

Issue 01/2012

sercos news

the automation bus magazine




Image Processing Systems
for sercos

See, Recognize,
Pinpoint

Strong Duo

WAGO: Interplay of the
fieldbus and system bus

Multifunctional

New frequency converter
from SEW-EURODRIVE

Higher Productivity

WINEMA counts
on sercos

The Full Picture



Automation technology is subject to constant change – to be a safe investment, bus systems always need to keep an eye on the future. They need to see, recognize, and pinpoint changes to satisfy current requirements and cover the full range of applications in machine and systems engineering.

Electronic image processing is gaining a foothold in various industries. Camera systems identify and measure objects, and monitor their position in the production process, while checking their integrity, form, and dimensions. They also support OCR and read codes.

The sercos automation bus enables the easy integration of camera systems, as well as flexible networking with further components. The result: high-performance, highly automated applications that boost efficiency in the long term and make an important contribution to quality assurance. These advantages are not only good for businesses, but their customers as well.

I hope you enjoy reading this latest edition of sercos news.

Peter Lutz, Managing Director sercos international e.V.

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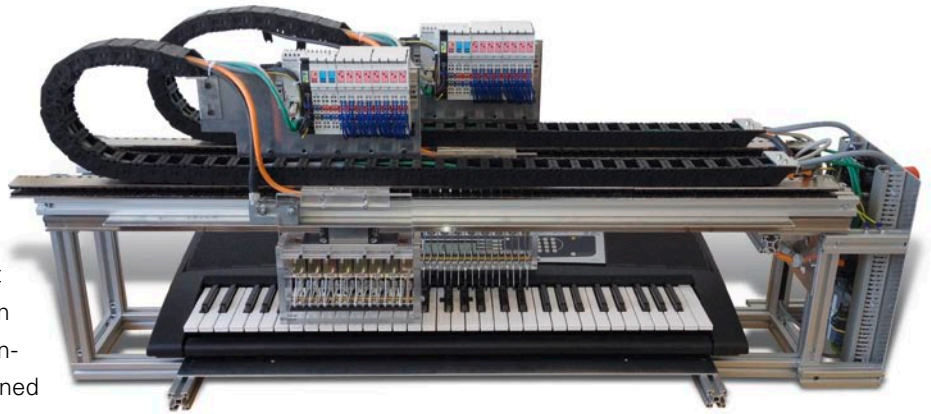
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“Play It Again, Sam!”

The sercos guitarist was by and far the biggest attraction of the last few trade fairs. It reminded numerous visitors of the cult film *Casablanca* and many requested an expansion of the musician's ensemble. We listened to these requests and are proud to announce that a new keyboardist has now joined the sercos band. Like the guitarist, he was developed by a group of students at the Institute for Control Engineering of the University of Stuttgart under the leadership of Jan Schlechtendahl. The student Valentino Nadale looks back at the keyboardist's development and reports on the solutions that the students used to take on a wide variety of challenges.

“A robot in a semester? And one that can play the piano? Isn't that a bit much to ask of us students? These were the questions that concerned us early in the semester. However, as we worked through the concept, we quickly realized that it didn't involve reinventing the wheel. Using sercos as an automation bus made our task a whole lot easier. Thanks to the standardized profiles, we could easily integrate IndraDrive Cs servo drives from Bosch Rexroth for the robot's movements. An MLP controller, also from Bosch Rexroth, was used for the control. In the beginning, we were overwhelmed by the virtually limit-



less options that resulted from these components – you can control, regulate, and monitor just about everything. We were able to successfully commission the robot with comprehensive documentation and support from Bosch Rexroth. sercos diagnostic functions were especially helpful during this step. The robot's repertoire could be quickly expanded from nursery rhyme melodies to true rock and pop classics. As we gradually progressed, we learned about the various aspects of sercos in the process. In addition to commissioning sercos, and configuring and programming the controller, we also produced all mechanical components on site at the Institute for Control Engineering. Though our project had a playful overtone, in the end we had acquired the necessary knowledge to produce industrial applications. I recently saw large boxes from a well-known musical instrument manufacturer at the Institute for Control Engineering, and can't wait to see if our sercos band will be adding new members...” ■



2012 Automatisierungstreff

The user and developer seminars organized by sercos international for the 2012 Automatisierungstreff in Böblingen, Germany, were very well received. The basics for using Ethernet in mechanical engineering were explained in the user seminar. Example applications from various industries showed the possibilities and advantages of the sercos uniform, real-time Ethernet protocol and were discussed further. The one-day event was rounded off by a comparison of the real-time Ethernet solutions relevant for mechanical and systems engineering. The developer seminar was oriented towards developers and product managers that wanted to find out more detailed information on how sercos works. The sercos communication protocol, various function profiles, and implementation of a sercos III interface were discussed during this workshop. ■

Strong Duo

With its *SPEEDWAY* 767-1311 series coupler, WAGO has introduced a real-time-capable I/O system for sercos that packs a punch not only with its extremely short delay and cycle times but also thanks to its high level of flexibility.



The *SPEEDWAY* 767-1311 series coupler is already equipped with 8 digital inputs in the standard version. With its open architecture, a system bus can be easily expanded by additional high-speed I/O modules. *sercos news* spoke with WAGO product manager Helmut Börjes about Ethernet-based real-time communication and the synchronized interplay of the fieldbus and system bus.

sercos news: *With the *SPEEDWAY* series, your product range now includes a solution that builds its own subsystem with additional components via the *sercos* fieldbus coupler. Isn't that a contradiction, especially right now when lean, smart solutions seem to be "in"?*

Börjes: Industrial Ethernet with *sercos* has proven itself in practical applications. *sercos* gives users both efficient and flexible solutions, not only for drive technology but also for machine and factory automation. To come back to your question: basically, it is possible to do everything with *sercos*, but the use of subsystems offers numerous advantages – especially in conjunction with *sercos*.

sercos news: *Are you getting at the separation between local and remote?*

Börjes: Exactly. Like our I/O system 750 series, the *SPEEDWAY* system is a modular I/O system, only with the added benefit that the user has the freedom to use it where it's needed in the machine or system. *sercos* no longer has to talk to every fine-grained I/O module on the transport layer. This task is done by the coupler, which gives *sercos* much more efficient access to consolidated data, including extensive *SPEEDWAY* networks. The network topology also creates the advantage that *sercos* communication remains decoupled in case of a cable break or communication or component faults in the subnet. A clear separation ensures greater operational safety in this case. In addition, I think there are two more important points.

