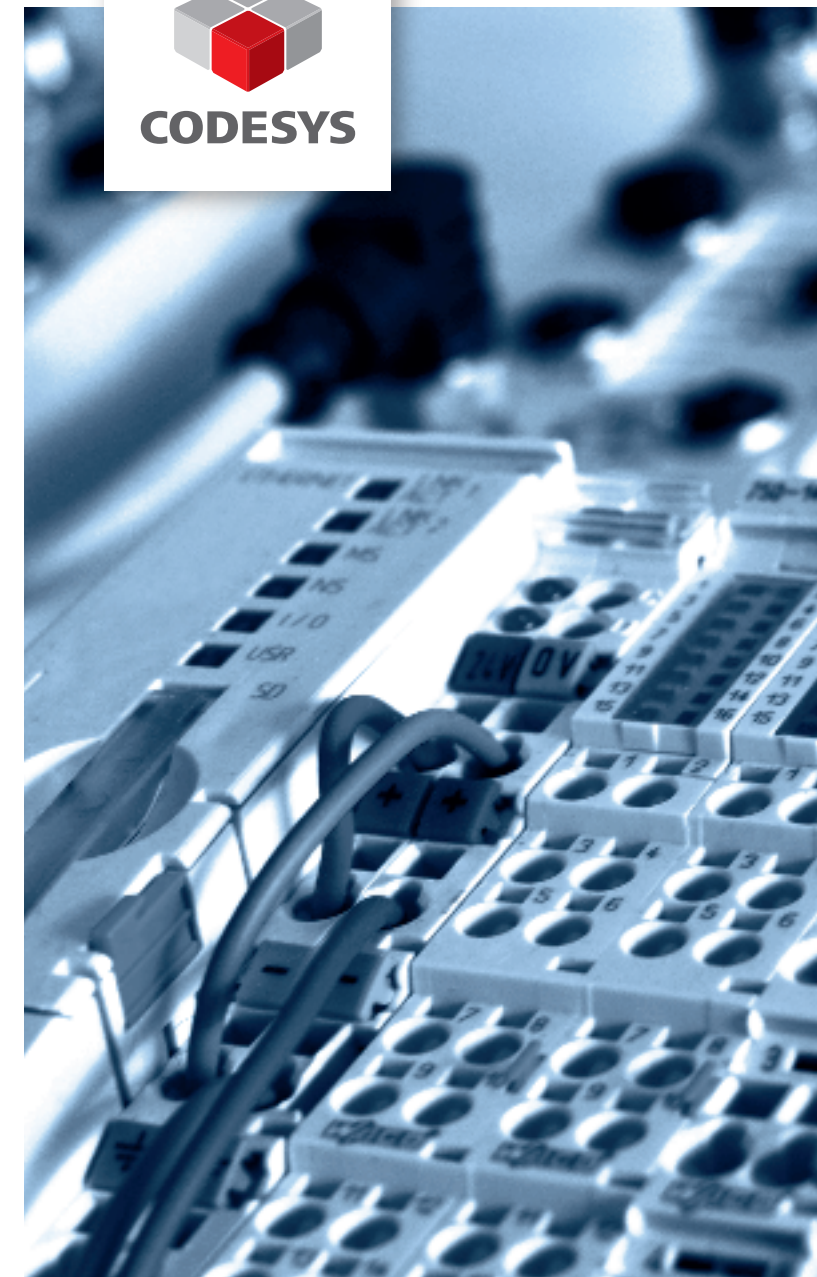
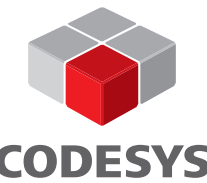
**Dr. Gunter May:** Intel developed the new Ethernet controller I210 in the meantime. This chip increasingly establishes itself as a standard component and is installed more frequently in standard network cards. It is a great advantage for us that it can also send packages time-controlled. This allows us to achieve a significantly improved real-time behavior, because the hardware again controls the sending of a package.

**Sercos International:** Surely it is not only Sercos that profits from this new chip, but also other fieldbus manufacturers with the same requirements for a high level of synchronicity and real-time capability?

**Dr. Gunter May:** That's right. Consequently, we can anticipate that this Ethernet chip will be a standard component in more and more industrial PCs. In comparison to other Ethernet-based fieldbuses, however, Sercos has the advantage that with this new chip, in interaction with the SoftMaster, we can create redundant network structures combined with high synchronicity. There is no other fieldbus that can simultaneously provide redundancy in combination with a synchronized network – standardized and without additional hard- or software. This means that we have solved nearly all disadvantages of SoftMaster, while maintaining the cost advantages of standardized hardware.

**Sercos International:** Which applications need redundancy and high real-time behavior simultaneously?

**Dr. Gunter May:** This combination is important e.g. for robotics applications, because the increasingly faster motions put more strain on cables, which occasionally break or must be replaced prematurely. A redundant structure of the network, paired with high synchronicity, reduces downtimes and increases operational reliability. Without redundancy, the robot stops immediately.



sps ipc drives 2015  
Hall 7 – Booth 550



Fieldbus

## CODESYS® Sercos

- Configurator and portable protocol stack seamlessly integrated into the market-leading IEC 61131-3 automation software
- Driver for Sercos master card available
- Diagnostics in the development system and the controller application



**Sercos International:** With the hardware-based creation of real-time behavior, Sercos achieves minimum cycle times of 31.25  $\mu$ s; with the SoftMaster we can achieve cycle times of just under 500  $\mu$ s. Which cycle times can now be achieved in combination with the new chip?

**Dr. Gunter May:** If the SoftMaster is combined with the Intel I210, the shortest cycle times of 125  $\mu$ s can be achieved. From this aspect, we are still somewhat limited by cycle time, but we have eliminated all disadvantages and the advantages in terms of cost and use of standard hardware dominate. The good news is clear: very many applications will be able to profit from more cost-efficient standard hardware in the future.

**Sercos International:** Do you already have initial experiences with this solution?

**Dr. Gunter May:** The Sercos SoftMaster was integrated at the prototype customer Rovema a few months ago. The packaging machine manufacturer is impressed, because in comparison to the previously used solution with the Sercos hardware master, it was now possible to use an industrial PC without special fieldbus hardware and without PCI slots to control the machine. By using the Sercos SoftMaster in

combination with the powerful Intel I210 it was possible to reduce the CPU load while simultaneously saving costs and space. Rovema appreciates the future readiness of this solution without hardware connection and plans to retrofit the complete machine program with this technology before Interpack 2017.

