

The Sercos logo, featuring the word "sercos" in a sans-serif font. The "s" is red, and the remaining letters "ercos" are white.

Issue 02/2014

# news

the automation bus magazine

## Automation in the Automotive Industry

ARC Advisory Group Identifies  
and Analyzes the Trends

### Revolutionary

Sercos powers the revolutionary drive construction and unique rotation options of Penta Robotics

### Optimized

Bosch Rexroth PS 6000 increases productivity of robotic welding machines in the automotive industry

### Mobile

Integrated servo drives from Schneider Electric increase the mobility of GEA Lyophil machines

## Dear Readers,

The economy is on the cusp of the fourth industrial revolution.

Both the digital and physical worlds merge to the "Internet of Things", which forms the basis for intelligent manufacturing systems and procedures, as well as for distributed and networked production.

A key position with regard to the implementation of the "smart factory" takes the automobile industry, which is one of the best-selling and most innovative industries world-wide.

There, the automation is a key factor to ensure the production of automobiles and their components in terms of quality, reliability and economy. Therefore the automotive industry has an important signal effect on other industry sectors.

An exciting question is how the "Internet of Things" will affect the further development of the bus systems in factory automation.

First, it should be noted that, despite the growing market share of Industrial Ethernet, an end to the traditional fieldbuses is not in sight. This is because they score with simplicity, low cost and reliability.

Growth drivers for Industrial Ethernet include high performance in terms of throughput and real-time characteristics, the integration of safety protocols, and interconnectivity to the higher office networks.

The increased networking of production under the fourth industrial revolution leads to an increase in communication needs, the growing importance of cyber-security, and the need to standardize interfaces and processes comprehensively.

Enjoy reading!



*Peter Lutz*

Peter Lutz  
CEO  
Sercos International e.V.

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## Webinar Recordings

- "Moving forward with tradition and innovation"
- "Sercos in practice: easily, quickly and flexibly"
- "Sercos in practice: efficient, reliable and economical"
- "Sercos tips & tricks to easily commission a machine"
- "Functionality of redundancy"
- "Mechanisms of connections"
- "Sercos III telegram structure"
- "Initialization of communication"
- "Synchronization of communication participants"

# Sercos webinars available for download

Sercos International presented around 10 technical webinars this year, which are available as free downloads in German and English at [www.sercos.org/downloads](http://www.sercos.org/downloads).

The webinars started off with the mini series "Moving forward with tradition & innovation" hosted by Peter Lutz, Managing Director of Sercos International. In the first webinar, he showed why Sercos® is employed with great success in a wide variety of machine and plant construction sectors and how the Sercos technology continuously adapts to the changing requirements of users and manufacturers.

In the second part of the series, Lutz showed how easily, quickly and flexibly peripheral components of a machine or plant can be connected using the Sercos automation bus. The webinar series concluded with the topic "Sercos in practice: efficient, reliable and economical", explaining why the automation bus enables networking in machine and plant construction and how Sercos makes optimal use of the available bandwidth of Fast Ethernet.

Rigobert Kynast, Technical Leader Sercos III Communication at Bosch Rexroth AG, started the second quarter with a

tips and tricks webinar, explaining how machine implementation can be made even easier by adopting some hints and tricks.

The webinars "Functionality of redundancy", "Mechanisms of connections", "Sercos III telegram structure" and "Initialization of communication" focus in detail on the appropriate topic. For example, the latter webinar explains step by step how a Sercos network is brought into operational mode after powering up.

### i Webinar on December 9, 2014

The last webinar in 2014 will take place on December 9 and is called "Synchronization of communication participants". You can register for this webinar at [www.sercos.org](http://www.sercos.org) under "News & Events".



Klaus Weyer  
Schneider Electric  
Automation GmbH

Dr. Thomas Bürger  
Bosch Rexroth AG

Prof. Alexander Verl  
Fraunhofer Institute

Matheus Bulho  
Rockwell Automation



## Sercos International e.V. elects new board of directors

Sercos International e.V. elected its new board of directors during the members' meeting at Hanover Fair 2014.

**D**r. Thomas Bürger of Bosch Rexroth AG is the new chairman, supported by Klaus Weyer of Schneider Electric Automation GmbH and Prof. Alexander Verl of Fraunhofer Institute.

Matheus Bulho from Rockwell Automation was newly elected to the board, replacing the departing Ralf Prectel (LTI Drives), who was honorably discharged together with the previous chairman, Dr. Bernd-Josef Schäfer (Bosch Rexroth AG).

Christoph Melzer (Automata GmbH) and Hans-Jürgen Hilscher (Hilscher Gesellschaft für Systemautomation mbH)

were both confirmed in their functions as cash auditors.

During the meeting, the members were comprehensively informed of the technological development of Sercos® based on current market trends, and also took a look at the strategic orientation of the user organization. "Strong growth in the spectrum of manufacturers and providers accelerates the implementation of innovative automation concepts and is, at the same time, proof of the high level of acceptance of Sercos in machine and systems engineering", explained Peter Lutz, Managing Director of Sercos International. "We also see this growth in Asia, specifically in China".

### Events 2015

#### March

SIAF Industrial Automation Fair  
03.09. - 03.11.2015, Guangzhou - China

#### MC4

03.10.2015, Bologna - Italy

#### Automation Summit

03.24. - 03.26.2015, Böblingen - Germany

#### April

#### Hanover Fair 2015

04.13. - 04.17.2015, Hanover - Germany

#### May

#### SPS IPC Drives Italia 2015

05.12. - 05.14.2015, Parma - Italy

#### Industrial Automation

05.13. - 05.15.2015, Beijing - China

#### 15th PlugFest

05.20. - 05.21.2015,  
Markttheidenfeld - Germany

#### June

Industrial Technology Efficiency  
06.18.2015, Segrate - Italy

#### July

Industrial Open Network  
(ION) Roadshow

07.07. + 07.09.2015,  
Osaka + Tokyo - Japan

#### September

#### Automation

09.09. - 09.12.2015, Mumbai - India

#### October

#### 16th PlugFest

Date + location to be determined

#### November

#### Industrial Automation Show

11.10. - 11.14.2015, Shanghai - China

#### SPS IPC Drives 2015

11.24.-11.26.2015, Nuremberg - Germany

#### December

#### System Control Fair

12.02.-12.04.2015, Tokyo - Japan

#### Machine Automation

12.11.2015, Segrate - Italy





## New Sercos brochures available

World-wide – independent – open – cross-linked: That's Sercos!

**B**rowse through the new image brochure and learn more about the user organizations and how we use our know-how for your success. Find out how members contribute to building the network of the future. You will also learn more about the benefits of becoming a member and the advantages your company can gain from Sercos membership.

The English Product Guide has also been updated in time for the SPS IPC Drives 2014 show in Nuremberg, Germany. The guide lists more than 135 vendors of Sercos®-capable products on over 85 pages. Vendors' Sercos products cover a broad range from actuators, controls, drives, encoders, and camera systems up to weighing transmitters, so that customers and prospects can find a solution for nearly every automation application. The Sercos Product Guide is the handbook for machine builders and users who either already use the high performance automation bus or for those intending to do so in the future.

Some products are displayed at the Sercos joint booth at SPS IPC Drives 2014 in Nuremberg in hall 2, booth 440.

In addition to the new brochures, a revised Sercos III brochure and a new competency brochure, "The fast route to Sercos", are also available.

The Sercos brochure is primarily targeted at interested parties and users of the Sercos technology. It explains basic concepts, the benefits of using Ethernet and the way Sercos functions by discussing transmission principles, protocol structures, topologies and more in detail.

"The fast route to Sercos" helps interested parties and users to get started. The brochure explains the various steps from the planning phase up to implementation. A vendor overview shows the various services offered by Sercos cooperation partners.