sercos news: *Which would be...?*

Börjes: An internal bus system optimizes the plug-and-play functionality, since it is no longer important whether other (external) nodes want to connect. If you integrate an additional module in the WAGO system bus, it is essentially managed automatically by the system bus and initialized without making any changes to the *sercos* structures. This provides advantages in the management of machine and system variants, as well as for fast startups or device exchanges.

sercos news: *And the second one?*

Börjes: If complex systems do not have any subsystems, at some point the number of nodes becomes critical. Because every sercos node uses up time during data transfers, this can quickly result in delays of several hundred nanoseconds or more. Especially for systems with many digital I/Os that each transfer relatively small quantities of data, this would be counterproductive. The use of *SPEEDWAY* puts less strain on the network, since efficient compression is obtained in terms of both data and time. This is especially advantageous for “hard” real-time applications.



“sercos has always been diligent in providing precise, comprehensive profiles to ensure compatibility with the components of different manufacturers.”

Helmut Börjes

Product Manager Automation

sercos news: *That’s an expression we’ve heard often lately, “hard real-time.” Tell us something about it.*

Börjes: Well, let’s put our cards on the table (laughs). “Real-time” is a relative term. That could mean several hundred milliseconds in the process industry, but in the manufacturing industry – for example with symbol recognition – we’re talking about double-digit microseconds. If you want to detect a signal with a 100 μ s duration, the internal system clock needs to be at least ten times faster in order to stay within the real-time range. As a general rule: we are always talking about real-time when system times do not substantially distort reality and the system’s actions in response to a request are reproducible.

sercos news: *Could you be a little more specific?*

Börjes: Sure. sercos works with cycle times as short as 31.25 μ s. The delay at our high-speed input on the *SPEEDWAY* coupler for sercos is just 10 μ s. This means that our maximum deviation from the real event is 41.25 μ s.

For a movement occurring at 20 m/s (72 km/h), that’s less than 1 mm. Another point that sets us apart from other solutions: our system bus is synchronized with the fieldbus. Though it sounds more complicated than it actually is, it still presents a technical challenge. sercos dictates when process values are read and written for the whole system. *SPEEDWAY* takes these values and applies them to the run-times of the system bus or I/O modules to ensure the synchronization of all I/O module inputs and outputs on the field side. This helps us prevent times from being modulated by the system. You know about the problems involved with asynchronous data transfer: if the I/O mod-

ule, bus, bus coupler, fieldbus, and control are not synchronized, in the worst case scenario, you need to factor in the individual cycle or delay multiplied by 2. Unfortunately, it’s not possible to predict when which combination will occur. And that is a step away from the definition of “real-time”. With sercos you’re on the safe side.

sercos news: *What other advantages does sercos bring to your customers?*

Börjes: sercos has always been diligent in providing precise, comprehensive profiles to ensure compatibility with the components of different manufacturers. Because each component in a sercos network behaves in strict accordance with the defined profiles, you never have any unwelcome surprises; instead, you achieve your goal quickly and directly.

sercos news: *What feedback have you received from users so far?*

Börjes: We have received extremely positive feedback about our *SPEEDWAY* components from the market. Our users are occasionally even surprised by the flexibility and comfort functions they get from *SPEEDWAY* together with sercos.

sercos news: *What has surprised them?*

Börjes: We took the entire product lifecycle into account during the development process. This starts with planning. The flexible layout provides enough leeway for subsequent adaptations and adjustments. We've simplified commissioning substantially, thanks to powerful diagnosis and parameterization functions. Only one thing counts during operation: "hard" real-time – and our customers get that with sercos, no if's, and's, or but's.

sercos news: *Is flexibility synonymous with a wide range of products?*

Börjes: Not at all. It is important to us to cover as many requirements as possible with just a few modules. With the *SPEEDWAY* components, for example, there is a wide range of settings for I/O channel behavior. A channel can be switched as an input or an output. Similar options apply to analog inputs that cover several physical measurement ranges on a single channel.

sercos news: *How do you support users during planning and commissioning?*

Börjes: In addition to powerful tooling, comprehensive device descriptions (IODDs) are available for all *SPEEDWAY* I/O modules based on the sercos I/O profile. This facilitates planning considerably and provides significant support during commissioning. We can set values in the modules to simulate or stimulate a system or its parts. Even if the environment is not fully defined, and sensors or actuators haven't been connected, you can still test the wiring under real conditions, for example.

sercos news: *And in the area of diagnosis?*

Börjes: sercos provides a proven diagnostics profile. It wouldn't make sense to reinvent the wheel. Extensive diagnostic messages from the *SPEEDWAY* components are therefore forwarded to the sercos fieldbus coupler via the system bus according to the profile. For the control and the user, it makes no difference whether a short-circuit notification, an open loop, or a temperature spike comes from one subsystem or the next. Diagnosis is simplified to a great extent because the error messages are not treated separately.



sercos news: *Especially for complex systems, maintenance is a topic that is often underestimated.*

Börjes: You've brought up a very important point. Especially for situations in which the system technician is not always on site, a component exchange often results in unimagined consequences. The sercos fieldbus coupler makes maintenance work so much easier, since its internal data covers the entire system. When a module is exchanged, the required data is transferred independently without the need for control unit intervention.

sercos news: *Can this procedure also be used for commissioning?*

Börjes: sercos uses a slightly different strategy in this case, but it offers ideal combination options. For standard machines, a practical division of labor would be that sercos is responsible for the initial parameterization that is completed for the entire generic system. When components are exchanged during operation, however, the parameters are transmitted locally from the *SPEEDWAY* infrastructure. This scenario also highlights the perfect interplay between sercos and the system bus.

sercos news: *Thank you very much for this interview.* ■

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When Machines Learn to See – Electronic Image Processing with sercos



Image processing is a key technology, and a majority of systems and machines already come with image processing systems. Image processing makes production faster, more reliable, and more cost effective, and also increases product quality. Industry experts forecast strong further growth in this area. With its new pictor and vicosys image processing systems, the specialist Vision & Control now also provides powerful components that can be used with the sercos automation bus. They can be integrated quickly, easily, and cost-effectively in machines and systems.