**Sercos International:** How do you see the future of Sercos?

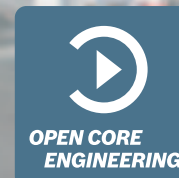
**Dr. Gunter May:** Sercos is standardized and established worldwide. There are free development tools and diagnostics tools, e.g. Sercos Monitor and Sercos IPS Conformizer. The SoftMaster is designed to be fully independent from operating systems and hardware. The source code will shortly be published. Other software modules, e.g. the Common Sercos Master API (CoSeMa) or Sercos Internet Protocol Services (S/IPS) are freely available as Open Source projects. This gives many developers the opportunity to adjust a system to new situations throughout the life cycle, over and over again, without licensing fees and based on open standards. We now have an installed base of five million Sercos nodes in more than 600,000 applications in the field. With the new openness and the consequent focus on standards we will surely open up new markets.

#### Sercos SoftMaster with Intel I210 vs. Sercos Master FPGA

#### Comparison Sercos Master variants

|               | HardMaster with Sercos FPGA  | SoftMaster with standard Ethernet   | SoftMaster with I210   |
|---------------|--|---|--|
| Architecture  | <div>Application</div> <div>Master stack</div> <div>CoSeMa</div> <div>Sercos FPGA</div> <div>Ethernet PHYs</div> <div>Spec. HW</div> | <div>Application</div> <div>Master stack</div> <div>CoSeMa</div> <div>SoftMaster core</div> <div>Std Ethernet</div> <div>Hour. HW</div>   | <div>Application</div> <div>Master stack</div> <div>CoSeMa</div> <div>SoftMaster core</div> <div>2x I210</div> <div>Hour. HW</div> |
| Hardware      | Sercos Master FPGA, 2x Ethernet PHY  | 1 standard Ethernet controller (only line topology)   | 2x I210 Ethernet controller  |
| Advantages    | – Benchmark –  | <ul style="list-style-type: none"> <li>Standard hardware; div. manufacturers and types</li> <li>Cost advantages</li> <li>Chiefly space advantage</li> </ul>                       | <ul style="list-style-type: none"> <li>Standard hardware</li> <li>Cost advantages</li> <li>Chiefly space advantage</li> </ul>      |
| Disadvantages | – Benchmark –  | <ul style="list-style-type: none"> <li>Lower synchronicity</li> <li>Only line topology</li> <li>UCC with restrictions</li> <li>Min. cycle time ~ 500 <math>\mu</math>s</li> </ul> | <ul style="list-style-type: none"> <li>Min. cycle time ~ 125 <math>\mu</math>s</li> </ul>  |

Comparison of various Sercos architectures. SoftMaster and Intel I210 fully develop their cost/performance advantages.



#### Freedom and efficiency redefined

Open Core Engineering increases software engineering efficiency and offers an unprecedented level of freedom through extended access to the control core: Independent creation of customized functions with high-level languages, simultaneously running on your firmware as well as on smart devices. Differentiate yourself from your competition and protect your expert knowledge.



Bosch Rexroth AG  
www.boschrexroth.com/oce



The Drive & Control Company

**Rexroth**  
Bosch Group



# Company Introduction

Since 1991, Guangzhou CNC Equipment Co., Ltd (hereinafter referred to as GSK) has been established. GSK is not only committed to the research and the practice of the machine tool CNC system industry development, but also specialized in the complete resolution proposal---"the trinity", including the CNC system of the machine tool, the servo drive and the servo motor. It also actively expands into the industrial robot and the full-automatic injection molding machine areas. GSK has become the high and new tech industrial enterprise involving the fields of society, teaching, industry and trade, and the research, development and manufacturing base for the CNC system and the industrial robot in China.

"GSK series CNC system of the machine tool" is recognized as "the famous product of Guangdong" and "the key export brand in Guangdong of 2009-2011", and the brand of "GSK" is evaluated as "the famous brand of Guangdong". GSK has become the preferred brand for the customer to purchase the domestic CNC system, and cooperated with more than 100 machine tool manufacturers, like SMTCL (Shenyang Machine Tool Co., Ltd.), BOCHI (BOCHI Machine Tool Group Co., Ltd.) and DMTC (Dalian Machine Tool Group Corporation), etc.

So far, the sales of CNC system have already reached 750,000 sets, and GSK has hold the leading position in the sales revenue and production output in China industry for 15 years and the 3rd place in the world. At present, GSK has become the largest CNC industry base in China and the national key CNC enterprise.

Add: NO.22 Guangda Road, Yunpu Industrial Zone, Luogang District, Guangzhou, 510530, China

Tel: 86-20-81796410/81797922

Http://www.gsk.com.cn



The Family Products Of Complete CNC System Of The Machine Tool



GSK Series Industrial Robots



The Planning Graph Of GSK Industrialization Base

## Why companies choose Open Source

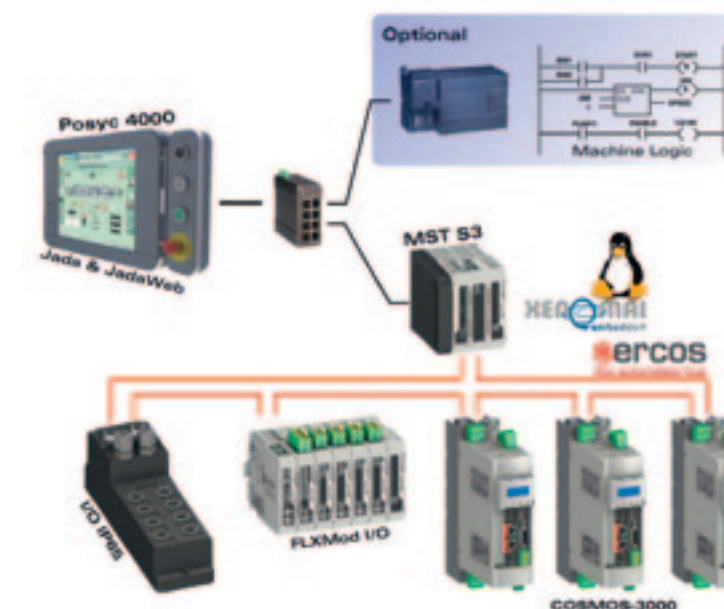
Italian company Smitec was faced with the decision to choose an open or a proprietary system. Which factors motivated the company to decide on Open Source?

