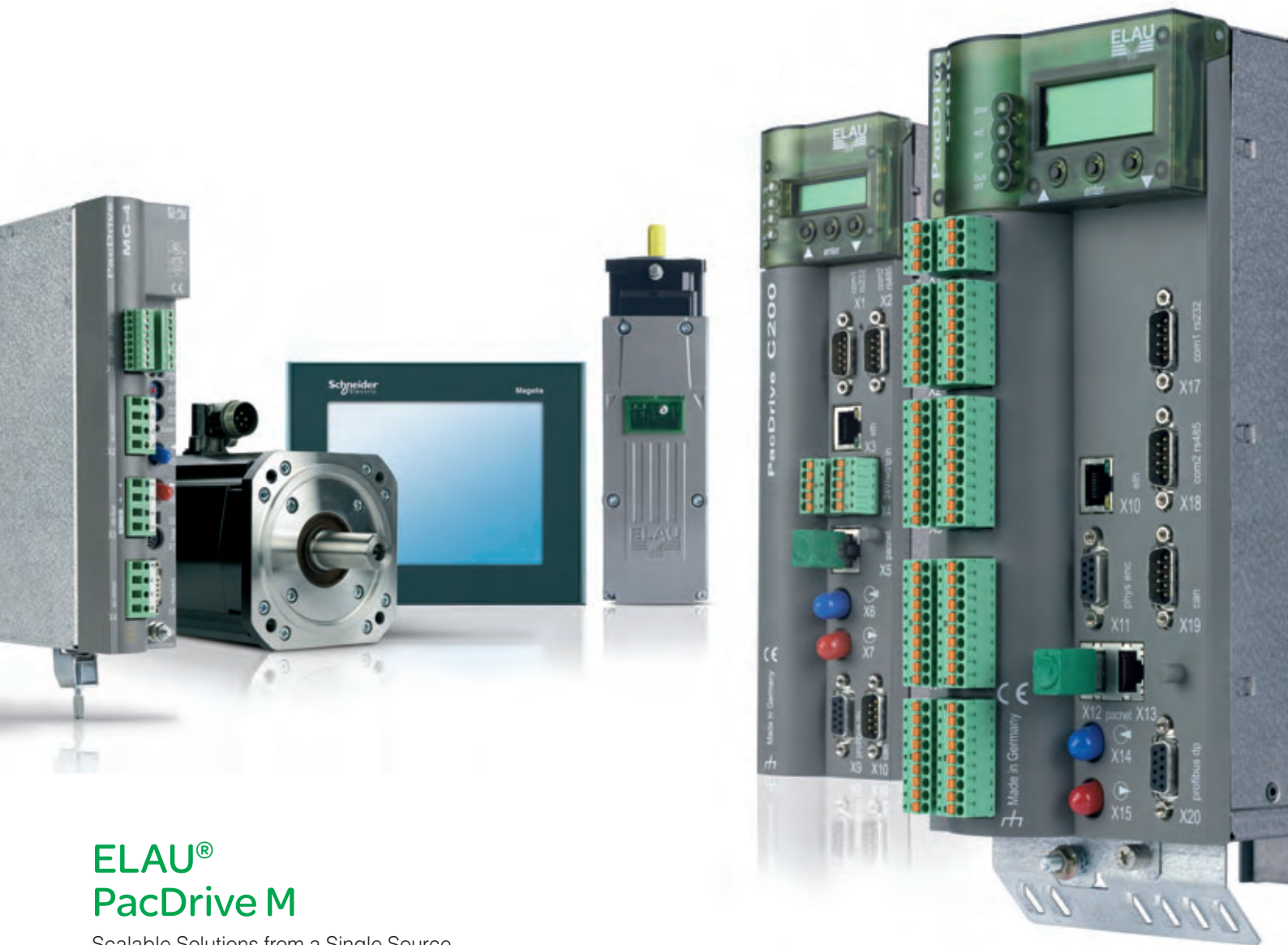


The Automation Solution for Packaging and Production Machine



ELAU®
PacDrive M

Scalable Solutions from a Single Source

ELAU PACKAGING SOLUTIONS

Schneider
Electric

complete automation solutions





Automating with the PacDrive® system

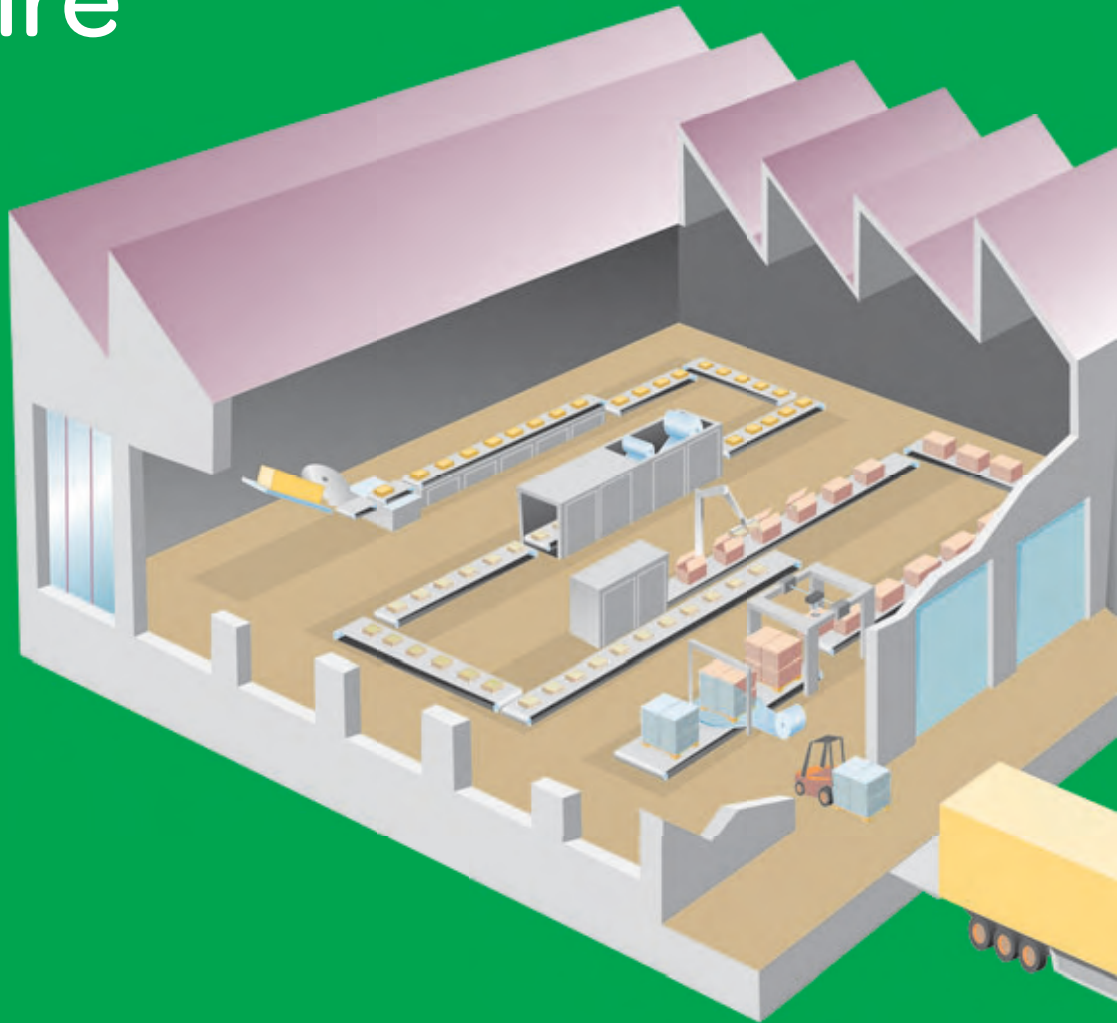
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A partner for the entire factory



One-stop shopping:
Schneider Electric offers
a full range of industrial
electrical equipment



Schneider Electric is one of the few companies in the world to offer a full range of products and solutions for energy distribution and management, building automation and engineering, and industrial automation. Schneider Electric's portfolio includes electrical equipment for production machinery and process technology at every level, from an entire factory to a single production line or an individual machine.



