![sercos the automation bus]

Sercos = Real-Time + IoT

The architecture of Sercos allows simultaneous use of Sercos, EtherNet/IP, TCP/IP and CIP Safety messages over a single Ethernet cable in the machine. Neither additional hardware nor optional tunneling of the protocols is required for that purpose.

The unmodified Sercos protocol operates over Ethernet TSN for real-time communication and high data volume using the same standard network at lower cost.

Demo to explore Sercos automation bus

This multi-vendor demo presents several Sercos automation bus user benefits:

- Maximum Ethernet network reliability with real-time network redundancy
- Certified products from numerous vendors work together on the same Ethernet cable
- Proven high-speed Ethernet communication
- Easy to understand and use due to IEC standards
- Supports I/O, motion and other peripherals
- New possibilities with direct communication (DCC) between network devices
- Configure/troubleshoot a device at any time using Ethernet TCP/IP (UCC) communication, even if real-time Sercos communication is not operating
- Standardized parameters across different products save time in training, setup and troubleshooting

More at www.sercos.org/technology

Demo use

Using the touch screen, read about key Sercos technologies and select the demo overview screen and touch on a product to obtain product information and more. QR-codes link to additional product details. User interaction is encouraged: move the rotary encoders; perform safe motion while the light curtain is broken; operate the stepper motors, move the actuators and explore other products.

Experience the Real-time Ethernet network redundancy by disrupting and restoring one Sercos Ethernet connection at a time. The Sercos device detects the interruption within one cycle, the Sercos master determines and indicates the point of interruption on the screen, switches to line mode and continues operating. After the Ethernet cable is reconnected, the network heals itself into redundant ring mode within one cycle while all functions continue working.
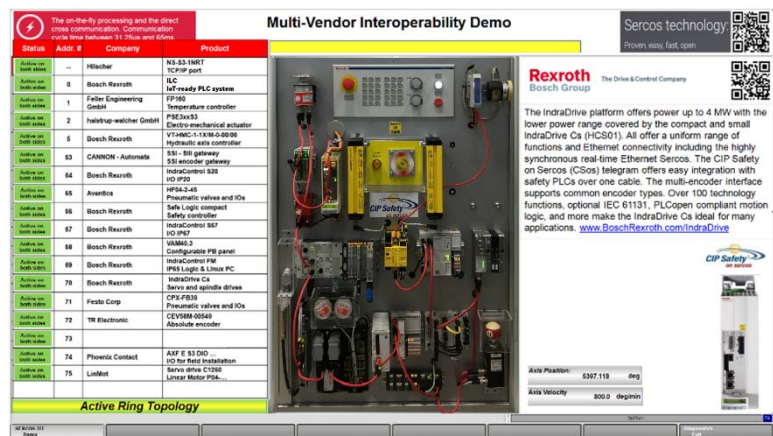
Product descriptions

A Absolute multi-turn encoder from **TR Electronic** merges seamlessly into Sercos networks. TR Electronic's ultra-long lasting gearbox and high resolution glass main disc detect position changes even without power, independent from counters or batteries. Absolute position values can be read out instantaneously across the Sercos network after re-applying power to the encoder. http://trelectronic.com/products
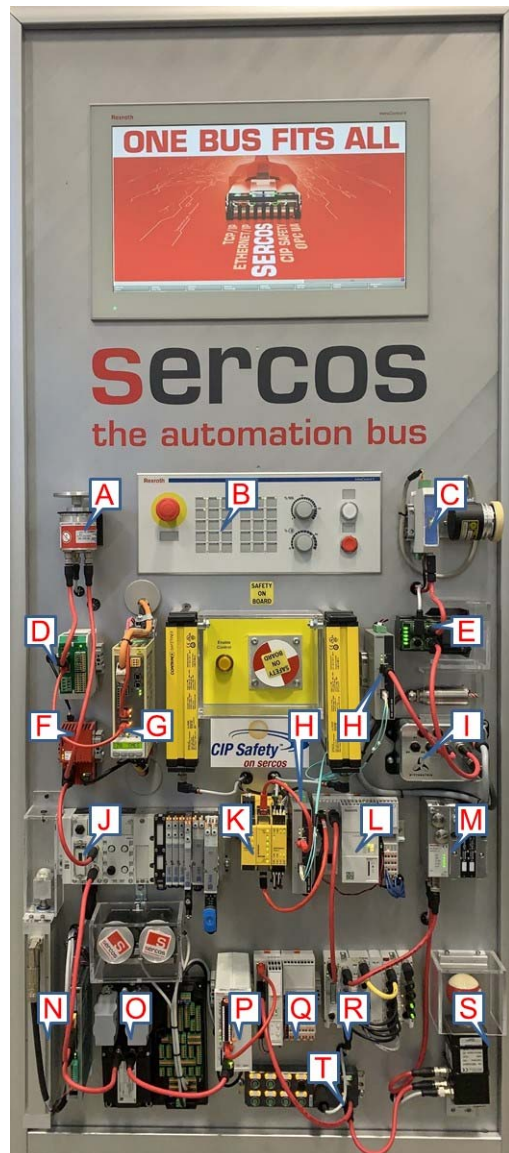
B The **Bosch Rexroth** IndraControl VAM 10/40 machine control panel features 2x15 short-stroke buttons and programmable LED indicators. Feedrate and spindle speed override switches can be scaled in software. E-stop and power ON/OFF pushbuttons can be wired into the machine's power circuit. www.boschrexroth.com/controls .