While addressing an issue as big as Open Source, I decided to focus on the process that has brought our company to embrace this kind of solution. A few years ago our company had its own RTOS, performing and tailored to its own needs. In a matter of a few years the time of release of new hardwares became so short as not to allow our system to keep up with the latest updates. So we had to tackle the issue of changing our RTOS. For some time we wondered whether we should choose a proprietary or Open Source solution. We gathered as much information as possible from magazines, direct contacts and the Internet. We came across conflicting opinions with regard to the terminologies and licenses, such as Open Source vs. free software, GPL, LGPL, BSD, and more.

In the end we opted for an Open Source solution, featuring Linux+ Xenomai. Our choice was based mainly on three reasons. The first is related to the mass of people employed in the development community, which outnumbers beyond compare the developers inside our company.

This condition significantly cuts down the release times of new versions and bug fixes. The second is related to the specialization and passion of the people working for an Open Source project. This doesn't mean that company developers are not passionate about their work, but they have to work on many issues in a very short time. Not being 100% focused on a project and its every detail, you cannot reach an optimal solution. The third reason is related to the possibility of making customizations, while a proprietary system might not allow for it when required by individuals. All in all, we decided to entrust to an Open Source solution the core of our system, which must be up-to-date with new technologies, robust and low-maintenance. A small team inside our company wouldn't have lived up to these expectations.

We therefore welcomed with enthusiasm the Sercos initiative of releasing the SercosMaster Soft Core as Open Source software.



Smitec automation system based on Linux and Sercos.





# Cyberphysical systems (CPS) and Industry 4.0 – positioning systems for machine construction

The importance of individuality and flexibility is growing constantly in manufacturing companies. Every year, they find themselves increasingly forced to manufacture new product formats at very short notice and having to respond quickly and flexibly to changing customer wishes. One of the key factors here is the time required to switch from manufacturing one product format to another.



Industry 4.0 – classification of positioning systems as cyberphysical systems

## Classification of cyberphysical systems (CPS) in the production environment

One defining aspect of the Industry 4.0 concept is the ability to network machinery, resources, tools, warehouse systems, and even the products being manufactured with each other in order to ensure that every process runs like clockwork despite the high level of flexibility required.

This network of physical objects in the manufacturing process connected by information technology is also known as the "Internet of Things." A networked factory is described as a "smart factory." All the physical objects involved in the process exist not only in the real world but also as "virtual representations," which are used to depict the real world in the Internet of Things and are enhanced with additional information. Every physical object in the manufacturing

process that is represented in the virtual world and can be networked to interact with other physical objects is known as a "cyberphysical system."

## Positioning systems as cyberphysical systems (CPS)

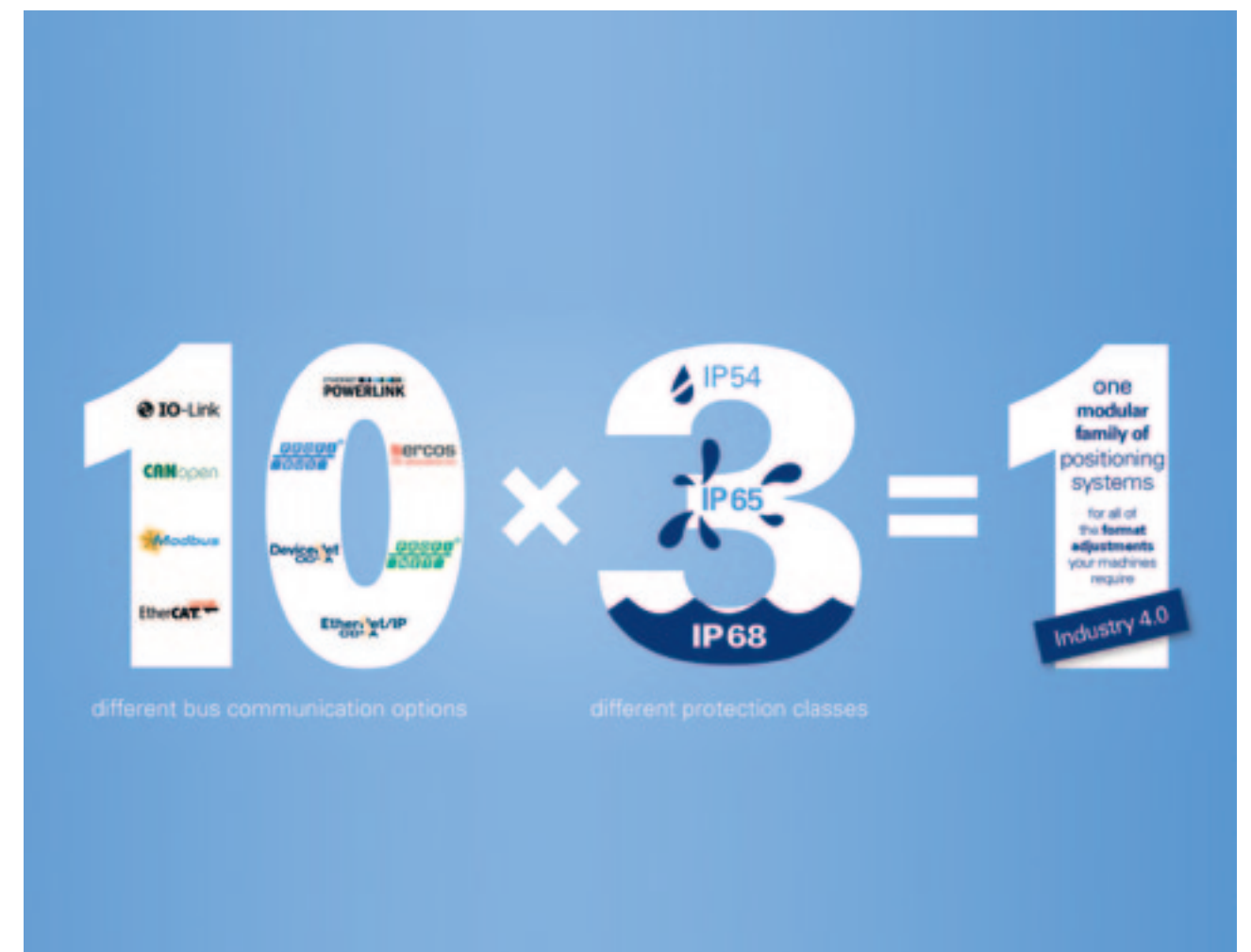
Positioning systems from halstrup-walcher have all the components required to function as an independent cyberphysical system – sensors for determining position (absolute encoder), actuators for moving the positioning objects (gearbox, motor, motor control unit) and on-board decentralized intelligence (embedded system). The positioning system can connect via bus communication – for example Sercos® – with the other CPS of the machine either directly or via machine control.