For many machine and system designers, sercos is the first choice when it comes to meeting requirements such as high data transmission rates, short cycle times, interference resistance, and the synchronization of all ring participants with low jitter. The sercos automation bus also provides users and developers with a wide range of components, covering axes and axis systems, axis controllers, PLCs and drives, and even sensors and other peripherals.

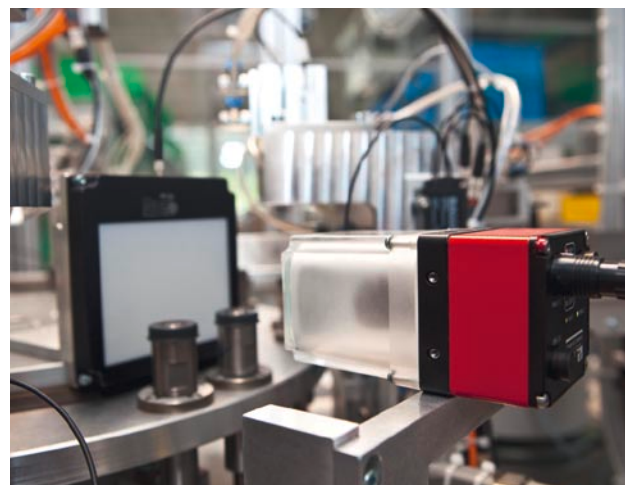
Perfect integration with sercos

Until recently, users had an almost unsolvable problem when it came to image processing. Image processing could only be integrated in systems using workarounds, and many of the advantages of the sercos bus system fell by the wayside. One of the main disadvantages was the substantial effort required for integration, which demanded extensive expertise. Other problem areas included a reduced transmission rate, a lack of real-time behavior, and no synchronization of participants, which resulted in jitter. These problems are now a thing of the past, thanks to the new image processing systems pictor and vicosys from Vision & Control. Using the on-board sercos interface, the image processing systems can be quickly integrated in the machine environment via sercos. This makes a real-time, jitter-free triggering of the image processing system possible. The image processing results are also sent to the master via the automation bus, ensuring a high processing speed and time synchronization.

Solutions for all applications

The image processing systems from Vision & Control come with numerous powerful functions that can be used in a wide variety of industries and applications:

- Object localization
- OCR reading
- Identification
- Color analysis/color classification
- Shape analysis/contour check
- Completeness check
- Counting
- Measurement technology
- Brightness analysis
- Surface analysis



Users have access to two different system classes. Intelligent pictor cameras support all common resolutions from VGA to 5 megapixels, in either black-and-white or color. The cameras have an additional digital I/O interface and come in a protective housing that is compliant with IP67. All of the image processing is done fully independently in the intelligent camera. vicosys multi-camera systems allow you to connect up to 8 cameras with different resolutions, in color or black-and-white, or as a line sensor. The evaluation unit is an embedded industrial PC. The systems also come with a digital I/O interface. Device concepts using individual combinations with optics and lighting from Vision & Control allow you to solve image processing tasks reliably and efficiently.

Flexible parameterization

The image processing systems are parameterized using a Windows GUI. Programs are usually created by the machine manufacturer. However, since parameterization is done via the UCC channel, the end user can also set parameters without influencing the production process. It is also possible to directly trigger a program change via the bus, ensuring fast product changes. As a result, operation is the same for the end user across the entire system. There is also an option to teach-in new product types using sercos.

Selected assembly and handling applications

- Palletizing and depalletizing
 - Traceability
- Track tracing
 - Adhesive bead check
 - Weld seam check
- Completeness check
 - Checking for the presence of production goods
 - Monitoring of assembly and processing steps
- Position check
 - Detection of position and rotation
 - Forwarding of position information directly to the machine or robot control

Selected packaging and filling applications

- Checking the packaging for size, shape, damage, orientation, contamination, foreign objects
- Checking the packaged goods for shape, size, breakage, position, orientation, color
- Fill-level check
- Completeness check
- Check of goods position in the packaging
- Closure check
- Check of labels and printing
- Palletizing
- Traceability

Selected solar and photovoltaic applications

Wafer technology

- Production of the silicon substrate
 - Monitoring of the growth process
- Wafer production
 - Check for contamination, saw grooves, scratches
- Cell production
 - Microcrack check
 - Edge break check
 - Check of the printing on the front and back
 - Color check
 - Finger inspection
- Module production
 - Position determination
 - Monitoring of the string process

Thin-film technology

- Front-end
 - Surface check
 - Track tracing
- Back-end
 - Contact check
 - Position determination



As a technology leader, Vision & Control develops, produces, and markets an optimally attuned modular system worldwide. It ranges from complex image processing systems, such as intelligent pictor cameras and vicosys multi-camera systems, to individual vicolux high-performance LED lighting and vicotar precision optics. Customers from Vision & Control can thus select the right components for their application and combine them individually in their image processing systems. This results in a perfect interplay of components and ensures their reliable performance. Innovative, pioneering products emerge with state-of-the-art technologies. High-performance algorithms and user-friendly operating concepts facilitate component integration, and users can perform initial startups quickly and independently. For highly demanding image processing tasks where standard components reach their limits, Vision & Control offers customized solutions for image recording and processing.

sercos news: *How does your company benefit from using sercos for its automation technology?*

Vision & Control: Our users are the primary beneficiaries. Previously, sercos did not allow them to directly integrate image processing in their systems, and workarounds were required. The further development of our V&C component system for industrial image processing, especially the intelligent camera series pictor and the vicosys multi-camera system, offers users a simple solution to combine the advantages of image processing with those of the sercos automation bus. Extensive integra-

tion activities, which also required considerable expertise, have now been minimized. The on-board sercos interface for our components makes it easy and enjoyable to integrate high-end image processing.

sercos news: *Why are you active in the user association, sercos international e.V.? What are your objectives?*

Vision & Control: As a technology leader, we not only want to be a voice for image processing in the world of automation, but also ensure that automation makes its way into image processing. What we need is a simple, elegant solution for both sides. Industrial image processing and automation technology need to be precisely enmeshed, like the wheels of a clock, and also function reliably. In addition to the numerous advantages, we are impressed by the professional network, as well as the will and dedication of its members to achieve these goals together. ■

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How a PC-based control exhibits true openness

A Control System as a Steersman



Made in Germany for Made in Germany. Strong global competition demands many innovative ideas from German industry for more cost-efficient shipbuilding.