A Global Partner

With 126,000 employees and annual sales of EUR 18.3 billion (2008), Schneider Electric is one of the world's largest companies in its industry sector. Sales and support personnel in 100 countries, 207 production facilities worldwide, and more than 16,000 sales offices form the backbone of a comprehensive network that can provide expert assistance in every location.

Schneider Electric in figures:

- EUR 18.3 billion (USD 25 billion) in sales in 2008
- 126,000 employees in more than 100 countries
- 207 production facilities worldwide
- R&D centers in 25 countries

Complete automation solutions for production lines and machines



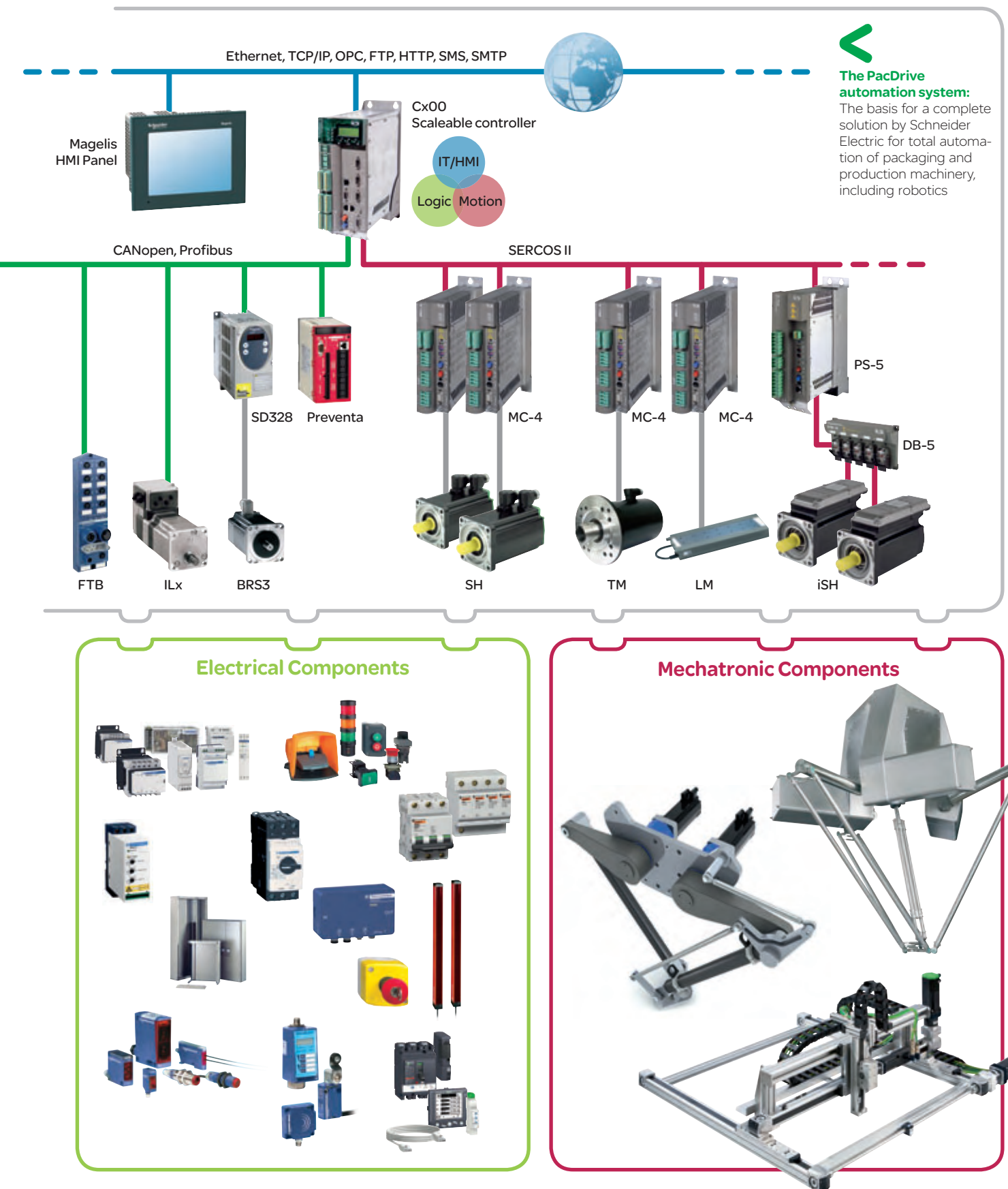
One-stop shopping:

Your single source for an automation platform, motion and field bus components and sensors, power distribution, and wiring & cabling technology. Schneider Electric offers it all, and it all fits together. With one of the world's most extensive product portfolios in the field of automation, Schneider Electric places complete solutions at your disposal, based upon ELAU's PacDrive® automation technology.

Proven in practice

More than 45,000 machines automated with PacDrive are already in use worldwide, and the number is growing rapidly. The PacDrive system architecture, based upon open hardware and software standards that do not rely upon a specific manufacturer, helps to ensure the security of your

investment and is adaptable to future technological advances. IEC standards and internationally current IT standards form the cornerstones of an open architecture that also permits the integration of HMI solutions or field bus interfaces as well as devices from other manufacturers.



Integrated Motion & Logic Control - A foundation for uniform solutions

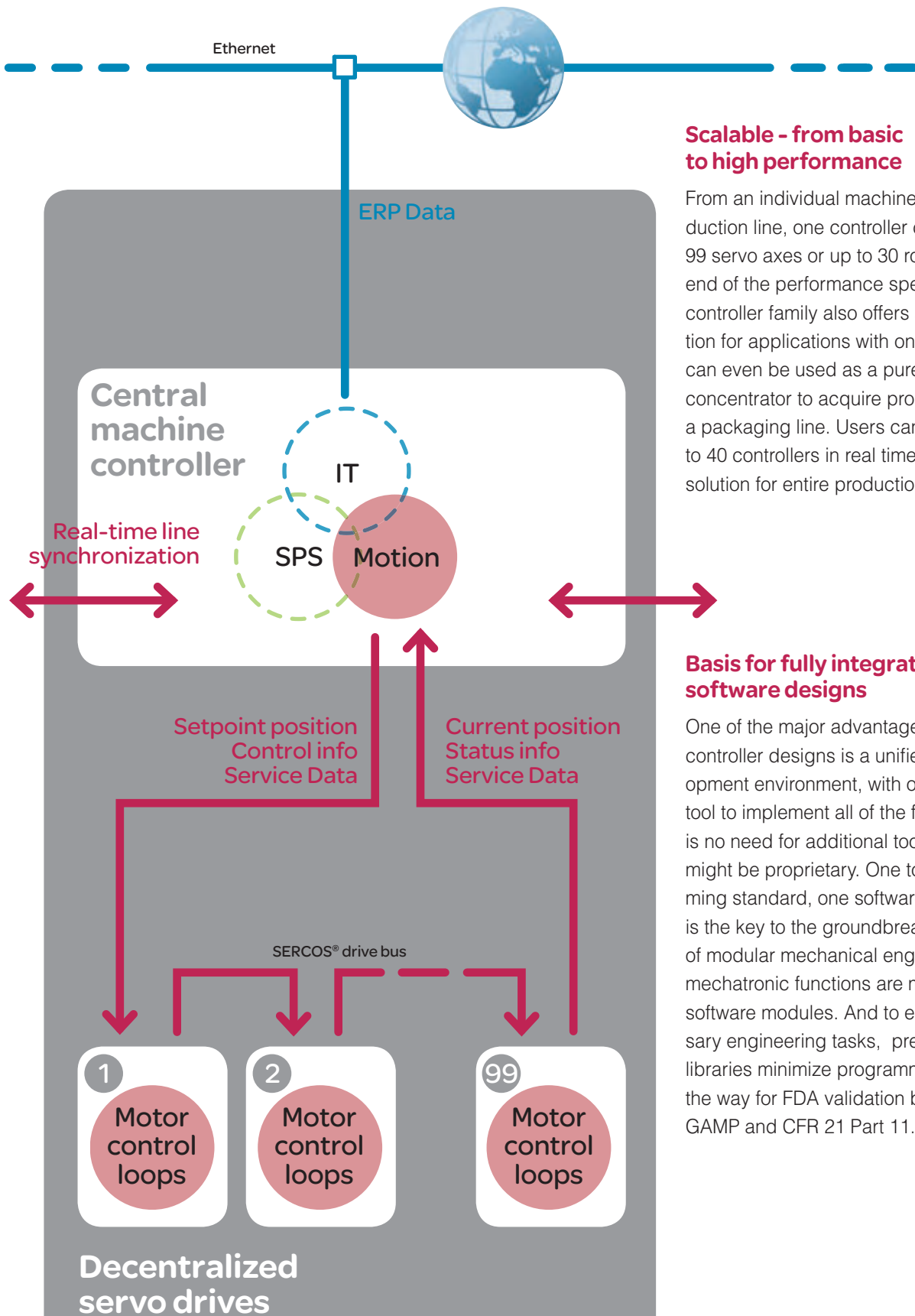
For more than a decade, a central element in the PacDrive solution has been the integration of motion, PLC, and IT functionalities in an automation platform. This allows the creation of fully integrated software structures that enable modular machine designs and reduce engineering times.