This ensures optimum integration of the cyberphysical positioning system into the machinery processes. Once the target position has been specified by the machine control unit, the positioning system runs to this new target position and reacts to any unexpected conditions (self-monitoring). For example, the positioning system can independently

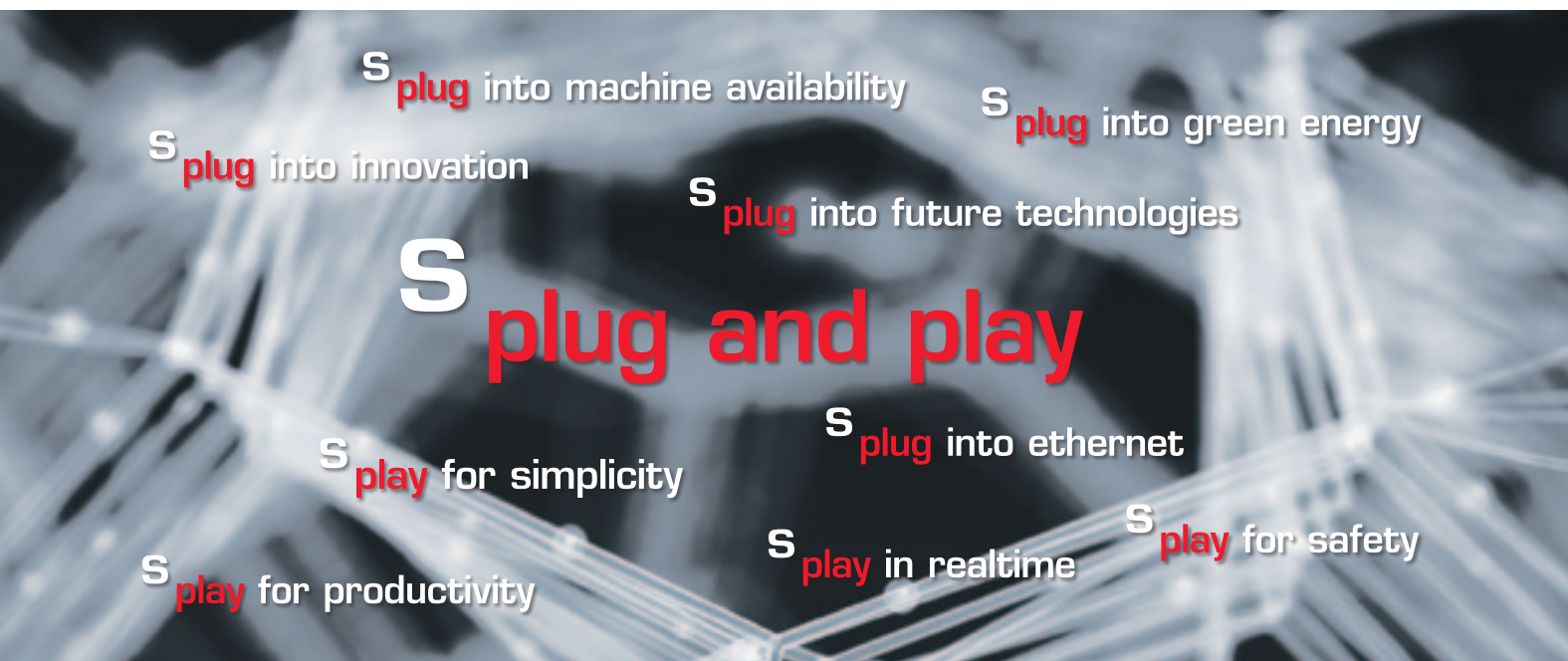
recognize the difference between an obstruction and dirt and responds accordingly (accelerates if the problem is dirt, stops for a genuine obstruction). The positioning task consumes only minimal machine control unit resources. It is executed independently and with optimum accuracy to the specified target. Positioning systems are therefore one of the central elements of factory automation as understood by the Industry 4.0 model: They provide self-monitoring support with outstanding flexibility.

## Flexibility at every level

Flexibility and quick format changes are not just the key to success in production operations – machinery manufacturers themselves can gain a vital competitive advantage from using the range of positioning systems supplied by halstrup-walcher. Our comprehensive modular system allows machine builders to adapt both the bus communication and also the IP protection class to specific customer wishes – without altering the relevant dimensions. This generates noticeable savings when altering and adapting products for customer-specific machine concepts.



10 x 3 = 1 – the innovative modular concept for positioning systems with flexible IP protection classes and bus communication systems from halstrup-walcher



## Measuring against the standard

If automation devices are to communicate smoothly with each other via bus systems, particular attention should be paid to the system behavior during their development. Here, too, the greatest possible automation of processes is the key to more efficiency.

Companies that develop fieldbus devices must test their devices against the corresponding standard specifications. This is normally the last phase of the development process and consists of having the device tested by a competent certification laboratory. If the properties of the device deviate from the specifications, the cause of the nonconformity is first identified as part of the certification process. For example, when a defined event occurs and a specified bit is not set properly. In the second step, an error search program must take place. Third and finally, a correction of the device behavior is to be implemented. The bit is set when the event occurs and subsequently the possible side effects of the implemented correction must be verified. This is a process that can take an enormous amount of time.

An additional test step in the development phase is ensuring the full compatibility of the devices to be developed with components of other manufacturers. For this reason, the various standardization bodies regularly hold so-called PlugFests. However, since these events take place on fixed dates, it is not possible for the developers to test the functionalities continuously throughout the entire development

phase, but only in a short period – generally twice a year. Ideally, however, developers should constantly have the opportunity to test their devices against those of other manufacturers.