Controlled by the IBH macro 8005 NT, ship elements are manufactured highly efficiently in the laser welding portal system at the Meyer Werft shipyard in Papenburg. It is no coincidence that the Swabian company IBH Automation, located in Kornwestheim, supplies the CNC, as the people in Southern Germany are characterized by their inventiveness; they love to come up with new ideas that are then implemented with utmost precision.

The machine fills the hall: 40 meters long and 6 meters high with a weight of 260 tons. This gigantic laser hybrid welding system is found at the Meyer Werft in Papenburg. Parts of the famous AIDA ships are also welded here. Such a club ship is a good 250 meters long. With 15 stories, it can accommodate over 2,000 passengers. The Meyer Werft places high demands on the machines used to produce such ships: The welding system is equipped with a 12 kW CO₂ laser from Trumpf and a 900 A MIG power source. "Thanks to this system, we have been able to substantially reduce the number of joints over the length of

a ship, helping to save costs," proudly notes the machine manufacturer, Held Systems Deutschland GmbH from Heusenstamm.

This gargantuan project includes demanding tasks for all partners. IBH Automation Gesellschaft für Steuerungstechnik mbH plays a central role here. The hardware and software company not only developed the control for weld seam tracking, but has also been in charge of interface management and data transmission. The control has to handle over 30 sercos axes. "And we had to manage a



Efficient technology – The laser welding system from Firma Held Systems Deutschland used for building ships at the Meyer Werft in Papenburg. Controlled with CNC from IBH Automation, Kornwestheim.

Image ref.: Meyer Werft, Papenburg

huge number of interfaces,” adds Roland Jaensch, managing director of IBH. The way Jaensch casually mentions this makes it sound easy. However, linking everything up is almost a field of its own. The IBH team integrated the customer’s requirements in this project. “It is important for us to provide customers with quick solutions,” explains Jaensch. At first, the job taken over by the machine does not appear to be all that complicated: Incumbent panels that will later comprise the deck and interior walls of the ship are welded to vertical piles for reinforcement. These reinforcements may be up to 30 meters long and are connected using a laser hybrid welding process.

The welding portal independently locates and joins the seam between the pile and the panel. The panel is moved to the next seam as soon as a pile is welded. The operator only needs to intervene in the case of malfunctions, such as when a gap is too wide or contamination threatens to interfere with the process. The Meyer Werft places high demands on the quality of the weld seams. After all, once the panel leaves the welding portal, it assumes pretty much directly its final location in the ship. This is why cameras and sensors monitor every detail of the joining process.

A special weld seam guidance is the basis for this solution: “We call it CNC-integrated weld seam guidance,” explains Dr. Walter Schwabe, managing partner of the ibs Automation GmbH in Chemnitz. In contrast to usual technology solutions for weld seam tracking, the positions stored in the program are not corrected in the interpolator; instead, a new NC program is automatically generated in the CNC. In practice, the IBH CNC control with CNC-integrated seam guidance can generate welding tracks at a speed greater than 10 m/min and with a track radius of 40 mm and track accuracy of + 50 µm.

This masterpiece is only possible by intervening in the workings of the CNC operating system software, which is the course the company decided on: weld seam detection is integrated in the CNC as a so-called compile cycle. IBH is one of the few manufacturers in Germany that can provide this interface.

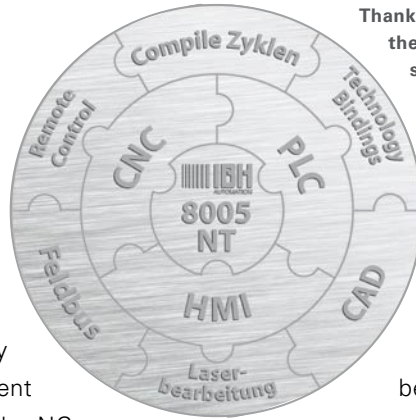
The interface is rather popular with machine constructors, as it offers easy integration of certain functions and own software developments in C++ in the CNC software. This open door for additional functions can be used for relatively simple implementation of specific customer requests without the need for complex special software. “As a result, each OEM can add their own expertise to the control,” is how Jaensch explains the advantages of this open IBH strategy.

Besides the CNC-integrated weld seam guidance, the system at the Meyer Werft also uses an online seam geometry check. It is connected to the IBH control via Profibus. The information flow is enormous and data packets are sent in both directions. The control also transmits parameters to the seam sensor during active CNC-integrated weld seam guidance. “This makes ‘on-the-fly’ parameter changes possible,” mentions Jaensch. Dr. Schwabe adds: “Application-specific data structures are communicated since the seam sensor can also transmit data such as the gap or angle of the fillet weld in addition to the position of the defined weld seam, such as lap joint, I seam, or fillet weld.”

A compact macro 8005 NT (New Technology) from IBH is found at the core of this gigantic welding system.



Managing director Roland Jaensch demonstrates how easy it is to operate the IBH operator panel at the IBH showroom in Kornwestheim.
Fig. IBH / Traffic AfWK&D



Thanks to an open, modular control system, the IBH CNC enables individual, customer-specific solutions.

Fig. IBH / Traffic AFWK&D

The IBH technicians have also made the control ready for other demands – such as efficient communication: the data for the machine comes directly from the engineering office. It is sent from the local CAD/CAM system to the NC program. “You could say that the system operates on a just-in-time basis,” notes Jaensch. There is a control panel directly on the machine and another in the engineering office that provide information on the process progress.

Another thing that not every control can deal with without any complex or susceptible amplification measures: The good 30 meters between the machine and engineering office at Meyer Werft. Communication actually takes place without any delay. “When we say real-time, that’s what we mean,” confirms Jaensch.

If you do not set out for true openness when dealing with such a wealth of data and requirements, you are certain to drown quickly. A PC-based control has many inexpensive docking options on board. Whether you want to connect Ethernet, USB or any kind of bus, no auxiliary constructions are needed in a truly open system. “We are good at integration,” reports Jaensch. He believes that the philosophy of the open system used in this exceptional laser welding system has proven itself once again.