Centralized controllers for all machine functions

PacDrive's digital system architecture is based upon the concept of a centralized controller. Using an IEC 61131-3-compliant machine program, a single processor performs all control functions, from cartesian and robotic motion to temperature regulation and machine logic. All of the functions run through the centralized controller, from the human-machine interface to motion and device bus communication, to line synchronization and vertical integration.

Basis for simulation and plug-and-play

The centralized controller generates motion data for all servo axes in the system. It also centrally stores relevant system data and equipment-specific parameters. This centralized approach offers decisive advantages. Moves can be tested and simulated in the controller without having to connect real drives. The controller helps to ensure reliable communication with every servo axis, including process data and motor status that can be analyzed for different purposes. Servo motors and drives can also be automatically configured based upon electronic 'name plates.' The controller recognizes the motors and drives, and can send the centrally stored parameters to each device for easy commissioning or replacement. Configuration of individual drives is a thing of the past.



Scalable - from basic to high performance

From an individual machine to an entire production line, one controller can control up to 99 servo axes or up to 30 robots. On the other end of the performance spectrum, the scalable controller family also offers an economical solution for applications with one to three axes. It can even be used as a pure-play PLC or a data concentrator to acquire production data from a packaging line. Users can synchronize up to 40 controllers in real time, a fully integrated solution for entire production lines.

Basis for fully integrated software designs

One of the major advantages of centralized controller designs is a unified software development environment, with one programming tool to implement all of the functionalities. There is no need for additional tools, some of which might be proprietary. One tool, one programming standard, one software structure: This is the key to the groundbreaking approach of modular mechanical engineering, in which mechatronic functions are mapped on reusable software modules. And to eliminate unnecessary engineering tasks, pre-tested software libraries minimize programming time and ease the way for FDA validation based upon cGMP/ GAMP and CFR 21 Part 11.

Scalable controller performance

The C200 A2, C200 A4, C400 A8, C400 A16, and C600 A99 automation controllers can be used in a broad range of applications. Aspects such as the number of axes to be synchronized, data transmission volumes, and the scope of the robotic elements all help determine which controller offers the optimum balance of price and performance.



Five performance classes in two form factors:

Scalable controller performance for economical automation solutions.



Functional:

The swiveling alphanumeric display for diagnostic data output covers the memory card bay.

Comprehensive controller functionalities

In addition to their motion functionality, all Cx00 controllers have an integrated PLC as well as HMI and data interfaces. There is full software compatibility between all of the controllers, with VxWorks as the universal hard real-time operating system. Control can be distributed across a number of continuous, periodic, or event-driven user tasks. Each controller has two integrated cam switch groups, each with 32 cam tracks. The system can allocate up to 255 cams. Up to 32 different positioning or encoder signals can be assigned to each of the two cam switch groups. Cam signals can be sent to a memory cell or to a digital output.