C The **CANNON-Automata** SSI-Gateway is a simple and inexpensive device that allows the connection of SSI absolute encoders from any vendor to the Sercos network, with up to four Sercos real-time data connections. Thus, it is possible to make the acquired position available to any other device connected to the Sercos network – an important feature for applications with master and slave axes, cam profiles, or electronic gears. Position values and measured actual velocity and acceleration can be transmitted. www.cannon-automata.com/index.php?Sercos-SSI-Gateway-en

D **Feller Engineering's** FP160 modular temperature controller with diverse extensions to fit in control cabinets is a multi-channel controller for temperature and process. The user benefits from central / decentralized use, very small footprint design, lower cost, and energy savings. In addition to the Sercos interface, the FP160 features 2- or 3-point controller for 8 or 16 zones, 8/16 inputs (thermocouple or Pt100/2-wire), 16/32 outputs for heating, cooling or alarm functions, and more. http://fellereng.de/en/portfolio/products

**E** **JVL** offers integrated Servo Motors and Stepper Motors. The MIS motor is the complete motion solution stepper motor with integrated controller and all necessary components in one unit. The MIS motors can be delivered in sizes of 0.36 to 25Nm. All MIS motors have optional magnetic absolute encoder built-in and MIS34x and MIS43 have optional absolute multi-turn encoder built-in. The MIS motors are available for 100MBit/s Ethernet and Sercos automation bus among other protocols. www.jvl.dk

F Sercos real-time Ethernet provides deterministic jitter-free data transmission for control and synchronization. In parallel, standard Ethernet TCP/IP telegrams can be transmitted via the UCC (Unified Communication Channel). The **Hilscher** NS-S3-1NRT Gateway Switch TCP/IP buffers these Ethernet telegrams for communication between the synchronized Sercos and standard Ethernet. Two Sercos Ethernet ports plus one Ethernet port for connection to normal Ethernet devices are provided, maintaining ring topology and avoiding data loss on higher data traffic of Ethernet telegrams. https://www.hilscher.com