The control is housed in two IBH high-performance industrial PCs. They have a standardized architecture that allows customers to use features found in classic PCs. For example, customers can back up data themselves without any problems. Standardized interfaces,

such as Ethernet or USB, commonly found in the consumer market enable data handling without any special expertise. As a result, the control can be connected to an existing PC network very easily. If, however, any problems occur,

IBH Service can respond immediately via remote control, thus providing customers with the greatest possible production reliability.

Another exciting benefit comes to light during commissioning with documentation available directly on the machine. Specific sections of the documentation were read out as HTML and PDF and linked to the visualization. The operator can thus find information quickly and using familiar browser functions (“search/find” options) in the control operation menu on the machine without having to look through thick manuals.

Jaensch is also composed when considering the future of his control. “Basically, open IBH CNCs do not age,” states the control specialist. Technical development results in faster processors and improved working memories. But new features can always be integrated as an upgrade or performance enhancement. With over 30 years involvement in the macro series, Jaensch speaks from experience. Many machine tools with these controls are still working reliably today.

After all, the fact that German shipyards are still able to compete globally is due to solutions like those used at the Meyer Werft. Highly specialized and innovative partners came together to gain an important competitive edge for the Papenburg location. ■

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New White Paper Outlines Vision for Machinery Integration

ODVA, sercos international and OPC Foundation join forces to address key communication challenges in production domain.



ODVA announces the availability of a new white paper, Optimization of Machine Integration (OMI), which outlines a strategic vision for an open and interoperable communication framework in the industrial sector.

For machine builders, OMI provides opportunities for creating additional value through simplified communication between machines and from machines to supervisory systems.

"By transforming data into information, OMI will provide tools for dynamic decision-making, thus maximizing machine productivity, improving machine performance and enhancing the preventive maintenance of machinery assets," said Katherine Voss, executive director, ODVA. "As a result, OMI will create more value for their machines, extend machinery life cycles, and will emerge as a natural sweet spot to help end users meet their overall business objectives, including workforce, profitability and sustainability goals."

This white paper is a collaborative effort by ODVA, sercos international and the OPC Foundation. All three organizations support a shared vision for machinery integration. ODVA envisions an interoperability framework for machinery that encompasses three domains of the industrial ecosystem – production, enterprise and power grid. This vision recognizes the value of communication in machinery control for production processes, while highlighting the possibility of using machinery information, such as energy metrics and safety factors, as a shared resource and common currency across the domains critical to manufacturers.

The OPC Foundation is dedicated to creating and maintaining open specifications that standardize the secure communication and analysis of process data, alarm and

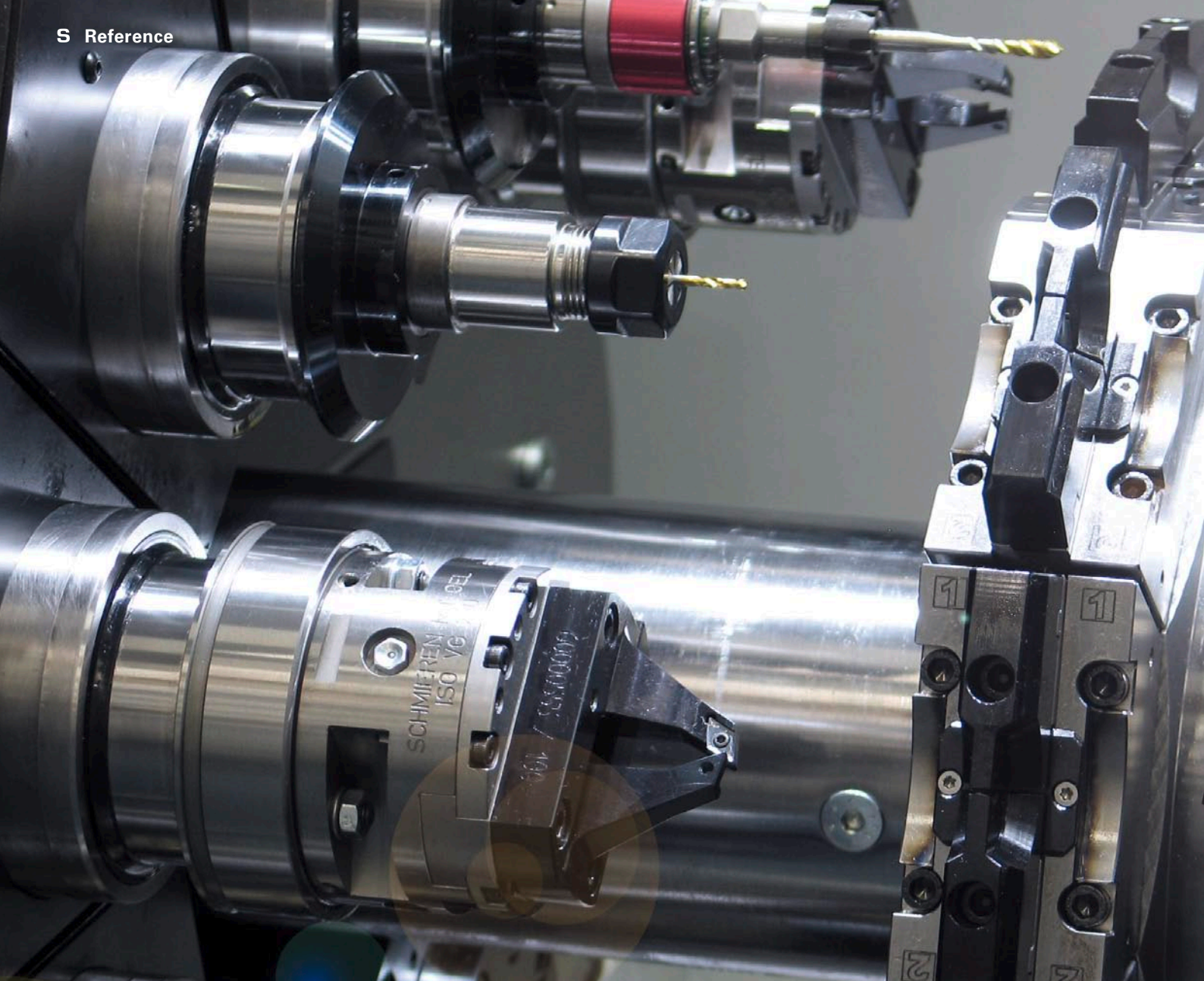
event records, historical data, and batch data to multi-vendor enterprise systems and between production devices.

sercos international, meanwhile, is dedicated to interconnecting motion controls, drives, I/O, sensors and actuators for motion controlled machines and systems. "The diversity of automation technologies requires a new conceptual approach in order to simplify the integration of machines in production," said Peter Lutz, managing director of sercos international. "We expect substantial technical and market synergies by cooperating with the ODVA and the OPC Foundation for the benefit of users and suppliers."