Depending upon the controller type, memory can be up to 256 MB SD/DDR RAM, or 128 or 256 MB NV RAM, with additional compact Flash memory of 128 MB or more. The memory card can be changed out externally, as can the battery. An alphanumeric display shows diagnostic data. All controllers include an integrated eight-channel software oscilloscope and a message logger for diagnostics. All controller types are CE and cULus certified.

Integrated I/O – externally expandable

All controllers have integrated digital inputs and outputs (except for the C200). The C400 and C600 also have analog inputs and outputs. Controllers include both standard I/O and high-speed I/O that allow significantly faster responses to events recorded by sensors. Users can increase the number of high-speed I/O by adding external expansion modules with a high-speed communication connection.

The number of standard I/O and encoder connections can also be increased via a field bus.

Interfaces and communication

Communication with the servo drives is over the SERCOS II motion network. Field bus communications via PROFIBUS-DP V1, CAN, CANopen, or Ethernet/IP helps to ensure flexibility in responding to different technical requirements for customers in Europe, North America and Asia. A 10/100 Base-T Ethernet connection as well as an RS 232 and RS 485 port are standard equipment in every controller. The Ethernet connection serves as an interface to the engineering system and the HMI via OPC, ARTI, or Modbus TCP, as well as an open interface for customized communications solutions.



- Scalable hardware for 0 to 99 axes
- All controllers are software-compatible
- Unit can be serviced without a PC, message output on the integrated plaintext display for messages in 5 languages
- Support for all current field buses
- Integrated 8-channel software oscilloscope and message logger

Performance overview: All Cx00 controller types

	Controller type	C200 A2	C200 A4	C400 A8	C400 A16	C600 A99
Motion Performance	Number of synchronizable axes	0-2	0-4 (8)	0-8	0-16	0-99
	Number of dynamic electronic cam plates operating in parallel	255				
PLC Performance	Time required per 1000 bit instructions (µsec)	25		5		
	Time required per 1000 words (µsec)	50		10		
	Programmable dynamic cams	255				
	Cam cycle time (µsec)	1000		250		
	Number of user tasks, continuous, periodic, or event-driven	Any number, within the system limits				
	Fast task cycle time (µsec)	1000		250		
Communication	Integrated motion bus	SERCOS II				
	Integrated Ethernet connection	10/1 00 Base-T, RS 232 and RS 485				
	Number of integrated field bus interfaces	1				2
		Profibus DP V1, CAN, CANopen, DeviceNet or EtherNet/IP				
Housing dimensions	Width x Height x Depth (mm)	60 x 240 x 240		104 x 270 x 240		

Constantly updated data available at www.elau.de/controls

Subject to modifications

Operator interfaces with full graphic display touchscreen panels



The right size for the right display:

Magelis HMI panels allow users to create customized solutions with a minimum of engineering time



In display sizes of 5.7" to 15", the graphics-capable Magelis® HMI panels with VxWorks® and Windows XP Embedded offer adaptability to operator display requirements. An ARTI driver simplifies the engineering phase by providing direct access to the runtime system variables.

HMI hardware in two basic designs

The fully graphics-capable Magelis XBT TFT HMI panels come in two basic designs: The GT panels, in sizes of 5.7 to 15" with VxWorks, can be seamlessly integrated into the controller solution. They are equipped for the application with 16 or 32 MB RAM memory. The GTW panels, which are equipped with 8.4" to 15" displays and run with Windows XP Embedded,

are a winning design that features open architecture for running a wide range of software applications. Memory for applications can be expanded from 250 MB to 1 GB. All of the panels have slots for further memory expansion. Ethernet, RS 232C and USB interfaces are integrated into all Magelis panels.