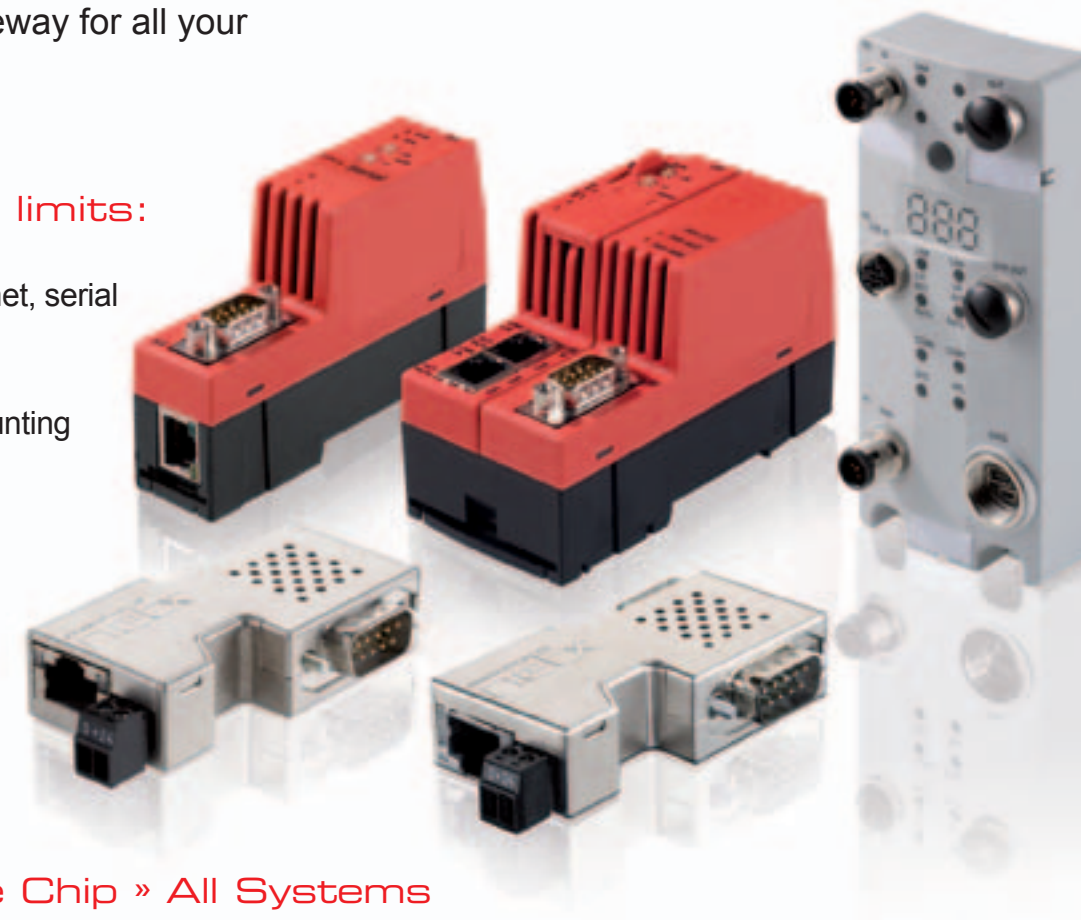
All brochures can be downloaded in the download section of [www.sercos.org](http://www.sercos.org) or be requested via email ([info@sercos.de](mailto:info@sercos.de)).

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Visit us at the SPS IPC Drives 2014: Hall 2, Booth 340



## Trends in factory automation

Trends in automation technology are a key driver of growth and competitiveness. What trends ought a manufacturer of automation technology or an end customer to follow? Implementing or studying a trend technology requires an increase in investments. The ARC Advisory Group cooperates closely with companies from the production industry and especially with automation manufacturers in order to identify and analyze technical trends and assess their future importance.

### Industry 4.0 everywhere

The Industry 4.0 concept, sponsored by the German government, has been a topic of discussion for a long time and was also the main topic of various trade fairs, such as

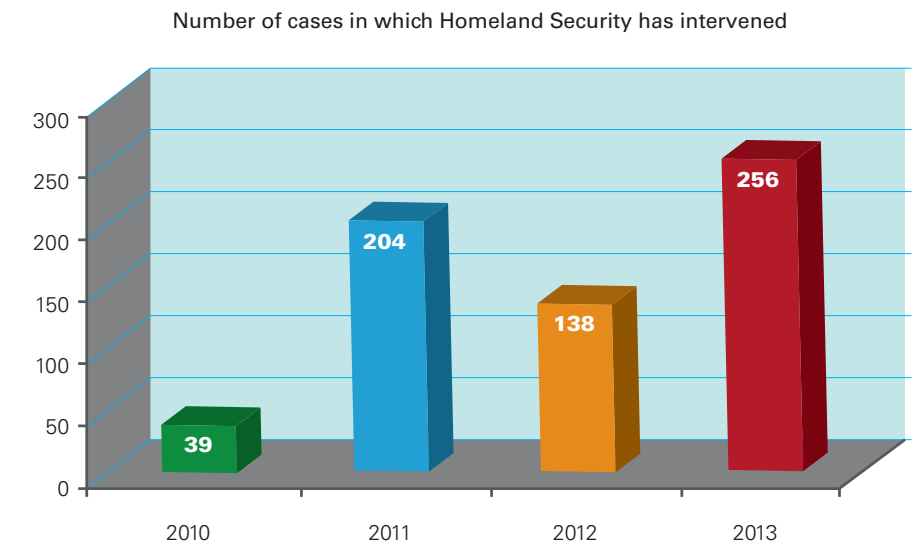
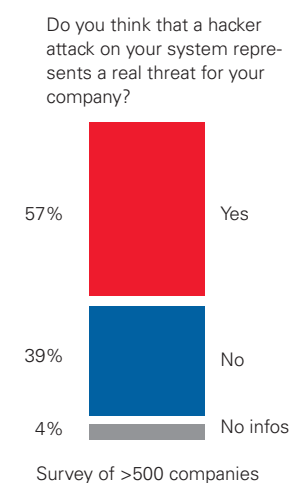
Hanover Fair 2011. The objective of Industry 4.0 is the intelligent or self-organizing factory. In the USA, there is a parallel initiative under the name "Smart Manufacturing Leadership Coalition". Both concepts are based on cyber-physical systems and the Internet of Things (IoT). In order to make these concepts a reality, users and solution providers face many challenges. One of these is the collection and analysis of the big data that is sent via the networked sys-

tem architecture. Furthermore, Industry 4.0 factories are no longer isolated plants but are mostly connected via the Internet so that data can be retrieved flexibly and at any time.

### Industrial Cyber Security

Collecting and sending data harbors risks in the field of industrial cyber security (ICS). Many companies are not sufficiently aware of the threat of cyber attacks (see image, left). The number of such attacks has increased considerably in the last few years. During that time, the US Department of Homeland Security has been engaged ever more frequently after a company had reported a cyber attack (see image, on the right).

With the stronger connection between production plants, the number of cyber-physical attacks will also increase significantly. Users and manufacturers of automation technology must be aware of this and take corresponding preventive measures.



Source: US Department of Homeland Security

### Engineering in the Cloud

An additional trend that has not necessarily emerged as a result of Industry 4.0 but goes hand-in-hand with it is "Engineering in the Cloud". Here, a virtual engineering platform (VEP) is installed on internal or external servers.

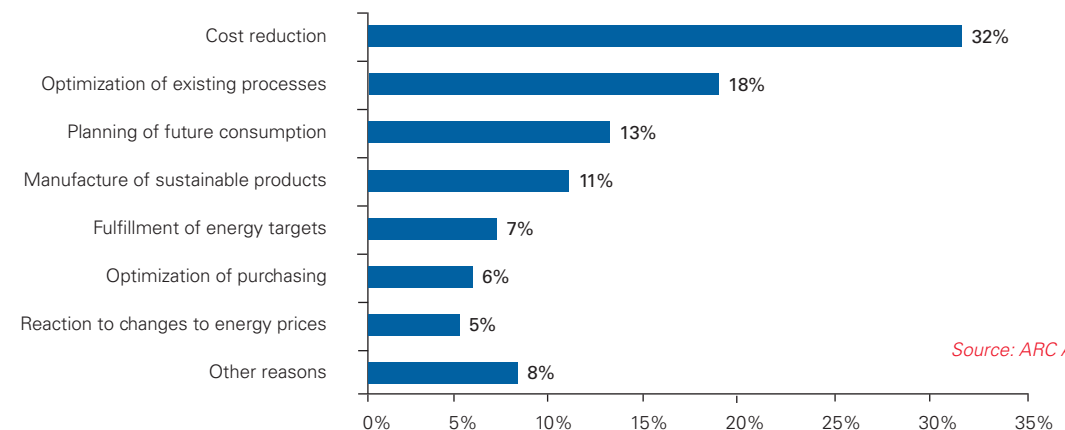
From now on, the engineers can access the VEP from anywhere in the world, which enables a simple, team-oriented, place and time-independent engineering process. In the end, the results are forwarded to the production plant in real-time, whereupon the production plant starts the production process in self-configured fashion - Industry 4.0 at its very best.

### Energy Management

Another trend of the last few years is energy management. The ARC Advisory Group estimates the savings potential of energy-intensive production plants at between 30 and 40 percent. In a survey conducted by ARC on the topic of energy management (see image below), one third of those surveyed said that they would like to reduce costs. Moreover, existing processes are to be optimized and future energy consumption planned. Measures to reduce energy consumption are not necessarily linked to high investments. Savings can be achieved through behavioral guidelines in the production plants alone.