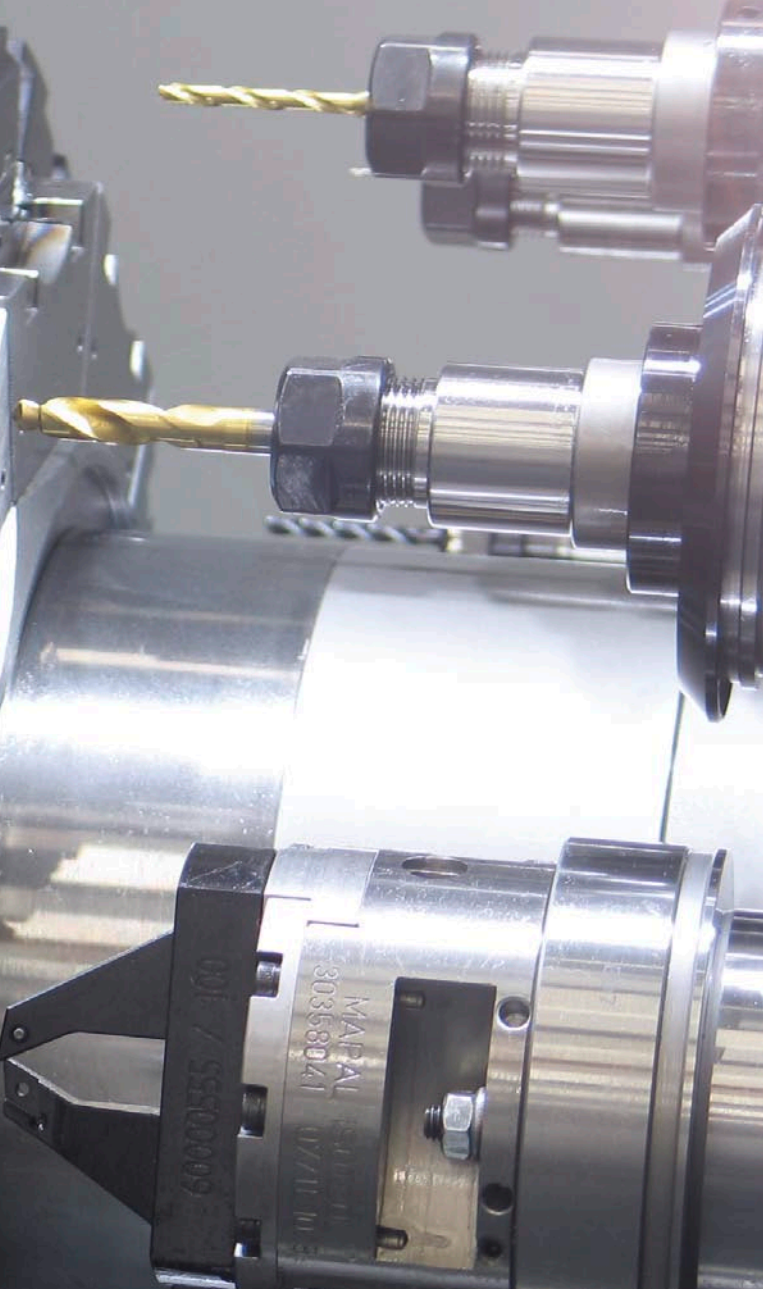
"OMI is all about advancing interoperability and providing standardized information integration for anything and everything related to machinery assets. OMI provides the infrastructure and tools necessary to meet and exceed the end-user's expectations to truly maximize their operations for real-time information being exchanged for productivity, performance and maintenance," said Thomas Burke, executive director of the OPC Foundation. "The OPC Foundation partnership with ODVA and sercos international uses the existing specifications and technology from all three of the cooperating consortiums and leverages each organization's already successful adopted standards for rapid deployment of OMI." ■

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WINEMA Rotary Indexing Machine – 20% More Efficient with Rexroth



RV 10 Flexmaster increases productivity with customized automation by Rexroth

In addition to short cycle times, the productivity of machine tools is increasingly determined by the effort required for their changeover. In recognition of this trend, WINEMA Maschinenbau GmbH has introduced CNC-controlled rotary indexing machines to a market segment that was previously dominated by cam-controlled machines. For its newly developed RV 10 Flexmaster for small workpieces with a diameter of at least 2 mm, WINEMA is employing the CNC system solution IndraMotion MTX by Rexroth with decentralized intelligent electric and hydraulic drives. The sercos automation bus provides the high-performance profiles for the smooth integration of both drive technologies. This increases productivity by 20% compared to previously available solutions.

The large-scale production of small parts is also increasingly subjected to ever shorter product life cycles. While manufacturers of standard parts previously could use the same machine for decades, the emphasis now is on varied manufacturing with frequent changeovers. "Our customers expect maximum output with minimum changeover times," confirms Eckhard Neth, Managing Director of WINEMA Maschinenbau GmbH in Grosselfingen, Germany. The manager of the medium-sized company speaks to manufacturers of price-sensitive mass products such as plug pins, cam disks or cable connectors made of various metallic materials. "Previously, cam-controlled machines were unbeatably fast for large-scale series production," he adds. "However, we top this speed and combine it with the advantages of CNC

technology for increased flexibility." The sercos automation bus offers excellent freedom for such innovative and flexible machine concepts.

Introduced at the EMO 2011 trade fair, the RV 10 Flexmaster was designed for the complete processing of rotationally symmetrical workpieces from 2 to 23 mm in diameter, with a focus on machining operations. "The machine also handles assembly tasks," Neth emphasizes. The core of the machine consists of a vertical indexing table with 10 clamping stations. In each cycle, the table, which is powered by a torque motor, rotates the workpieces to the next station. A CNC bar feed pushes the semi-finished product into the hydraulic two-jaw chuck. The insertion process can also include a plunge-cut oper-

ation parallel to the cutting of the blank. The Flexmaster then guides the workpieces through the process with a single clamping operation.