G **Bosch Rexroth's** IndraDrive platform offers power up to 4 MW, with the lower power range covered by the compact IndraDrive Cs (HCS01). Ethernet connectivity includes the highly synchronous real-time Ethernet Sercos. CIP Safety on Sercos (CSoS) offers easy integration with safety PLCs over one cable. The multi-encoder interface supports common encoder types. It features over 100 technology functions, optional IEC 61131, and PLCopen compliant motion logic. www.BoschRexroth.com/IndraDrive
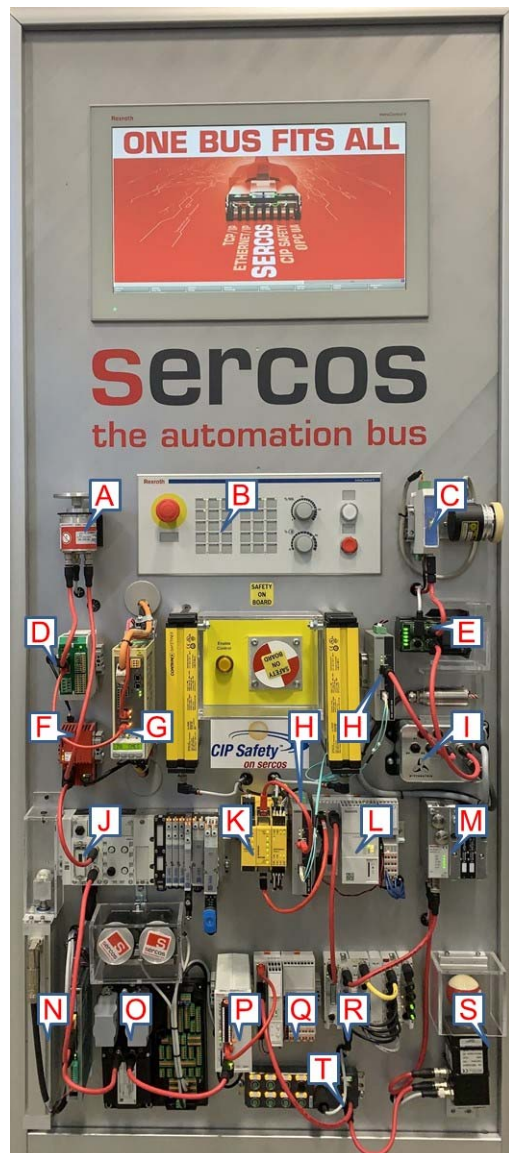
H The FL MC 2000E (SM40) LC from **Phoenix Contact** converts the 100Base-Tx Ethernet interface to fiber optics (100 Mbps according to FX standard). It provides a high level of immunity to interference and long transmission range (up to 9km) in industrial applications. It meets IEC 61850-3 and IEEE 1613 standards and offers comprehensive link diagnostics and alarm relay output. The RJ45 port offers an auto crossing function for use with 1:1 and crossover cables. The use of two units allows extending the range between Sercos devices, although real-time redundancy is not supported at unit connection points. www.phoenixcontact.com.

I The cyber® simco® drive from **Wittenstein** is a servo drive for sine-commutated servo motors in the +24 to 48 VDC voltage range with a maximum capacity of up to 1.5 kW. It is available as an IP20 control cabinet variant or in a decentralized design with IP65 protection rating. With its flexible Ethernet and fieldbus interfaces, the cyber® simco® line servo drive is open for connection to a wide range of control systems. The cyber® simco® line servo drive easily integrates into Sercos automation bus networks with real-time performance and redundancy. www.wittenstein-us.com.

J The **Festo** CPX-FB39 electrical terminal offers scalable integration into higher-order controllers using the Sercos automation bus. It interfaces with general purpose MPA pneumatic valves, VPPM proportional valves, or ISO standard VTSA valves. Updates are accomplished via the free Festo Field Device Tool software. Channel- and module-oriented diagnostics include module under-voltage, short circuit, trace data, and more. CPX-FB39 provides access to acyclic/cyclic

Sercos Multi-Vendor Demo 1

Sercos data, S/IP data, IP addressing via Sercos or operator unit, acyclic startup parameters and more.
www.festo.us

K The SafeLogic compact (SLc) from **Bosch Rexroth** provides safe logic processing in small to mid-range machines. Defined function blocks and graphic wiring simplify configuration and speed up the commissioning process. Using the Sercos gateway module, the safety logic directly communicates to the safety certified IndraDrive using CIP Safety on Sercos and provides status to the supervisory controller, e.g., a PLC. www.BoschRexroth.com/safelogiccompact

L The motion control system MLC based on the embedded control XM from **Rexroth** offers state-of-the-art PLC technology with object-oriented languages, motion, robot and logic control, fast I/O processing, highly dynamic motion control tasks, up to 40 axes, OPC UA, Open Core Interface as a bridge between PLC based engineering and IT automation, multi-Ethernet protocol support and much more.
www.boschrexroth.com/mlc