There are a handful of other trends that impact production and development in various industries. However, ARC believes that the above trends will exert a major influence in the next few years.

### Objectives of Energy Management



Source: ARC Advisory Group





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## On track with Sercos

EMotion-4000-8DOF from Bosch Rexroth is the basis for Europe's largest driving simulator  
True-to-life vehicle movements evoke realistic driving behavior

**S**imulation systems are expensive tools – at first sight. Examples are numeric models calculated on high-performance computers to predict crash situations, flight simulators to train the flying staff members and the creation of miniature ocean waves for hydrodynamic research. They are not an end in themselves, but are economically optimized methods in place of trials using real objects and the real environment. The same situation exists regarding research of driver/vehicle interaction in driving simulators. The more realistic the simulation is, the better are the results derived from it.

The largest driving simulator in Europe was commissioned in the summer of 2012 at the University of Stuttgart. This simulator was developed to improve the energy efficiency and safety of road vehicles. Bosch Rexroth was appointed to supply the advanced motion system at its heart: the EMotion-4000-8DOF with its nerve cord, the Sercos® ring.

Boxtel (NL)-based Bosch Rexroth has accumulated decades of experience in the development of advanced vehicle simulation systems. The company has been working with aircraft and automobile manufacturers since 1986 to simulate the movements of a vehicle as realistically as possible. A multitude of systems has been built since then, both hydraulic

and electric-powered. These systems feature 2 to 8 degrees of freedom and are suitable for loads of up to 12,500 kg (the electric EMotion systems) or 14,500 kg (the hydraulic HyMotion systems).

### Driving simulator for research

In 2009, Bosch Rexroth was approached by the University of Stuttgart in connection with the development and construction of Europe's largest driving simulator. This driving simulator is intended for both the automotive industry and other research institutes to enable in-depth research without the need to carry out real-world test runs. For example, research into the driving characteristics of new types of cars, or the influence of 'assistance systems' on driving style. Assistance systems include brake control and collision avoidance functions that can contribute to reduced fuel consumption and increased safety.

A major advantage of a driving simulator over 'real world' tests is the fact that test drivers always drive under identical conditions. They are not subjected to a different set of weather or traffic conditions, for example. This makes the required measurements more accurate and reliable, and more suitable for comparative studies. Moreover, simulators enable

situations to be modeled that would be much too dangerous to try with real people and vehicles.

For real conclusions to be drawn from the test results, it is important that the simulated world experienced by the test subject should be as realistic as possible.



(Copyright Schreiber/FKFS)

Europe's largest simulator, housed at the University of Stuttgart, has a 4,000 kg payload, which allows for a full-car mock-up

In the case of car tests, this is about the complex interplay of visualisation (what the driver sees both outside and inside the car when performing certain actions), and movement (what the driver feels when performing these actions).

### Structure

In order to model both the visual aspect and the vehicle motion as realistically as possible, the simulator incorporates a passenger car (the motor of which is replaced by electronics), which is positioned inside a dome. The interior of this car is identical to that of a real car. A 360° panoramic view of the surroundings is projected onto the inside wall of the dome, using LED projectors.



(Copyright Schreiber/FKFS)

Inside the dome. The projectors can be seen here above the full-vehicle mock-up

### Motion system

To ensure that the driver convincingly experiences the acceleration, deceleration and other forces ensuing from his or her actions in the test vehicle, a Bosch Rexroth EMotion-4000-8DOF motion system is deployed in the simulator. This is an 8-axis system, comprising a powerful hexapod and an XY table combined with an advanced control system. The structure of the complete system begins with three parallel rails (X direction), anchored to the concrete floor. A gantry construction is then positioned that can move along these rails, driven by four synchronous AC servomotors and a rack and pinion system. Two parallel rails (Y direction) are then placed atop the gantry, creating an XY table. To optimise the movement of the XY table and ensure a low noise level, runner blocks are used for motion along the rails. The synthetic bearing cages used also contribute to the low noise level. Mechanical end stops are mounted to prevent the gantry from running off the rails, and to absorb simulator movement in an emergency situation.

The EMotion-4000 hexapod is mounted on the gantry system: This moves over the gantry in the Y direction, driven by two synchronous AC servomotors (which also employs a rack and pinion principle). The hexapod comprises six electric-powered actuators, on which the dome is mounted by means of six universal joints. The entire electrical system ultimately results in 8 degrees of freedom: Two from the XY table, and the other six from the hexapod itself. The complete system is capable of moving a maximum mass of 4,000 kg; this mass includes the dome, car, projectors and test driver. Within a movement envelope of 10x7m, a maximum speed of 3 m/s and a maximum acceleration of 5 m/s² can be achieved.

### Realistic simulation

The combination of XY system and hexapod is what makes it possible to simulate the accelerations and forces stated above. Because all degrees of freedom of the hexapod are supported by the six electric motors, the movements can be powerfully applied. This results in immediate and strong accelerations, which the driver experiences as forces with a magnitude and timing that strongly resemble the forces experienced in a real-world driving situation.

An acceleration or deceleration (braking) is simulated by combining two movements: forward/backward motion and tilting. This tilting makes use of gravity to press the driver into his seat (acceleration) or to lift him out of his seat (braking). If the hexapod alone was used to create these two movements, a 'dip' would be created in the sense of acceleration, potentially disrupting the illusion. This is prevented by having the XY table take over the forward or backward movement from the hexapod before it reaches the end of its stroke. At the same time, it is important that the takeover of these movements is carefully controlled, so that the test driver does not simultaneously experience being tilted. »

### System control

The system described above can make every required movement needed to simulate a realistic environment. The trick is to then translate all movements, speeds and accelerations of a car into movement and positioning of the motion system. Two control cabinets are used: one for the EMotion-4000 hexapod and one for the XY table. Both control cabinets facilitate I/O for a connection to customer-specific systems, and of course to the actuators of each system. The drive controllers in the control cabinets are connected via Sercos to a motion computer that runs special software developed by Bosch Rexroth. This software ultimately forms the heart of the system, and ensures that the driver's actions immediately lead to the correct response from the motion system. Its response is defined by the application-specific S-parameters (standardized Sercos parameters) sent to the drive controllers during configuration and startup of the system via the Service channels. The response is arranged through the motion system settings, otherwise known as motion cueing. This motion cueing is based on models from NASA and TU Delft, but has been extended by Bosch Rexroth such that the movements are significantly more realistic. Establishing the correct settings for this motion cueing is specialised work, carried out jointly with the customer. In addition to the motion cueing, the software incorporates various special effects, for example to convincingly simulate unevenness in the road surface.

The realism and comfort during the operation of the EMotion-4000 hexapod and the XY table depends essentially on the synchronism of the distributed drive controllers. The Sercos bus system is the only common fieldbus that guarantees synchronicity far below 1µs. This is achieved by hard real-time scheduling of the Sercos telegrams. Invented in the 1980s, it is still the most efficient method

of highly synchronous data transfer and independent of the number of devices in the Sercos ring. To further improve the quality of motion, the Bosch Rexroth control software uses not only position setpoints during motion generation, but applies additional torque command to compensate for friction specifically for every part of the motion profile.

All of the data pertaining to a specific vehicle can be input into the customer's host software (running on a separate computer), so that the motion system knows how to respond to the test driver's actions. This software is also responsible for projecting the correct images inside the dome.

### Final result

The final driving simulator is an advanced system that enables a variety of research to be carried out. The combination of true-to-life simulation of vehicle movement and the 360° panoramic view from behind the steering wheel evoke realistic behavior on the part of the driver, so that serious research regarding safety and energy-efficient driving can be performed. For the future, Bosch Rexroth is working to achieve even higher speeds and accelerations, to make the system even more dynamic. In the future the reliability of the EMotion-4000 will be increased thanks to the ring redundancy feature of a Sercos III network. The EMotion-4000 benefits from the extension of Sercos towards a universal automation bus. Due to the high usable bandwidth of the Ethernet-based Sercos III, all other peripherals, such as fast I/O for accelerometers or Safety controllers, can be added to the Sercos ring. The native Sercos drive profile functions and the Sercos Energy profile with its monitoring and energy-saving functions, valid for all devices, allow the complete system to operate in a very energy-efficient way.