The rotary indexing principle allows the machine to process nine workpieces in parallel in each cycle, achieving a very high throughput. This, combined with the very high transfer rates provided by the sercos automation bus, ensures maximum productivity. One advantage of the vertical principle is that processing takes place at all stations at once and from both sides with nine axial axes each. In addition, the Flexmaster has two radial axes on both sides for other operations such as drilling and thread or contour milling. The machine also handles thread cutting or upsetting and offers flexibility for special processes such as wobbling or cross-sliding. For a fixed workpiece, this gives the same results as rotating the workpiece during processing.

54 electric and hydraulic CNC axes

In the development of the new machine, WINEMA for the first time employed the CNC system solution IndraMotion MTX by Rexroth in combination with sercos. The MTX performance version controls the 54 CNC axes of the RV 10 Flexmaster, of which 27 are IndraDrive spindle drives. Up to 12 NC channels are available. The consolidation of CNC and PLC in a single hardware unit simplifies the entire automation process. The slender architecture allows the CNC core to execute even the complex processes of the Flexmaster in minimum time. The typical NC set formatting time is less than 1 ms and the CNC interpolation time is 0.25 to 1 ms. The IEC 61131-3 compliant PLC, which handles ancillary movements of the machine and visualization tasks, processes 1,000 instructions in only 0.06 ms, thus reducing unproductive idle time.

Compact hydraulics reduce heat penetration

To keep the machine compact, WINEMA applied an intelligent mix of hydraulic and electric drives. The spindle sleeves for the circularly arranged processing axes are hydraulically powered. "This requires only two hose couplings, and we significantly reduce the heat transfer

into the machine," Neth points out. The external oil cooling dissipates the heat of the hydraulic axes outside of the machine. The stable temperature improves precision – vibration-cushioned spindle sleeves with direct positioning transducers allow a repeat accuracy of less than $\pm 1 \mu\text{m}$ for the hydraulic servo axes. This results in an accuracy of less than $5 \mu\text{m}$ on the workpiece, which is adequate for this application. At high speed, the spindle sleeves can reach 30 m/min.

The micrometer-precise control of the hydraulic feed axes is handled by the Rexroth HNC 100-3x assembly in a controller format. Its software takes the special requirements of fluid technology into account and thus separates the drive and control levels. "For the electrical setup of the hydraulic axes, Rexroth IndraWorks provides the same software tools as for the other drives, and this substantially facilitates our work," Neth emphasizes.

Real-time communication via sercos cuts cycle time

The electric and hydraulic drives communicate with the control via sercos. The Ethernet-based automation bus employs strictly deterministic real-time mechanisms. „Combining the HNC with sercos and IndraMotion MTX allowed us to improve our output by 20% compared to the previously available solutions," Neth calculates.

The highly dynamic torque motor for the indexing table also contributes to the improved output. It positions the table so precisely that the hydraulically clamped spur teeth can engage immediately. "This allowed us to lower the unproductive idle time to under 0.3 seconds," he adds proudly.

In the RV 10 Flexmaster, WINEMA also observed energy efficiency requirements. The hydraulic delivery stream is generated by an axial-piston variable displacement pump. In contrast to fixed displacement pumps, it operates on an as-needed basis, considerably lowering energy consumption. What's more, it lowers the level of cooling required.

Many processes – simple handling

The control simultaneously coordinates several processes. Predefined functions simplified WINEMA's engineering efforts. "Rexroth supported us intensively in all technologies throughout the entire development phase, significantly lowering our time to market," Neth says, emphasizing: "Of course, it is an advantage that Rexroth supplies the entire automation system, which significantly reduces the interface problems."

Manufacturers of large-scale series parts often employ numerous machines by the same vendor, which is why a uniform user interface across all series is important. "Our customers demand uniform and simple handling and programming during operation," says Neth in describing a key requirement. The new RV 10 Flexmaster is therefore based on a proven basic concept, which WINEMA has already implemented in several series. User-friendly software tools from the Rexroth solution helped WINEMA quickly transfer the in-house interfaces to the new RV 10.

Users want to employ several of the machines unattended as the standard mode of operation. The operator then focuses on quick changeover for producing variants. This is where the RV 10 Flexmaster offers a decisive advantage: A complete changeover takes less than 90 minutes. Cam-controlled machines, on the other hand, are down for at least half a shift. "The higher output and faster changeover quickly offset the higher purchase price through lower unit costs, and the users see it the same way," Neth says in summarizing the meetings with interested buyers at the EMO. He is already planning to expand the production facilities in Grosselfingen.

Motion controls for hydraulic drives

The hydraulics produce wear-free linear movements and, thanks to an open design, can fit compactly even in confined areas. Motion controls that are especially matched to the specific requirements of hydraulic systems combine these advantages with the latest in digital control technology. Decentralized intelligent drives respond like electric drives to the control unit. Rexroth offers an exten-



sive range of motion controls for hydraulic drives. The cabinet-based HNC 100-3x controls up to four axes and supports various control communication protocols such as sercos, PROFIBUS DP, CANopen, or PROFINET RT.

For the motion controls of the IAC series, Rexroth has completely integrated the electronics into the valve. The single-axis control units support open-loop as well as closed-loop operations and feature a Multi-Ethernet interface. Decentralized control units lower the cabling expense.

Both versions offer CNC functions and, similar to the electric drives and controls by Rexroth, are initially set up using the consistent IndraWorks engineering framework. This does not require a profound knowledge of hydraulics. In a highly dynamic environment, the precision of the movements is limited only by the position measurement systems used. ■

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Lattice Releases sercos III Real-time Industrial Ethernet Solution



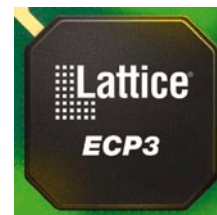
Lattice Semiconductor Corporation (NASDAQ: LSCC) recently announced the availability of a sercos III real-

time Ethernet solution. The low cost, low power LatticeECP3™ FPGA-enabled sercos III solution provides a low cost and flexible design alternative for real-time industrial networking applications.