M The **Aventics** B-design bus direct control (BDC) module with Sercos interface allows operation of the HF and CD-PI family of pneumatic valve terminal systems, 0.4 to 4.8 Cv flow, on the Sercos bus. Additional control units allow multiple valve systems and discrete wiring of individual valves, all controlled via a single module. The BDC module enables you to set various parameters, configure module diagnostics, and read detailed diagnostics in addition to the onboard diagnostic LEDs.
www.aventics.com/
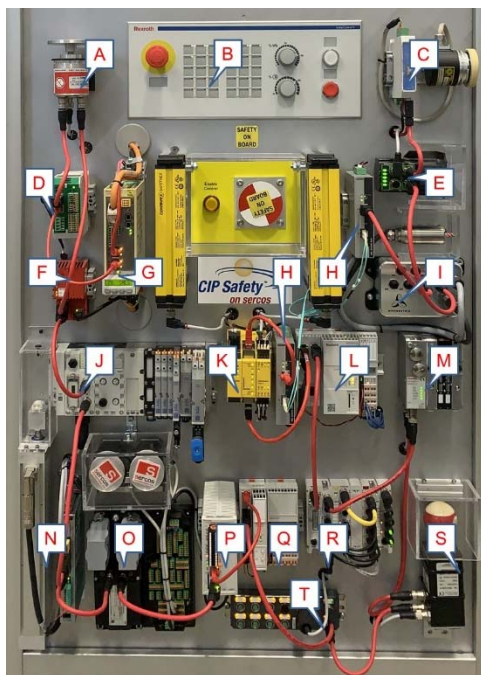
N The **LinMot** C1250 servo drive with the Sercos automation bus offers 32-bit position resolution and an integrated power stage, ideal for standard and high-end positioning tasks with NC-synchronization in the low voltage range, 24-72VDC. LinMot linear motors employ a direct electromagnetic principle. Electromagnetic force provides direct linear movement without the use of cams, gears, belts, or other mechanical devices.
www.linmot.com

O The compact IndraControl FM control hardware from **Bosch Rexroth** unites machine PLC, I/O, stepper interface and the Open Core Interface for Industry 4.0-enabled applications geared towards cabinet-free automation applications. With IP65 protection class, IndraControl FM provides fast signal processing at minimal PLC cycle time of 250 μsec, open connectivity with Multi-Ethernet communication interface, support for high-level language-based applications with Open Core Interface, and integration of IoT-based applications with optional Linux board. www.BoschRexroth.com/controls

P The functionality of the single-axis HMC controller for hydraulic drives from **Bosch Rexroth** covers many applications. Key features: IndraWorks software for uniform setup; fast control (position, force, pressure, alternating position/force, velocity); fast Ethernet support (Sercos automation bus, PROFINET RT, EtherNet/IP, EtherCAT, PROFIBUS, TCP/IP); digital position transducers (SSI, EnDat2.2, incremental); analog 0 to ±10V and 4 to 20 mA; voltage or current actuating variable output; and PLC according to IEC 61131-3. www.boschrexroth.com/HMC