## i Future EMotion-4000 automation system structure based on Sercos III

### Ethernet communication protocol

- Ethernet based
- 100 Hz communication

### Hypcos (RT-linux based control system)

- Advanced Motion Control
- Motion Cueing
- Test features
- Troubleshooting and error handling
- Interface between customer and motion

### Sercos III

- Ethernet based
- 1 kHz communication

### Control Cabinet

- Indradrive HCS01
- Relays & I/O connections
- Design in accordance with EMC
- Designed for 4EE
- Safety onboard

### Motors

- MSK motors
- Multiturn encoder
- Brake

### From 1,000 kg to 4,000 kg

Bosch Rexroth has an interesting history when it comes to the development of affordable alternatives for XY / hexapod motion systems as they were used in the past. The first 1,000 kg system was installed at Renault in 2003, as part of the Ultimate simulator. A 2,500 kg system followed in 2005 at Leeds University, a 1,000 kg system at PSA (Peugeot Citroën)



and a 2,500 kg system at VTI in Sweden. Another 2,500 kg system was installed at the University of Tongji (China). The system at the University of Stuttgart as described above is the first 4,000 kg XY / hexapod system ever installed by Bosch Rexroth.



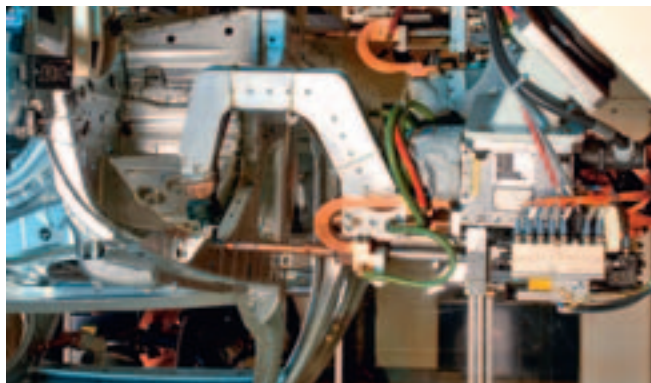


## Sercos increases productivity of robotic welding machines

Welding control system PS 6000 meets the requirements of the automotive industry

The requirements placed on welding technology by the automotive industry in terms of quality, productivity, energy efficiency and improved welding process control continue to increase. Rexroth has risen to these challenges with the tried-and-tested resistance welding system PS 6000. Equipped with the Sercos automation bus, this system makes for highly precise and dynamic control of robotic welding guns. It combines innovative software tools for quick and easy planning with certified safety functions to protect man and machine.

Resistance spot welding has become established in the automobile industry. Here, metal sheets of various alloys and thicknesses are pressed together by a welding gun. An electric current in the welding gun electrodes then joins the sheets by means of a spot weld.



With its adaptive control and monitoring system PS 6000 provides highest quality for spot welds.

Spot welds are subject to extremely high requirements in terms of quality and reproducibility which can only be fulfilled using adaptive control systems and corresponding process monitoring algorithms. Every single spot weld therefore has to be precisely documented and archived – for a mid-sized car this would be about 6000. With the major trend towards lightweight construction, the mix of materials and the introduction of high-strength steels, new demands have been placed on welding technology which can only be met using modern resistance welding systems.

The PS 6000 system from Rexroth features an adaptive control and monitoring system and is also equipped with convenient operating units and high-performance transformers which are also available as compact control cabinet solutions, so-called “welding cases”.

The flexible control set-up, intelligent control method and highly dynamic servo drives make innovative applications possible, for example aluminum welding. Standard functions for constant current and pressure control and the functions for welding gun maintenance and electrode milling ensure a high level of welding quality.

This quality and the productivity are especially important in the automotive industry. As a result, robotic welding guns driven by servo motors are being implemented more and more in automotive welding and assembly lines. These welding guns offer a range of advantages: In addition to low noise emissions and a high level of productivity thanks to quick closing operations, the controlled build-up of power makes welding process control more precise.

Bosch Rexroth provides you with a space-saving solution for the automotive industry by offering the PS 6000 in a compact “welding case”.



Rexroth's welding controller PSI 6000 is the heart of the PS 6000 system and features integrated servo gun activation via the Sercos automation bus. This controller makes it

easier to implement these servomotor guns in automotive welding and assembly lines. In this harsh industrial environment, Sercos is a particularly quick and reliable interface for transmitting real-time data. Thanks to its redundant ring topology, data is still reliably transmitted if a cable breaks. Sercos also functions as a standardized communication interface for all the control peripheral equipment, including the IndraDrive Cs drives and the intelligent gun data module GDM. This module has an electronic type plate and stores all welding gun data, e.g., operating hours and the number of spot welds, and supplies this data for production and maintenance purposes via the Sercos interface. This allows preventive maintenance of the welding gun, thereby optimizing cost-effective production.

The certified Safety on Board functions integrated into the IndraDrives, e.g., Safe Stop, provide optimal protection for man and machine.

The Windows-based user interface BOS 6000 with its integrated SQL database makes it really easy to program, control and monitor the welding process and the drives. The user interface also provides diagnoses of the drives and the servo welding gun. In addition, the BOS 6000 acts as an interface to higher-level systems, allowing process, operating and quality data to be centrally stored and analyzed.

### i Bosch Rexroth

*Economical, precise, safe, and energy efficient: drive and control technology from Bosch Rexroth moves machines and systems of any size. The company bundles global application experience in the market segments of Mobile Applications, Machinery Applications and Engineering, Factory Automation, and Renewable Energies to develop innovative components, as well as tailored system solutions and services. Bosch Rexroth offers its customers hydraulics, electric drives and controls, gear technology, and linear motion and assembly technology all from one source. With locations in over 80 countries, more than 36,700 associates generated sales revenue of approximately 5.7 billion euros in 2013.*

To learn more, please visit [www.boschrexroth.com](http://www.boschrexroth.com)

*The Bosch Group is a leading global supplier of technology and services. According to preliminary figures, its roughly 281,000 associates generated sales of 46.4 billion euros in 2013 (Note: due to a change in the legal rules governing consolidation, the*

*2013 figures can only be compared to a limited extent with the 2012 figures). Its operations are divided into four business sectors: Automotive Technology, Industrial Technology, Consumer Goods, and Energy and Building Technology. The Bosch Group comprises Robert Bosch GmbH and its more than 360 subsidiaries and regional companies in some 50 countries. If its sales and service partners are included, Bosch is represented in roughly 150 countries. This worldwide development, manufacturing, and sales network is the foundation for further growth. In 2013, Bosch applied for some 5,000 patents worldwide. The Bosch Group's products and services are designed to fascinate, and to improve quality of life by providing solutions which are both innovative and beneficial. In this way, the company offers technology worldwide that is “Invented for life”.*

Additional information is available online at [www.bosch.com](http://www.bosch.com), [www.bosch-press.com](http://www.bosch-press.com) and <http://twitter.com/BoschPresse>



# New AS-i 3.0 Sercos Gateway with integrated Safety Monitor, CIP Safety on Sercos

Safety even for small and medium-size systems

Sercos® has been one of the leading Ethernet-based bus systems in mechanical engineering and construction for more than 20 years. With CIP Safety it also has a protocol for transferring safety related signals via Sercos. They are simply transferred along with other real-time data over the Sercos network. In order to also use the advantages of AS-i Safety at Work for CIP Safety on Sercos – especially in the range of diagnostic functions – Bihl+Wiedemann adds a new team player whose amazingly low cost predestines it for smaller and medium-size systems: the CIP Safety Gateway over Sercos.

It has long seemed that those responsible for system safety tend to be somewhat more conservative than their colleagues on the standard equipment side of the aisle. While deployment of automated production systems was becoming a matter of course, cumbersome parallel wiring long remained firmly entrenched on the safety side. Real forward progress was not made until around the turn of the millennium, when AS-i Safety at Work succeeded in making it possible to send both safe and non-safe signals over the same bus line.

But from then on the move towards automated safety has quickly become a mega-trend. According to the 2009 study "Safety in Machine Building", around half of all companies were already using safety based communication technology in the field. The key motivations for this shift were simpler access to data and – perhaps most important – better diagnostics. In this respect Bihl+Wiedemann were a step ahead from the very outset, due to the numerous diagnostic features such as duplicate address detection, EMC and earth fault monitor within those AS-i Gateways with an integrated Safety Monitor.

In the opinion of market insiders, this development is gaining even more momentum. In part, of course, thanks to the new EC Machinery Directive, but mainly because fewer and fewer companies want and can afford longer downtimes, with the result that greater diagnostic capability is being demanded of the systems.

Diagnostics are also becoming more and more relevant for small and medium-size systems. That is why the specialists from Bihl+Wiedemann have developed a customized solution for those kinds of systems. The Safety Basic Monitor has been packed into a stainless steel housing and has been equipped with additional features. In addition to a display for diagnostics and startup, the new modules offer a fieldbus interface that is mechanically rugged enough so that the diagnostic data for the safety devices do not interfere with communication in the entire system. At the same time of course you need to ensure EMC compatibility of the interface. Since the fieldbus interface was integrated directly into the safety units, the controller can simply and easily call up all the safety information without any additional software parameter settings. Specifically, the status of all the safety devices is available in real-time as a standard signal. Now the controller is able, for instance, to bring the machine into the desired state before the safety unit shuts off the power after Stop 1.