An important test requirement is based not least on the hardware used in the devices – especially with respect to Ethernet cables and the Ethernet controller chips. The Ethernet cables consist of four pairs of wires that are exposed to extreme wear conditions in many applications, for example on robots. The loss of just one wire in a twisted pair constitutes a problem in Ethernet-based communication. On the one hand, it leads to a direct interruption in communication; on the other hand, the interruption is sometimes not clearly indicated with a “no link” error message. This occurs because the different Ethernet controller chips found on the market behave differently in the case of such an event. The impact of such an incident is significant:

- Production could be stopped for safety reasons.
- The error search requires that the machine must be stopped.

### Authors



*Joao Daniel Lopes (l.) and Agus Atmosudiro  
Research associates at the  
ISW of the University of Stuttgart*

- A possible “link on” signal despite a pending communication error could be misleading.
- Despite the wire break, occasional contact can exist in the case of moving cable routing, which can make the debugging process even more complicated.
- The behavior of the communication standard in the case of such an event is perhaps not standardized, for which reason reactions to this problem are not specified.

For all these reasons, it is the primary interest of manufacturers that the devices to be developed behave in a fully predictable manner in the case of such an event. This can be achieved only if the behavior of the Ethernet controller chip in the event of a wire break is tested. This requires, in turn, that a device be used that can simulate a wire break if necessary. Due to the high limitations with respect to the jitter in industrial Ethernet-based fieldbus communications – typically in the region of 40 nanoseconds – the applied solution must function as a wired solution. In other words, microcontroller switches/peripherals are not usable for these purposes.

### Certification using the example of Sercos

For this reason, the Sercos® Conformizer, among other things, was developed at the Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW) in Stuttgart. This tool consists of a computer, a Sercos Master PCI card (Sercans) and a test framework. The framework comprises several scripts to test the functionalities defined in the standard. In addition to the ISW, which performs the corresponding tests in its role as the official certification body of Sercos International, companies can also use this solution to perform early tests at their own workplace and thus reduce development times significantly.

As already mentioned, in addition to the validation of compliance with the standard, the full compatibility of the developed devices with devices of other manufacturers

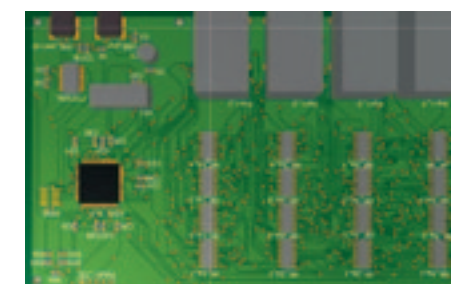
is also to be ensured. For this purpose, a test platform was also designed at ISW that enables a virtual PlugFest using the Sercos Conformizer. This platform consists of an electronic circuit board with four double Ethernet connectors. This circuit board allows three Sercos devices and the Sercos Conformizer to be connected. Within the Sercos Conformizer framework, the active or inactive ports as well as the network topology are definable. Additionally, the Sercos Conformizer contains a communication server with which the Sercos developer can access the fieldbus in the ISW laboratory, configure the fieldbus network topology and perform tests – all remotely.

Finally, another functionality is available at ISW: the simulation of a physical wire break. With a circuit board developed for this purpose, it is possible to simulate the break of one or several wires of the Ethernet cable. The simulation of the cable break takes place by means of multiplexers, which are controlled by a programmable “system-on-a-chip” microcontroller. To check functionalities that are required, for example in the cable break check, test scripts must be developed. This process is time-consuming, since it requires profound knowledge of the Sercos Conformizer framework. In order to accelerate the development process in this aspect as well, ISW has developed another tool called “ConfoMata.” Via its graphic user interface, the corresponding test scripts can be generated without programming skills being required. Moreover, ConfoMata automatically produces the documentation on the test (aim of the test, results to be expected, test structure, etc.), which can then be saved in various formats (Wiki, Word, etc.).

Sercos Conformizer  
graphical user  
interface



Layout of the  
Sercos circuit  
board





# Use CIP Safety on Sercos for safe monitoring and controlling of safe drives

In light of stricter safety requirements dictated by the European Machine Directive on the one hand and ever growing time and cost pressures on the other, safe monitoring of speed-controlled drives is becoming more and more important.

Users today expect cost-efficient solutions that help to significantly reduce expensive downtimes. Bihl+Wiedemann offers just such a solution with their new CIP Safety on Sercos® Gateway BWU3160, which as a CIP Safety Originator can safely monitor and control drives with a CIP Safety connection – even without any additional higher level safety controller.

Whereas it used to be considered routine to shut down the entire machine for manual intervention in a production system – for maintenance purposes, for example – today it is sometimes not even possible to fully power down the machine, since otherwise certain activities could no longer be performed. In other cases permanently growing cost pressures have in the meantime resulted in ever greater time pressure, since it can be calculated to the penny what every machine stoppage costs a company. Now by safe monitoring of drive speeds – say in setup and trial runs or to eliminate faults – the complete system usually no longer needs to be shut down since simply stopping movements is enough. This allows production processes to be significantly optimized – especially in areas where man and machine work together “hand-in-hand.”

For systems with speed-controlled drives there are various ways to accomplish safe speed monitoring. Essentially, speeds can be monitored safely either using external speed monitors or by a monitor already integrated into the drive. The integrated version is used especially when drives are already handling complex regulation and positioning tasks and a safe bus system such as CIP Safety is being used – such as on machining centers or in screen and offset printing. Here printing machines for labeling hollow bodies such as bottles or tubes operate with very high precision. In setup mode with an open flap, safe speed monitoring, which is integrated together with the link to CIP Safety in the frequency converter associated with the drive, is activated to minimize injury risk.

To monitor drives with CIP Safety on Sercos up to SIL3/PLe without an additional higher level safety controller and thereby make better and more efficient use of the advantages of CIP Safety on Sercos together with AS-i Safety, Bihl+Wiedemann has developed the new BWU3160 Gateway. This AS-i 3.0 Sercos Gateway with integrated Safety Monitor, CIP Safety on Sercos, features like its predecessor BWU2758 two AS-i masters with integrated switch for two AS-i networks, three 2-channel safe inputs and six fast electronic safe outputs onboard. Using Safe Link, the safe coupling from Bihl+Wiedemann, the gateway can now be expanded to nearly 2,000 safe in- and outputs.