Q The **Bosch Rexroth** IndraControl S20 is a state of the art modular I/O system for distributed control topologies. Very fast signal processing at 1μs per module together with the highly synchronous Sercos automation bus provides real-time performance benefits, for both cyclic and acyclic data. Its optimized design for industrial use offers tool-free and simplified direct wiring with easy installation and module exchange. The bus coupler communicates at 100 Mbit/s and supports up to 63 I/O modules, 8-32 channels per module and 1485 bytes of process data. www.boschrexroth.com/controls
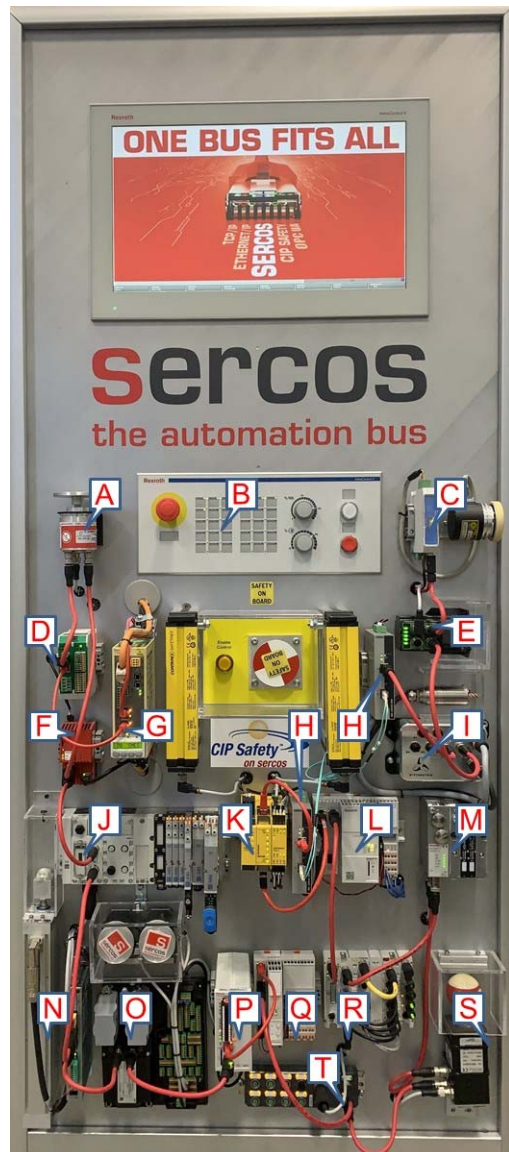
R The **Bosch Rexroth** IndraControl S67 IO system enables reliable, cabinet-free installation near the machine, even in harsh environments. A wide range of digital and analog I/O, temperature, communication and function modules with fast performance is available. Built in diagnostics for supply voltage, overload and communication is available on Sercos. Standard M12 and M8 connections ensure quick and secure connections to peripherals. www.boschrexroth.com/controls

S The **halstrup-walcher** PSE3xxS3 positioning system is an intelligent, compact solution for positioning auxiliary and positioning axes. It consists of an EC motor, gear power amplifier, control electronics, and absolute measuring system connected to the Sercos automation bus. The integrated absolute measuring system eliminates the need for time-consuming homing. Ethernet-based Sercos simplifies the wiring. A hollow shaft with adjustable collar makes assembly quite simple. The product is especially suitable for automatically setting tools, stops or spindles. https://www.halstrup-walcher.de/en/index.php

T The **Phoenix Contact** Axioline E series is the I/O system with a block design for easy field installation. Various I/O types are available for today's leading Ethernet systems such as the Sercos automation bus. Exceptionally compact devices are available in two housing variants with different housing materials: plastic and metal. Axioline E is robust, with fast installation and easy handling. www.phoenixcontact.com.

The Sercos automation bus

The SErial Realtime COmmunication System, or Sercos, is one of the world's leading digital interfaces for communication between controls, drives and decentralized peripheral devices. Sercos has been used in machine engineering for approximately 25 years and is implemented in nearly 6 million real-time nodes. With its open, manufacturer-independent Ethernet-based architecture, Sercos III is a universal bus for all automation solutions.

An efficient and deterministic communication protocol based on an optical transmission system for high noise immunity is the foundation for Sercos' success. Today Sercos is used successfully in the most varied market sectors and applications. Sercos has established itself as the de facto standard for challenging applications that place great demands on dynamics and precision. However, Sercos not only specifies a real-time-enabled communication system, but goes much further and specifies over 700 standardized parameters which describe the interaction between control systems, drives and other peripheral devices using universal semantics. This creates a basis upon which devices from different manufacturers can be combined without any problems.

The Sercos user organizations

Sercos North America (Sercos NA) is the North American Sercos User's Group. Sercos Asia consists of groups in Japan and China. All operate as independent organizations, closely affiliated with Sercos International.

Sercos International is an association of users and manufacturers that is in charge of technical development, standardization, certification and marketing for the Sercos automation bus. All rights to the Sercos technology are owned by the association, not by any one company. Any manufacturer can implement the Sercos technology, which is described by IEC standards. Conformance tests guarantee that Sercos implementations are standard-compliant, ensuring that devices from different manufacturers are interoperable.

Based in Germany, Sercos International presently has more than 90 member companies located around the world.

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