Integrating the fieldbus interface into the safety unit also offers advantages when it comes to diagnostics. Among other things, the directly readable shut-off history saves the user considerable time, since the often tedious search for the trigger of a shutdown is now a thing of the past, even for small systems. Of course the corresponding information is also available through a web server for remote maintenance. It is also possible to view the status of the system on the device's own display.

Now there are not only spontaneous diagnostic messages available for things such as critical guard doors, but also an overview of the switching states of the individual components.

The range of functions for the new Safety Gateways from Bihl+Wiedemann has increased with the number of diagnostic options. Twelve freely configurable terminals allow the user, for example, to access up to six 2-channel outputs, six 2-channel inputs or standard inputs. Depending on the application, potential-free, antivalent or OSSD signals

can be read. And with the new ASIMON 3 G2 software, it is just as easy to redefine safety outputs as safety inputs, if needed.

As versatile as the new CIP Safety Gateway on Sercos itself are of course the ways in which it can be used. As a small

safety unit, it stands out with optimal fieldbus compatibility and when interacting with a continually growing range of expansion modules. And even if the user does not (yet) want to switch over to automated safety and continues to use parallel wiring, the cost and/or performance comparison still falls on the positive side.

## AS-i 3.0 Sercos Gateway with integrated Safety Monitor for CIP Safety on Sercos (BWU2758)

- Stand-alone design: 12 terminals on the integrated safety monitor are configurable, e.g.:
  - as 6 safe outputs plus 3 safe two-channel inputs
  - as 6 safe two-channel inputs
  - as standard I/Os
  - or any combination
- For use in compact or large, distributed systems
- AS-i Power 24V-capable: For use in compact systems with no additional AS-i power supply needed
- With expanded diagnostic capabilities such as duplicate address detection, integrated earth fault and EMC monitor



AS-i 3.0 Sercos Gateway, CIP Safety on Sercos, with integrated Safety Monitor (BWU2758).

## Diagnostic features

- Spontaneous diagnostics using display
- Detailed diagnostics and history of each switching state in display, over fieldbus or software
- All states are accessible over the fieldbus without additional efforts



Spontaneous diagnostics using display Current switch positions using display



Safe control of frequency inverter(s) with integrated speed monitor with the AS-i CIP Safety on Sercos Gateways.

## Bridge between two worlds

The Sercos/Ethercat-Bridge from Cannon-Automata bridges the gap between Sercos and Ethercat real-time Ethernet networks.

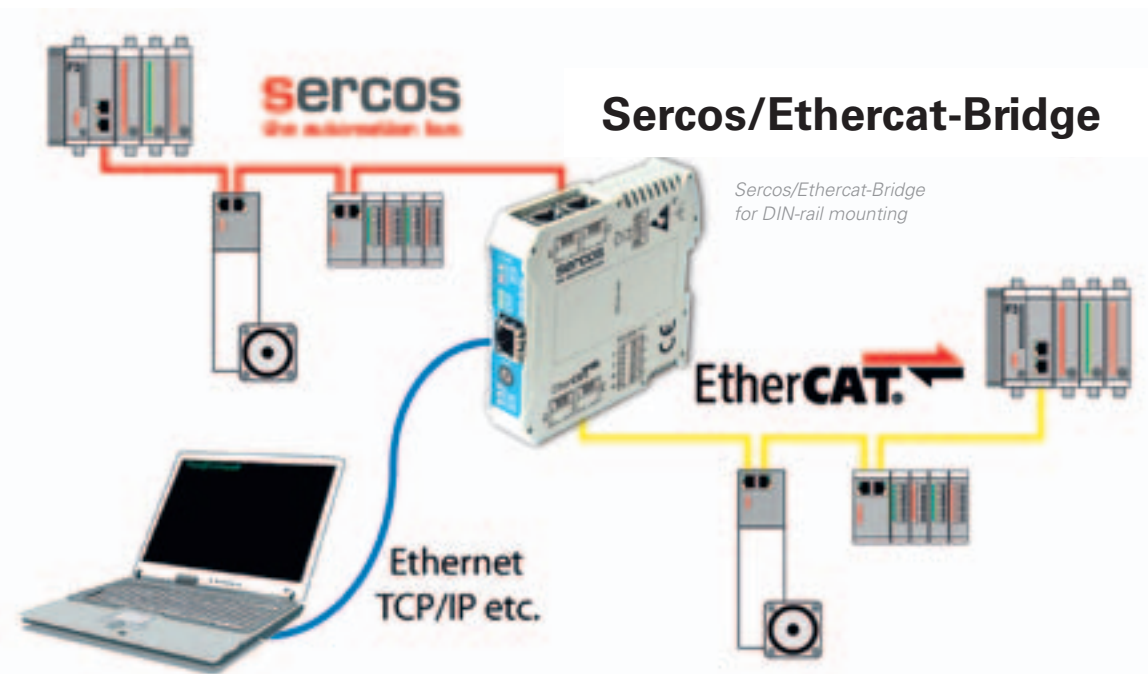
Both Sercos® and Ethercat have established themselves as high-performance Ethernet-based communication standards and are used in a variety of different applications. The two buses are also encountered more and more often as internal communication platforms for intelligent sub-systems, such as robots and assembly or transport systems. With the Sercos/Ethercat-Bridge from Cannon-Automata, it is now possible to connect Sercos and Ethercat masters and to transmit data bidirectionally in real-time within heterogeneous real-time Ethernet communication structures. Multi-master applications are now easy to handle; the constraint to a homogeneous bus structure is eliminated.

The Sercos/Ethercat-Bridge is represented on both buses as an I/O device. The width of the real-time data is flexibly configurable in the range of 32 to 2048 bytes and can be adapted to the needs of various applications. Copying the data between the two buses is supported by hardware and is executed within one communication cycle. In addition to the application-specific I/O data, information about

communication status and diagnostic data of the Sercos or Ethercat bus is transferred to the respective opposite side. This allows a fast reaction of the two masters to changes of the communication state or error events.

Besides the real-time data channel, the device also supports a bidirectional channel for asynchronous data transmission. On the Sercos side this mailbox mechanism is represented by IDNs that are readable and writeable over the service channel. From the Ethercat side the mailboxes are accessible over CoE objects or VoE protocol.

The device is designed as a compact module for DIN-rail mounting. For both Sercos and Ethercat, two RJ45 ports are available. A further RJ45 connector on the front side serves a standard Ethernet port. Over this interface, devices can communicate with other devices connected to the real-time buses using the respective mechanisms (UCC channel and EoE protocol). The IEEE 1588 master also available on this interface can be used for clock synchronization.



Linking of Sercos and Ethercat busses over the Sercos/Ethercat-Bridge

## “HARD” REAL-TIME WITH SERCOS and WAGO-SPEEDWAY 767



### Sercos-fieldbus coupler:

- 8 high-speed digital inputs
- 10 µs delay
- 31.25 µs Sercos cycle
- Cycle time: 250 µs
- System bus synchronous to fieldbus

### Digital high-speed I/O modules:

- 8DI / 6 µs delay
- 8DO / 0,5 µs delay
- 4DIO / 3 µs + 0,5 µs delay
- Channel-by-channel configuration

[www.wago.com](http://www.wago.com)





## Mobile transfer units on a long leash

For 60 years, GEA Lyophil GmbH in Hürth near Cologne has been developing and building freeze-drying systems for the pharmaceutical industry. The company holds a leadership position in the field, particularly in the area of automated loading and unloading systems for freeze dryers. It has been able to improve mobility for its newest units by using integrated servo drives from Schneider Electric.

In the freeze-drying process, moisture is extracted from a frozen product through a series of sublimation and desorption processes performed under vacuum conditions. Over the years, gradual improvements have been made to the freeze-drying process through more precise temperature management, improved isolation of the process against contaminants, and more efficient process designs. Currently, the best potential for further optimization lies in peripheral technology. Automatic loading and unloading systems are highly innovative components of freeze-drying operations, designed to reduce the risk of contamination by personnel when loading and unloading the freeze dryers. GEA Lyophil was one of the first companies worldwide to identify the potential of automated loading and unloading processes, and made initial steps in this direction as early as 1989. Today, GEA Lyophil is the leading global supplier of the ALUS™ (Automatic Loading and Unloading System).

### Technical Management



Michael Groth  
Technical Manager  
ALUS™, GEA Lyophil, Hürth/ Germany

Electrical engineer Michael Groth, technical manager for ALUS™ within GEA Lyophil, is the “man of the hour” for this product segment: He joined this product segment back in 1990, shortly after the company started moving in this direction, and helped to drive it forward, initially as a developer and later as a manager. As he explains it, “Essentially, ALUS™ is a transfer unit. It transports the vials or other containers with the substances for freeze-drying from the manufacturing process to the dryer, then redirects them back into the process after the freeze-drying is complete.