The FPGA module consists of a LatticeECP3-35 FPGA, 8 MB Flash and 8 MB DRAM. Due to its compact dimensions and its wide bus and I/O interface, the FPGA module can also be integrated as is into sercos III slave devices. This saves cost and reduces the time to market for slave devices like I/O units or drives.

The base board has 16DI and 16DO, all with status LEDs, an RS232 interface, various switches and the standardized bi-color sercos III diagnostic LED. The board is supplied with 24VDC or 5VDC. A socket for expansion modules allows the addition of more functions or interfaces, such as analog I/O.

The FPGA module is supported by the proven AUTOMATA sercos III slave communication stack and test tools such as a master simulator for Windows XP. A sample implementation of the sercos III I/O profile (FSP-I/O) is available.



The sercos III real-time Ethernet evaluation kit with the Lattice FPGA module can be purchased from Automata GmbH & Co. KG. ■

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Bihl + Wiedemann



Thanks to the new AS-i 3.0 sercos gateway with integrated safety monitor

and safe cross communication, in the future digital and analog data, as well as AS-i safety diagnostic data, can be exchanged between the AS-i installation, the lowest automation level, and sercos. On the AS-i side, the safety gateway with integrated AS-i master and safety monitor watches over the AS-i installation; sercos sees it as an I/O node with a variable number of input and output signals, the number of which is determined by the AS-i configuration.

Bihl+Wiedemann develops and manufactures AS-i gateways and AS-i safety gateways for all common automation systems. Linking sercos, an established bus

system for mechanical engineering and systems engineering, with the AS interface, a proven, easy, and cost-effective installation system for the lowest field level, will make many advantages available for sercos in the future, such as controlling the release circuits to SIL3/Cat4/Pl, expanded diagnostics including detection of double addresses, short-to-ground and EMC monitors, or safe cross communication with up to 31 secure gateways where input and output data is permanently exchanged and provided to the respective program. ■



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Simple Applications Solved Quickly

The new MOVITRAC® LTP B frequency converter from SEW-EURODRIVE is suited for a wide variety of drive solutions in a wide range of applications. It is easy to install, highly reliable, and particularly efficient. The MOVITRAC® LTP B with sercos III communication interface enables efficient networking of complete production and distribution lines.

The MOVITRAC® LTP B series can be used universally as it was designed and developed for controlling the speed of asynchronous motors, permanent-field synchronous motors (without encoder feedback), and servomotors. This wide range of application options for different motor types and tasks allows for an optimum drive solution in terms of efficiency and energy consumption. In addition to the energy-saving function that reduces consumption in part-load operation and the "sleep mode" that switches off entire areas (as long as they are not needed), the operation of synchronous motors in speed control mode is another aspect that characterizes this sustainable SEW-EURODRIVE product.

With the newly developed communication interface, MOVITRAC® LTP B can now also be connected to sercos III. The interface is equipped with an integrated Ethernet switch as standard. This allows new users of this technology to still use the line topology of conventional fieldbus technology. Other bus topologies, such as star or tree, are also possible by using certain network components. Ethernet-compliant cables with RJ45 plug connector are used to link the individual communication modules.

Many applications demand variable drive speed. In some cases, the exact speed must be set for process optimization; in other cases, one plant area has several different tasks to perform. In all these cases, a frequency converter is used. However, the space in the control cabinet is very limited in many plants. This is why often units are required that can also be installed outside the control cabinet.

Depending on the model and power range, the drives can be connected directly to the following supply systems:

- 200 V–240 V, 1 or 3-phase, 50–60 Hz
- 380 V–480 V, 3-phase, 50–60 Hz

The MOVITRAC® LTP B drive solution is available in the power range from 0.75 to 160 kW. ■

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Broader, Deeper, More Universal – sercos Specification Update Now Available

The sercos user organization released the specification update for the real-time Ethernet solution sercos III on March 1, 2012.

On request by users and manufacturers, several profile and protocol extensions have been included in the sercos specification over the last 2 years. Specification V1.3 not only broadens the functionality and the range of applications of the globally accepted real-time standard sercos but also includes new trends in machine and plant construction. The extensions are fully compatible with the existing specification so that a high level of standardization and best possible interoperability of devices from different manufacturers can be ensured.

Following electronic drives, hydraulics and pneumatics are also turning more and more towards digitally controlled modules. This increases flexibility and shifts tasks previously solved by mechanical means to software solutions. The sercos organization recognizes the importance of this trend and has extended the existing sercos drive profile to support electric, hydraulic, and pneumatic drives across different technologies. Two new profiles have been added to the new sercos specification. The energy profile defines parameters and commands to reduce energy consumption in a uniform and vendor-independent way. Furthermore, an encoder profile was specified that provides absolute and incremental encoder interfaces to all devices in a sercos network.

The following new services were specified on the protocol level: an oversampling procedure that allows acquisition of equidistant values and activation of equidistant command values – faster than the configured bus or connection cycle. This increases the process control intricacy, for instance in extremely time-critical laser applications, as it allows for more data to be collected and communicated at a faster speed. Measurement methods were



integrated directly in the protocol, thereby opening up the possibility to access these mechanisms across different manufacturers and products.

In addition, a time-stamping procedure for event-triggered acquisition of values with corresponding time stamps, as well as time-triggered activation of command values, has been defined. This function is event-controlled, promptly transmitting defined events such as certain measurement values to the controller and switching outputs independently from the clock cycle. This increases process stability, for instance in complex solutions such as those needed in semiconductor or solar manufacturing.

The specification update is completed by an installation guide which specifies cabling with copper wire and optical fiber, each in compliance with the IP20 and IP65/67 protection classes.

You can find further information in the Internet at www.sercos.de. ■

Out Now:

Product and Manufacturer's Guide

The sercos Product Guide is the official product brochure for the sercos automation bus. It contains products from all sercos generations. It is geared towards chief engineers in machinery and plant manufacture and contains all important information on products and manufacturers related to sercos. The Product Guide presents a compilation of all new products and features.

Further information and order:
www.sercos.de



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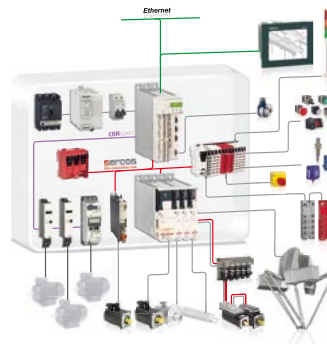
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