The new CIP Safety Gateway from Bihl+Wiedemann, which enables implementation of applications up to SIL3/Cat.4/PLe, acts as a CIP Safety Originator and can monitor and control drives with a CIP Safety link up to SIL3/PLe without the need for an additional safety controller. Only a cable is required – the Sercos cable – over which both standard data and safety data are sent. Through this cable the drives having integrated safety technology can be controlled either by the standard controller or by the CIP Safety Gateway, which assumes the safety role and safely turns off the drives when needed.



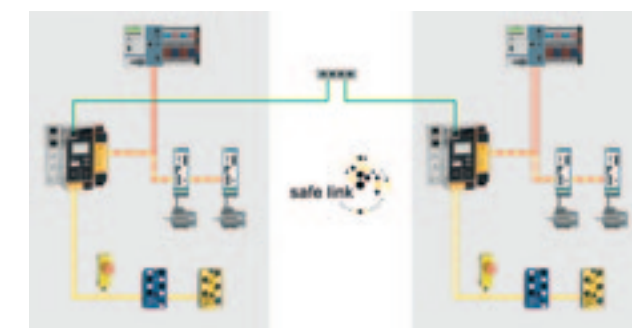
AS-i 3.0 Sercos Gateway, CIP Safety on Sercos (BWU3160)

By using Safe Link technology from Bihl+Wiedemann, a safe linking of up to 31 Safety Gateways over standard Ethernet, now multiple drives with CIP Safety on Sercos can be safely monitored and controlled, even if they are installed in different machines or systems. This works because the CIP Safety Sercos Gateways in the Safe Link network connected to the safe drives operate on the principle of “one talks and all listen” for exchanging safe data, which means every station in the network always has all the safety-relevant information and can respond accordingly.

The new CIP Safety on Sercos Gateway BWU3160 with Safe Link technology from Bihl+Wiedemann thus enables the integration of drive-, peripheral- and safety bus in a single network to ensure greater functionality and flexibility with reduced hardware and installation costs. And the numerous AS-i specific benefits – from the simplified installation technique for standard and safe sensors to the comprehensive diagnostic capabilities – are always part of the package at no extra cost.



CIP Safety Gateway from Bihl+Wiedemann as CIP Safety Originator in the Sercos network. The gateway communicates directly with the safe slaves (CIP Safety Targets) without an additional safety controller. All the benefits of AS-i and AS-i Safety in the lowest field level are retained.



Safe coupling of individual applications using Safe Link



Key features of the new AS-i 3.0 Sercos Gateway with integrated Safety Monitor, CIP Safety on Sercos (BWU3160)

- Safe control of drives with integrated speed monitor and safe fieldbus link
- Simplified handling and reduced hardware and installation costs through integration of the drive-, peripheral- and safety bus as well as standard Ethernet in a single network instead of antiquated parallel wiring with single wires
- CIP Safety on Sercos for 2 AS-i networks, integrated switch
- Version “1 Gateway, 1 Power Supply for 2 AS-i Networks”
- Applications up to SIL3/Cat.4/PLe
- Chip card for simple device exchange
- 2 AS-i masters in one gateway
- 3 two-channel safe inputs in the device, expandable by up to 62 two-channel safe inputs
- 6 independent safe outputs in the device, expandable to maximum 64 independent safe outputs



### Acal BFi Germany GmbH

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acal | bfi

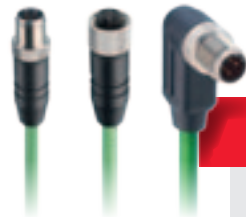
## Scan head series with Sercos III Interface

Laser processing through Sercos® III is now possible due to the series of SH15-SH50 scan heads from Smart Move.

This approach generates a whole bunch of advantages during the integration of multiple laser processing stages in an entire machine. The management of the job data, the parameterization of the job and the real-time control of a bunch of heads in a large machine is now straightforward. A scan head is usually driven from an additional external controller card. Such cards are offered from different suppliers: all with their own software, their own data formats and their own interfaces.

A scan head from Smart Move incorporates its own Sercos III capable controller card. Therefore necessary additional functions are no longer restricted by the given hardware on the controller card since they can be implemented now using the open Sercos world.

In addition, a scan head from Smart Move processes its job extremely fast while maintaining precision. This because a modern state space controller is used, which allows an unusual precision even in cases where the motorized deflector mirrors are moved close to their physical limits.



### Belden Electronics GmbH

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☎: +49 (0)7127 14-1567 | www.beldensolutions.com

lumbergautomation  
A BELDEN BRAND

## Belden's connectivity portfolio for Sercos

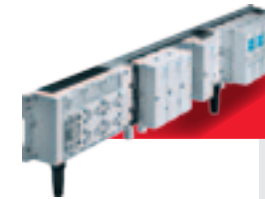
Belden, a global leader in high-quality end-to-end signal transmission solutions, offers a comprehensive product portfolio for Sercos® III networks.

The products are designed to meet the Sercos specifications for manufacturers and users within the automation technology industry.

Belden offers a complete connector and wiring solution for Sercos applications. The portfolio contains a broad range

of receptacles as well as field attachable connectors and single and double ended overmolded cord sets in various lengths.

Sercos suitable M12 interfaces are available as 4-pole, d-coded straight and right-angled versions. Single- and double-ended overmolded cord sets offer an IP protection of IP69K, have a 360 degree shielding, and come with a halogen free PUR cable.



### Festo AG & Co. KG

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☎: +49 (0)711 347-0 | www.festo.com

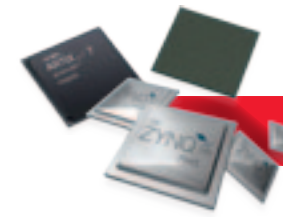
FESTO

## Festo CPX

This fieldbus node is based on the latest Sercos® specification and allows perfect motion control and I/O control via the same bus.

Festo CPX: Ideal as an automation platform, valve terminal partner, or remote I/O – electric, open, and direct. The unique comprehensive function integration and diagnostics will significantly increase your productivity. It is exactly what you need when you demand the best from your automation solution.