To explain it in very simple terms, the system consists of a loading tray with a conveyor for loading and unloading the vials, an automatically unfolding bridge for docking to the freeze dryer's loading door (known informally as the “pizza oven door”), and a slider for transferring the entire batch into the dryer and out again”.

An ALUS™ is either integrated permanently into a production line in the clean room or moves on tracks between various freeze dryers as a mobile unit outside of the clean room. In both cases, mobility is important. Integrating the unit into isolators calls for very tight space requirements. Clean room space is expensive and restricted to essential equipment only. Once the door to the freeze dryer is opened, the ALUS™ must be capable of moving to the side, even when it is permanently integrated into a production line.

Even though the mechatronic processes involved are not particularly time-critical, GEA uses servo-technology in ALUS™ design because this is the only way to achieve sufficient security for the process. Despite relatively high final speeds, the precise programming of motion profiles for smooth acceleration and deceleration prevents vials or bottles from falling over during transfer operations.

### Single-plug solution for greater mobility

GEA Lyophil is currently introducing a new generation of mobile ALUS™ units with even easier coupling and uncoupling. Groth points out the enormous benefit of this improvement: “The new ALUS™ units can be coupled and uncoupled from the stationary control cabinet, both electrically and in terms of control technology, by connecting and disconnecting a single plug”. Groth had already been on the lookout for some time, hoping to find technologically practical solutions that would allow mobile ALUS™ units to operate “on a long leash”. Attempts were made using cable carriers, but these failed to meet expectations.

Then he found PacDrive technology by Schneider Electric. PacDrive offers Lexium 62 ILM integrated servo drives as an alternative to classic “servo technology” using cabinet-based drives. These are part of a complete solution, which includes servo drives with integrated drive electronics, a central shared power supply for all the machine's servo drives, and a flexible networking concept for connecting the drives to the shared power supply and the controller.

This networking concept consists of distribution boxes and double-ended pluggable hybrid cables for connecting each drive to the power supply and to the Sercos® data communication. »



“Bridging the gap”: The bridge, which is unfolded by a servo motor, reduces space requirements in the isolator.



The vials, shown here on optional tablets, approach the unit and are then pushed across the bridge by a slide into the freeze dryer. The process is reversed after the freeze drying process is complete.



The Lexium 62 ILM servo drives, connected with the distribution boxes and hybrid cables, are located in the base of the ALUS, outside of the hygiene-critical area.



The Sercos bus comes from the PacDrive-Controller, and is guided into the shared power supply together with the power supply for the drives and the motor feedback signal through a connection module with a single hybrid cable from the cabinet control cabinet to the machine's first distribution box. From that point, the hybrid cable is distributed in tree or line structures to all integrated servo drives. Serial daisy-chain topologies without distribution boxes are now also possible.

#### Hybrid cable conducts all signals and power supply

With the hybrid cable, the Sercos bus is available on site in every drive. It can also be made available as a separate connection on the motor's drive electronics by means of an additional module in order to integrate I/Os into Sercos communication using M8 standard connections. A single connecting cable between the stationary control cabinet and the machine can therefore provide everything needed for the controller and drive technology in the machine: drive and I/O communication via Sercos, motor feedback signal, and power supply for the servo drives!



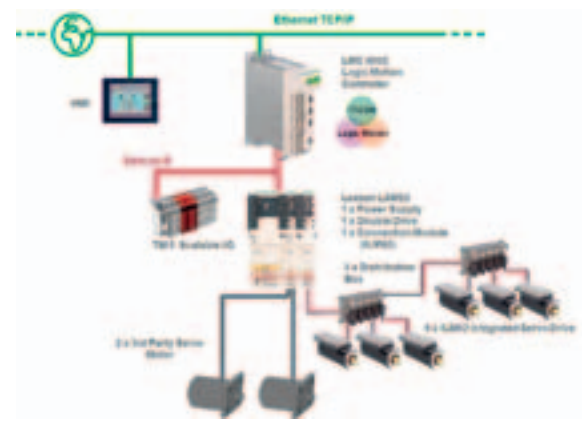
Anne Gerlach, ALUS Development/GEA Lyophil, explains the structure of the PacDrive automation solution with shared power supply.

The project originally began at GEA Lyophil as a topic for a master's thesis. Schneider Electric provided a free "starter kit" to GEA employee Anne Gerlach, then a graduate student, to create the project's solution using PacDrive technology. Gerlach quickly familiarized herself with the motion control technology. Looking back, she recalls that "commissioning the drives was especially easy". Her project won over the company, as Michael Groth is happy to confirm. "At the time we made the decision on PacDrive, no other automation company offered us a way to reduce an entire machine unit's power and communication connections to a single cable in this way".

#### Smooth integration of third-party drives

The automation architecture of the new ALUS™ consists of a PacDrive LMC400 logic motion controller, which communicates via Sercos with a total of six servo drives (in the

standard configuration; up to eight in some cases). Groth uses Lexium 62 ILM integrated servo drives wherever possible. In addition to supplying power to the 62 ILM drives, the shared power supply also runs a Lexium 62 LXM double drive. This is a classic cabinet-based servo drive connected in series with a quick-connect mechanism, also powered by the universally compatible shared power supply.



Automation structure of the new ALUS™: depending upon the version, two additional Lexium 62 ILM drives are connected to the available receptacles on the distribution boxes.

The double drive controls two specialized third-party hollow-shaft motors, which offer size advantages due to a combination of a servo motor and a gear box. Schneider Electric provided GEA Lyophil with parameter files for downloading into the motors. These files allow the drives to be integrated into the system communication using electronic name plates. This prevents any interface problems in system communication with the third-party drives. They can even be included in the extensive PacDrive diagnostics mechanisms and messaging functions.



For more information

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# 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 99 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.



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## Rexroth Technology leads to "less" – less waste, shorter changeovers – for new flexographic press

Newest generation system integrates frameless motors, regenerative drives, an advanced controller platform and linear motion components for a sophisticated press that provides more productivity and excellent print quality.

**P**aper Converting Machine Company – PCMC (www.pcmc.com) of Green Bay, WI/USA, is a global leader in tissue converting, packaging, flexographic inline tag and label printing, and nonwovens and envelope technology.

As PCMC began developing a new generation of presses in 2008, the company sought to satisfy several customer requirements – most of which focused on reducing the factors that affect printers' productivity and competitiveness.

"The industry wanted faster changeovers to help increase profitable printing time", said Dave Wall, Engineering Value Stream Leader for Printing, Coating and Laminating at PCMC. "Printers wanted to eliminate waste – both physical waste such as film, as well as wasted time". Customers also wanted to reduce the time it takes to set

up registration and impressions to print good products. To achieve those goals, PCMC focused on using servo drive technology to make this step faster and easier.

Two additional factors PCMC wanted to address were reduced energy consumption and reduced system complexity, to keep costs down and make press maintenance easier.

To satisfy these requirements, PCMC integrated a range of electric drives, controls and linear motion products from Bosch Rexroth Corporation (Charlotte, NC/USA, www.boschrexroth-us.com) into the new Fusion Flexographic System.

### **Fusion – Wide Web Printing and Converting**

The PCMC Fusion Flexographic printing press is an all servo-driven platform that includes up to 21 axes for a

ten-color press, or 17 axes for an eight-color machine. There are also seven axes for web conveyance and tension control from the unwind axis to the rewind axis. All axes are connected to the Rexroth control system via the highly synchronous Sercos® bus.

To develop the Fusion system, PCMC worked closely with long-time supplier Bosch Rexroth and local distributor and system integrator CMA/Flodyne/Hydradyne (Brookfield, WI/USA www.cmafh.com).

The Rexroth drive and control systems powering the Fusion press include IndraDrive M servo drives with regenerative and DC bus sharing capabilities and IndraDyn T frameless torque motors, all controlled by the IndraMotion MLC motion logic controller. IndraMotion for Printing provides a full range of pre-engineered technology function blocks to solve the most complex printing and converting application. Implementation of these proven algorithms shortens engineering time and minimizes field support typical with implementation of new control algorithms. The easy configuration and the high diagnostic level of the Sercos automation bus reduces engineering efforts during start-up and commissioning. The service computer can be connected to any free port of the Sercos communication system having access to all the Sercos nodes via the Unified Communication Channel (UCC) without affecting the real-time behavior of the bus at any time.

The redundant ring architecture of Sercos with auto-healing means that an interruption in communication anywhere in the bus will not cause an interruption in motion, and redundancy will be restored automatically

as soon as the cause of the interruption is removed. Advanced diagnostics further allow the location of a break to be determined so that this location can be examined for loose or faulty cables, etc.

### **Reducing Press Setup Time**

Changeovers were the first area the development team focused on: Reducing changeover time when a new job is put up on the press adds to profitable printing time. Each Fusion system consists of a large central impression cylinder, eight to ten feet in diameter, radially surrounded by eight or ten printing "decks" with two cylinders, one containing the image and the other applying the ink. All of these cylinders are driven by Rexroth IndraDrive drives and motors.

During changeover, once the color cylinders are exchanged and the press web rethreaded, setting the image registration and impressions is the next step. In the past, this involved time-consuming manual adjustment, deck by deck.

Using Rexroth intelligent IndraDrive servo drives, PCMC developed a new setup feature called PrintSense. The image cylinder and anilox inking cylinder in each deck are brought together to reach "the kiss point" where the image impression will be correct.

IndraDrive motor feedback data generated by each cylinder's drive is captured and used by pre-established algorithms to calculate when the proper feedback setpoint is reached from both drives, eliminating the need for time-consuming initial print setup. »

*The Rexroth IndraMotion MLC control system provides a full range of pre-engineered technology function blocks, helping PCMC speed the Fusion's commissioning time and enabling printers to set image registration faster and reduce non-productive changeover time.*





### Drive-integrated Safety Improves Efficiency

IndraDrive systems set new standards in drive engineering, with intelligent functionality, integrated safety features and regenerative power capabilities.

According to Wall, both the safety features and the regenerative drive capabilities provide the Fusion with a competitive edge. "During setup, we can use the IndraDrive Safe Halt feature while we change the plate; normally we would have to build a brake or lockout mechanism to safely hold the axis in position, adding more parts to the system". The regenerative drive feature lets the Fusion system capture energy typically wasted when machine axes slow or stop, feeding it back into the system power bus to reduce energy demand -- a feature that PCMC prominently promotes about the system.

### MLC Controller Enhances Printer Expertise

Printers are more than machine operators; they are skilled craftspeople tasked with ensuring the highest quality printing production. To help them exercise their craft, PCMC chose the Rexroth IndraMotion MLC motion logic controller to operate and control the tension and registration of the Fusion press.

The compact IndraMotion MLC system is suited for synchronizing multi-axis systems up to 64 axes. It features pre-engineered function blocks for winding, registration, tension, and other key settings; open system interfaces such as the Sercos automation bus; and support for

IEC 61131-3 function blocks and motion sequences. According to Wall, the MLC helps to complete image registration faster, using an integrated end-of-line vision inspection system.

"The vision system shows the press operator the image registration at operator controls; the operator can use the controller to advance/retard a color, or move left/right, to get the registration correct", Wall said.

### Frameless Motors Help Reduce Costs

For major systems like Fusion, cost control is the result of smart engineering that reduces component counts. To accomplish this goal, PCMC, working with CMA/Flodyne/Hydradyne, chose Rexroth IndraDyn T frameless motors to drive 11 of the Fusion's axes.

IndraDyn T torque motors are liquid-cooled kit motors consisting of a separate stator and rotor designed for maximum torque applications up to 13,800 Nm. The rotor is mounted directly to the extended journal of the cylinder, rather than coupling a traditional servomotor shaft to the axis. The central impression cylinder can be > 80" diameter. In order to hold 0.001" accuracy on a 40" radius, Bosch Rexroth utilizes a 32 million ppr sin/cos feedback device. Bosch Rexroth is one of the few companies in the world with this level of control accuracy.

With Sercos, the position commands to the printing cylinders are synchronized with less than 100 nanoseconds of jitter. This, along with the high-bandwidth servo gains that are achieved with direct-drive motors and IndraDrive Advanced control sections, results in highly accurate print registration that is limited only by mechanical and process influences that are outside the scope of the drive and control system.

Doug Anderson, sales engineer from CMA/Flodyne/Hydradyne, worked with PCMC from the outset to select and size the IndraDyn motors.

"One of the strengths that Rexroth offers is its vast array of kit motors", Anderson said. "We selected one torque motor size for the large impression drum, which needs to stop within 10 to 15 seconds, and then another size to handle the different widths of the image and color rolls".

Using the IndraDyn torque motors enabled PCMC to reduce the Fusion's part count by nearly 60 percent compared to the previous generation machine.

"I don't know of any other company besides Rexroth that could have supplied us with the range of products that we needed -- for example, the frameless motors let us accelerate the Fusion six times faster than in the past".

### Linear Components Deliver Critical Rigidity

A crucial mechanical design challenge on a printing press is the decks mounting the image and inking rolls. These rolls range in width from 42" to 75"; each deck must move in and out for job changeovers when the press is re-webbed and the rolls exchanged. However, once printing commences, the decks must be extremely rigid and hold the rolls in position, to keep each color layer in perfect registration while the rolls spin up to maximum speed.

To provide the flexibility and rigidity needed, each image cylinder and inking cylinder incorporates two Rexroth precision Ball Screws and four profiled Ball Rails. Rexroth Ball Screws and Ball Rails combine high rigidity and high load capacity in compact sizes, engineered to deliver precise tolerances and operate error-free for thousands of hours with minimal maintenance.

"We can't have the mechanical elements of the press moving around, because that will show up in the print", Wall said. "The Rexroth Ball Screws and Linear Rails give us the rigidity and resistance to backlash and tolerances the Fusion needs".

### Fusion: Successful Launch

Since the Fusion's launch in 2010, it has been a success: According to Wall, PCMC has been continuously building machines, secured repeat orders, and is expecting more growth.

"The improved changeover times, the simpler system design, which makes it much easier to maintain and thus increases their profitable printing time, and the energy savings are all helping to contribute to the Fusion's success", Wall said.

PCMC credits both CMA/Flodyne/Hydradyne and Bosch Rexroth with contributing to that success -- through technology and the support both provided during development and production of the Fusion.

"Working with Rexroth and CMA/Flodyne/Hydradyne we did a lot of complex engineering up front and chose the technology to help us make the system less complex", Wall said. "Since the Fusion was launched, we've had several customers tell us that the most compelling aspect of the design is its simplicity -- and that's helped to differentiate us from the competition".



CODESYS

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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

Advanced Rexroth technology such as IndraDrive regenerative drives enable the Fusion to operate with increased efficiency while consuming less power.

PCMC was able to reduce the component count in the Fusion press by close to 60 percent, in part due to using Rexroth IndraDyn frameless torque motors and other components.





## Sercos drives innovative robotics design

Sercos International e.V. powers the revolutionary drive construction and unique rotation options of the Penta Robotics' Veloce parallel robot with its technology.

**D**esigned for processes in which typical pick and place applications are required, the Veloce combines all required movements such as X, Y, Z translations and product rotation capabilities. It is therefore perfectly suited for the needs of the packaging, food processing, pharmaceutical, solar and semiconductor industries.

"The key innovation is the integration of the rotation as part of the robot architecture itself", explains John Beerens, Chief Commercial Officer at Penta Robotics based in Vreeland, the Netherlands. He continues: "This means that no additional rotation link and motor are needed to be positioned over the workspace, as the motors are symmetrically positioned in the Unibody. So, there are only mechanical links between the motors and the traveling plate".

Using this kind of architecture means that Penta Robotics' primary focus for developing the robot were functionality, user-friendly control and design.

Bosch Rexroth's open core engineering allows the company to directly connect to the PLC via a self-developed App

running on an Apple iPad. Motion controls, drives, vision and sensors are all interconnected via the Sercos® automation bus that enables the interaction.

"Sercos is used in many areas and has its particular benefits in applications that need high speed at highest precision such as robotics", explains Peter Lutz, Managing Director of Sercos International e.V.. "Our technology offers high speed due to fast Ethernet (100 Mbps full duplex) and a high data throughput because of the summation frame procedure used. The on-the-fly processing and direct cross communication reduce running times in the network to a minimum. The communication cycle time is configurable between 31.25µs and 65ms, with synchronization accuracy better than 1µs", concludes Lutz.

Penta Robotics' Veloce is used world-wide in various industries and is supported by selected system integrators such as Emkon in Germany, Vector in Mexico, AFP in China and many more.

### 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.

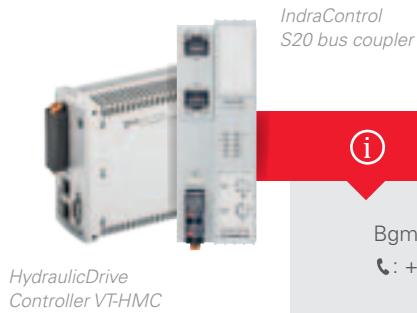


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## HydraulicDriveController VT-HMC

The easy, open and scalable digital axis controller VT-HMC for modern automation hydraulic axis. As a digital controller with integrated axis controller and a PLC functionality to IEC61131-3, the HMC has been designed for use in tough industrial environments and features high-level interference immunity, as well as high resistance to mechanical vibrations, shocks, and climatic conditions.