With the CPX/MPA and CPX/VTSA valve terminals, you benefit from the most comprehensive, most modular and most flexible automation solutions in the world. The optional CODESYS controller as well as the CPI and CTEL installation systems facilitate control and installation concepts that are perfectly adapted to your system concept. And they allow an integration into Industry 4.0 host environments via OPC UA.



### Sercos International e.V.

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sercos  
international

## Sercos IP core available for Xilinx® 7 series FPGAs and Zynq® SoC family

The Sercos® III IP Core for Xilinx 7 series FPGAs and devices of the Zynq SoC family is available since April 2015.

The IP core is available for Sercos III master and slave controllers (SERCON100M/S) for automation devices. It includes all hardware functions, such as timing, synchronization and processing of cyclic and noncyclic data based on two integrated Ethernet MACs. Sercos III master and slave devices can be implemented as a single chip solution using Xilinx Artix®-7 FPGAs, other FPGAs of the 7 series, or Zynq SoC devices, which integrate an ARM® dual-core Cortex™-A9 processor.

The ongoing use of the flexible and continually developing FPGA technology brings significant cost, performance and flexibility benefits to the Sercos community.

Detailed documentation on the IP core, reference designs and example Ethernet interface diagrams are available from Sercos International (www.sercos.org). Technical support and customer-specific design services are provided by Cannon-Automata, Ried/Germany, and Caronno, Pertusella/Italy (www.automataweb.com).





## KOSTAL Industrie Elektrik GmbH

Lange Eck 11 | 58099 Hagen | Germany  
www.kostal.com/industrie

KOSTAL

## Smart connections with the Kostal Inveor line of drive controllers

The "Smart connections." claim is not only the brand claim of Kostal Industrie Elektrik. It also stands for the philosophy behind the development of the Inveor line of drive controllers. The goal for the Inveor was always to develop a product that is ideally oriented to the requirements of customers and their respective applications without sacrificing the advantages of volume production.

The result is a consistent line through all performance categories (0.25 to 22 kilowatt) that presents itself identically through all sizes with regard to design, operation, and building structure, and which can be ideally configured to the respective customer requirements with numerous optional modules.

The broad power spectrum from 0.25 to 22 kilowatt, which is represented by five different sizes, creates the prerequisite for use both in the higher and in the low power range, meaning that the Inveor offers a large number of possibilities for increasing efficiency in the most varied branches.

Flexible use with all of the usual motor types is made possible with the help of an innovative adapter plate concept. Both asynchronous and synchronous motors can thus be operated with energy savings.

Attention was paid to ensuring the greatest possible flexibility in connection with the control and operating environment in application while developing the Inveor. It can therefore be equipped with all of the usual fieldbus systems as an option.

Fieldbus systems are now indispensable in modern automation processes. The capability of system diagnosis presents a significant advantage. In this case, for example, warnings are forwarded directly to the next higher level control system in order to plan maintenance intervals, etc. The wiring work involved in bus connections is also reduced. This saves time in planning and installation, and also ensures greater reliability of the complete system due to reduced interfaces.

The use of optionally pluggable fieldbus modules means that the customer can select the bus system of relevance to them, as the Inveor supports CANopen, Profibus, Profinet, Modbus, Ethercat, SAS and, as one of very few drive controllers, the Sercos® environment. This enables easy integration of Kostal drive controllers into existing automation processes, without the user having to deviate from their previously used fieldbus system.

In terms of the connection of human and machine, the Inveor also offers a manifold assortment for operating the drive controller with six different options. A foil keypad, an external and an integrated control unit, operation via an external touch screen, computer software and an integrated potentiometer are available.

Thanks to its clever, modular design concept, that allows as much individualisation and standardization as possible, the Inveor is the smart connection of motor and application environment for almost any application.



## LAUMAS Elettronica S.r.l.

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## New multichannel Sercos III weight transmitter – TLM8 SercosIII

LAUMAS extends its range of weight transmitters for PC-PLC, offering the new TLM8 SercosIII with a slave Sercos® III port, graphic display, and eight independent reading channels for load cells. The TLM8 transmitter offers the benefits and performance of an advanced digital weighing system even using analog load cells.

- Mounting: Omega/DIN rail for back panel or IP67 junction box
- 16-bit analog output
- RS485 serial port – Modbus RTU
- Slave Sercos III port

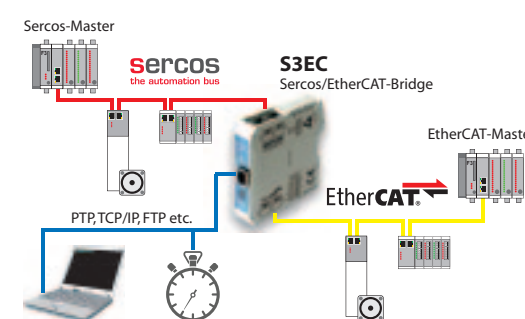
### The most innovative features

- RS485 (Modbus RTU)/fieldbus transmission of the divisions for eight independent reading channels
- TEST key: Direct access to diagnostic functions with graphical display of current load distribution on each active channel with archive backups: storing, retrieving, printing

- Digital equalization: The instrument allows equalizing the connected load cell's response in a fast and reliable manner over time avoiding use of junction boxes with trimmer
- Significant events archive (zeroing, calibration, equalization, alarms): storing, retrieving, printing
- Automatic diagnostics: The instrument is designed to store the percentage value of load distribution for each channel. The diagnostic function compares the recorded values, and if a significant variation between the values is detected during normal operation, the instrument displays an alarm alternating with the weight value

### Depending on the weighing system type it's possible to perform

- Load diagnostics: Load distribution control in constant barycenter systems (e.g liquids silo)
- Diagnostics on zero: Check on load cells drift state (e.g silo, weighbridge, platforms)



- Sercos- and EtherCAT-Slave with IO-Profile
- Adjustable size of synchronous real-time data (32 - 1024 Byte)
- Asynchronous data channel (SVC & CoE)
- Standard Ethernet channel over additional RJ45 jack (UCC & EoE)
- IEEE1588 support



**S3EC** Sercos®  
EtherCAT®  
Bridge

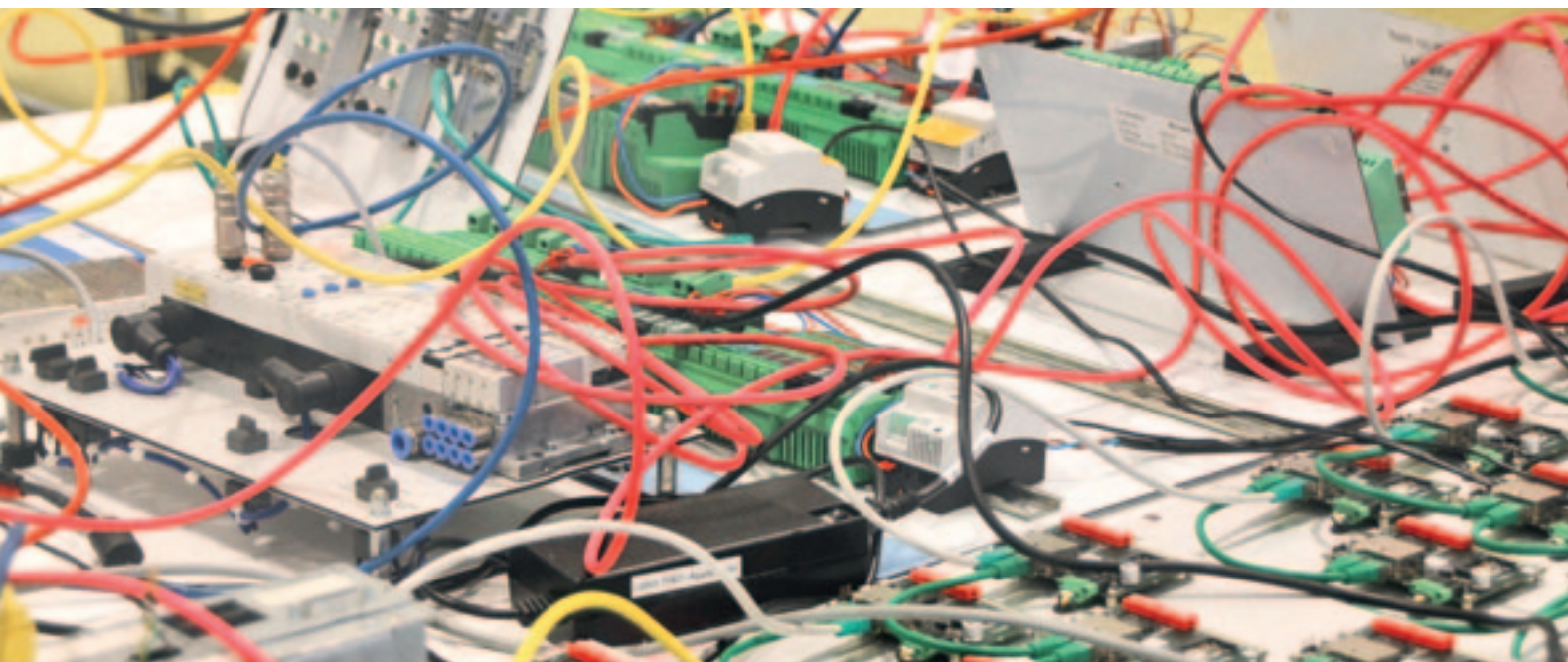
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## Record number of participants at 15th Sercos PlugFest

Sercos International posted a record number of participants at the 15th Sercos PlugFest, which took place at Schneider Electric Automation in Marktheidenfeld, Germany, from May 20 to 21.

Approximately 30 participants tested 25 products. These included nine master devices, such as CNCs, motion controls, and PLCs; as well as 16 slave devices (including servo drives, gateways to IO-Link, AS-i and SSI, pneumatic valve terminals, and decentralized I/O peripherals in various versions).

The Sercos®/Ethercat Bridge from Cannon-Automata was included in the test for the first time. It provides the opportunity to connect Sercos and Ethercat masters and to transmit data bidirectionally in real-time in heterogeneous real-time Ethernet communication structures.

During the PlugFest, master-slave combinations were tested using a prescribed test list. Additionally, interoperability

tests were performed using various multidevice test structures, each with more than 40 slave devices.

In addition, the Institute for Control Engineering of Machine Tools and Manufacturing Units (ISW) at Stuttgart University and the Esslingen-based Steinbeis Transfer Center supported conformity tests with the test tools from Sercos International.

“Last year we obtained feedback from the Sercos community in order to make the PlugFests even more attractive. The implementation is reflected not only in the participant numbers but also in the constantly growing number of Sercos-capable products,” said Peter Lutz, Managing Director of Sercos International.

## Sercos seminar Events

Laying the foundations for the future.



Sercos International welcomed ten participants to the Sercos® III development seminar at Steinbeis Transfer Center in Esslingen, Germany, on June 16, 2015.

The seminar was aimed primarily at equipment manufacturer developers and product managers, and introduced participants to the fundamentals of Sercos communication, FPGA hardware, profiles as well as testing and diagnostic tools. The one-day event also outlined the benefits of certification and explained the certification process.

Participants learned about the benefits of Sercos technology, such as the redundancy feature, direct cross communication, hotplugging slaves during runtime and much more. The seminar also covered the various topology options, the different telegram structures, installation, connection mechanisms, and a range of other aspects.

A presentation on Sercos III FPGA hardware answered questions on implementation versions, hardware, and driver software. Device models, profiles and configurations were presented, as were the Sercos Monitor and the Sercos Conformizer testing and diagnostic tools.

Sercos International successfully launches events in the second half of the year.



Sercos International staged its first events in the second half of the year with great success. Over 600 participants in Tokyo and over 330 visitors in Osaka attended this year's Industrial Open Networks Fair held on July 7 in Osaka and July 9 in Tokyo. This event is organized by suppliers related to the industrial open network, consisting of 48 companies. In addition to an exhibition with products from around 50 providers, the fair included a range of seminars including a Sercos International seminar on “Real-time Ethernet with Internet.” Around 40 visitors took part in the Sercos® seminar in Osaka which was held by Bosch Rexroth on behalf of Sercos International. The seminar in Tokyo was fully booked with 66 participants.

Visitors to the event were also introduced to an implementation in which the OPC UA Companion Specification for Sercos is reflected. The specification describes how the Sercos information model is mapped onto OPC UA so that the functions and data provided by Sercos devices are accessible via OPC UA. The aim is to facilitate data exchange between the machine periphery and superordinate IT systems and support the requirements of Industry 4.0 with respect to semantic interoperability.

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