- Best in class controller
- Sercos® and other bus systems
- Service and diagnosis options
- Scalable in software:
  - Position & velocity control
  - Pressure & force control
  - Alternating control

## IndraControl S20 bus coupler plus

IndraControl S20 is the new modular I/O component family from Bosch Rexroth. Sercos® provides a simple, high-performance system connection and fast and flexible handling of process signals. Based on a user-oriented system design for extreme operating conditions, the system enables fast device installation and exchanges in the field.

- Sercos specification V1.3
- Minimum Sercos cycle time 31.25µs
- Rotary encoding switch for address adjustment
- Up to 63 IndraControl S20 - modules expandable



## C.E. s.r.l.

Via del Litografo, 5 | 40138 Bologna | Italy  
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## Remote module I/O Sercos III

This remote module offers a number of qualities:

- Extremely compact
- 32 digital outputs
- 64 digital inputs
- Protection against polarity reversal
- Short-circuit protection of outputs
- Thermal protection of outputs
- Status LEDs for inputs and outputs
- Diagnostics with display on LEDs
- Sercos® address can be set from 1 to 99



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## ECX-Master-Selector

Dual Ethernet Master Selector for two redundant masters.

### Designed to build redundant master systems

- One network with possible cable redundancy connected to the primary or the secondary master by a simple control signal
- Ideal to build up a redundancy on the master side

### Compatible for Ethernet-based systems

- Flexible application range to switch one network between two masters/PCs for all Ethernet based systems or field bus standards with 100BASE-TX.

### Optical isolated switching signal

- The switching signal is optically isolated
- Characteristic according to 61131-2, type 3
- DIN-EN carrier rail mounting
- Ethernet physics according to IEEE 802.3



## Hilscher Gesellschaft für Systemautomation mbH

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## netRAPID – instant solution for Sercos

netRAPID is a complete netX controller-based Sercos interface the size of a stamp. It carries all essential electronic parts necessary for doing real-time Ethernet communications and just needs to be expanded by the network connectors and LEDs.

Data exchange to the host is carried out via 16 kByte Dual-Port Memory or 50 MHz SPI.

As a netX Chip Carrier, it is a “ready-to-solder” communication solution and your easiest way to your own netX design. Thanks to trendsetting netX 52 technology, netRAPID is well prepared for the latest requirements of all real-time Ethernet systems. netRAPID allows you rapid and risk-free prototyping, as well as automated SMD mass production of your embedded design.





## Hilscher Gesellschaft für Systemautomation mbH



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## Real-time Ethernet Kit

The Kit is suitable for development and test laboratories as well as for training purposes.

It can be used to build up a complete communication system for all real-time Ethernet systems. With the included netANALYZER, the performance and function of individual systems or system components that operate according to

Ethernet II IEEE 802.3 specification or corresponding bus systems can be displayed.

The Kit includes a comprehensive manual, which allows an easy quick-start. With the cifX-PC card and the NXIO-devices real-time Ethernet systems such as Sercos can be set up.



## Kistler Lorch GmbH



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## Kistler is setting new standards for electromechanical NC joining systems with the maXYmos NC

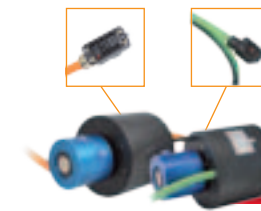
Extending the maXYmos product range to control and monitor production processes and quality assurance.

The newly developed maXYmos NC monitors and controls the joining process. Equipped with an intuitive touch display, the new system is particularly easy to use, while the integrated sequence control offers a high level of flexibility for straightforward to highly complex joining processes.

The NC joining systems are predominantly used in the automotive and supply industry in the widest range of manufacturing processes, such as gearbox, motor, chassis or pump installation.

The maXYmos NC evaluates and documents the XY curves of joining and press-fitting operations in combination with NC joining modules and the associated IndraDrive servo amplifier.

Due to the form of measurement curves, each stage of the production and assembly line – and even the entire product – can be monitored and operated via Sercos III all in real-time. In this way, optimum cycle times can be achieved with the highest degree of repeat accuracy. Unplanned downtimes are minimized as machine availability increases, in turn allowing the productivity of the manufacturing process to be accelerated.



## Servotecnica S.p.A.



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## Real time communication slip rings

Servotecnica is a manufacturer of electrical slip rings for the transmission of power and high data rate signals. The contact, based on a gold to gold technology, allows a clean and reliable communication between the static and the rotating part.

The wide range can satisfy all the needs of the market, ranging from very small rotary joint (Φ 12 mm) to big ones (Φ 400 mm) option IP67 and ATEX are also available.

The company's experience in the motion control market allowed us to transmit different real-time buses over our

slip rings, including Sercos III, Ethercat, EtherNet IP and Profinet, cooperating with market leading manufacturers.

The new transmission technology allows the use of "hybrid" cables for the transmission of power and signals in a unique solution, avoiding crosstalk and noise, and granting high performances and lifetime.

Custom solutions are available, such as the use of special materials and treatments, cables or connectors and the combination of the electric joint with fluid or optical ones.



**Smitec S.p.A.** provides automation and control systems whose **modular and open architecture** makes them easy to update and expand, vowing for interchangeability and replaceability of its component parts with products from other manufacturers.

The company's core product is the **MotorNet System (MNS)®**, a PC based automation system for the management and control of industrial machines with independent axes.

The electronic devices involved communicate via **Sercos Interface™ technology**, an international standard in motion control applications on multi-axes systems for real-time data and signal exchange via Ethernet.

The control software is **Linux-based** with real-time extension, while the operator interface is entirely based on **Jada** – the proprietary SCADA.

Smitec delivers **tailor-made automation systems**, starting from the technical specifications analysis, through the electronic design, engineering and SW/FW development, up to the installation of the complete solution.



# Sercos International presents a multi-vendor demo at the Industrial Automation North America (IANA) Show

Sercos International's multi-vendor interoperability demo at IANA in Chicago, IL, September 8 to 13.

The multi-vendor interoperability demo presents various automation products connected using the Sercos® automation bus, including the Bosch Rexroth XLC (eXtended Logic Control) PLC, IndraDrive Cs servodrive, various I/O devices (Inline, S20, S67 and VAM panel), SafeLogic compact safety control, and HNC100®-3X hydraulic axis controller. Additional Sercos devices include an Aventics pneumatic valve system, Cannon-Automata SSI Gateway for Encoders, Feller Engineering's multi-channel temperature controller, Festo's pneumatic valve terminal, a halstrup-walcher positioning system, RiceLake's Laumas Load Cell Transmitter and a TR-Electronics programmable absolute encoder.

Cannon-Automata showed a demo of the new A2 PC based-Intel Atom dual core equipped Programmable Automation Controller. The A2-PAC device family combines the advantages of a PC-based control with the typical features of PLCs and motion controllers.

Also on display was Bihl+Wiedemann's AS-i 3.0 Sercos Gateway with integrated safety monitor for CIP Safety on Sercos, which can be used to transmit data from safety input slaves and to safely control safety output slaves via CIP Safety.

Peter Lutz, Managing Director of Sercos International, presented "Trends in Industrial Communications for the Factory of the Future." Part of his presentation was on the blended infrastructure conceptual approach that simplifies the integration of machinery in manufacturing. True to the slogan "Fewer cables, less complexity, easier machine integration," Sercos International developed this approach in collaboration with ODVA and the OPC Foundation. A

common network infrastructure where Sercos telegrams, EtherNet/IP messages, CIP Safety messages and TCP/IP telegrams run on one single cable allows mechanical engineers and users to reduce the costs and complexity involved in machine integration. At the same time, they are able to continue using their preferred product suppliers and automation devices and can benefit from more than 1,000 connection options.

## Imprint

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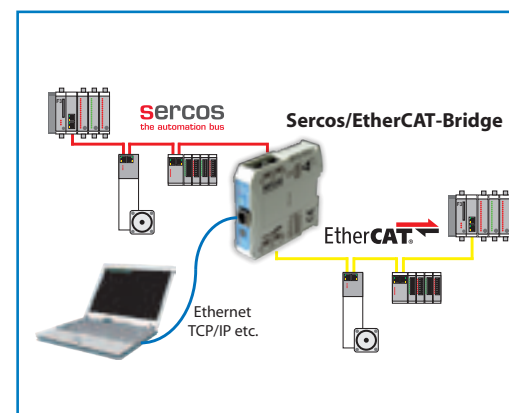
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