- Optimal HMI design for ELAU automation solutions
- Broad range of solutions with VxWorks and Windows versions
- Direct access to the controller's runtime variables

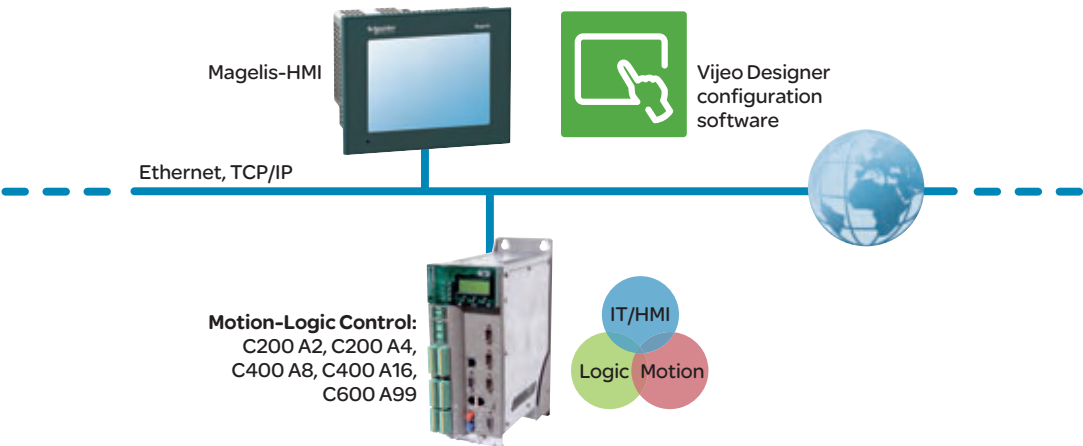


Direct access:
An ARTI protocol driver forms the basis for high speed communications between the HMI panel and the controller, with full access to the runtime system variables

Efficient Engineering

The Vijeo Designer configuration software can be used to uniformly implement Magelis-based HMI solutions for all equipment. To reduce engineering times, an ARTI protocol driver builds a bridge directly from the configuration tools to the controller application. This provides direct

access to runtime system variables, which can be easily browsed with the configuration tool. This eliminates the otherwise typical requirement for yet another definition of variables for the HMI application.



Technical Data

	Magelis XBT GT		Magelis XBT GTW	
	XBTGT 2330	XBTGT 7340	XBTGTW 450	XBTGTW 750
Display size	5,7"	15"	8,4"	15"
Resolution	320x240	1024x768	800x600	1024x768
Colors	65536		262.144	
Operating system	VxWorks		Windows XP embedded	
Application memory	16 MB	32 MB	256 MB to 1 GB	256 MB to 1 GB
Expandable memory	1 x CF slot up to 1 GB			
Ethernet	1x10/100 Base T		2x10/100/1000 RJ45	
Serial interface 1	1xRS232C		2xRS232C	
Serial interface 2	1xRS485			
USB interface	1x1.1 Type A Master	2x1.1 Typ A Master	4x2.0 Typ A Master	4+1(on front) x2.0 Type A Master

Excerpt from the program, complete and constantly updated data available at www.elau.de/HMIs Subject to modifications

Fully Integrated Tools

A modular software development environment is the basis for efficient engineering with PacDrive. The central element is the EPAS-4 engineering tool, which is used to develop the controller application and for testing and simulation. Other EPAS-4-compatible tools support engineering tasks by providing software tools for human-machine interface, drive design, commissioning and diagnostics

Engineering

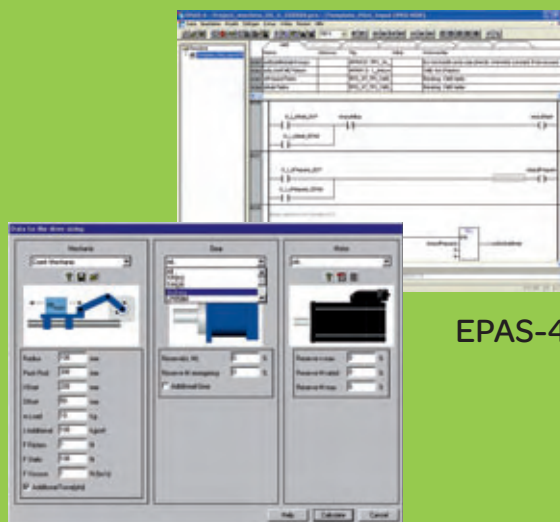
Controls & Drives

HMI



Fully Integrated Engineering:

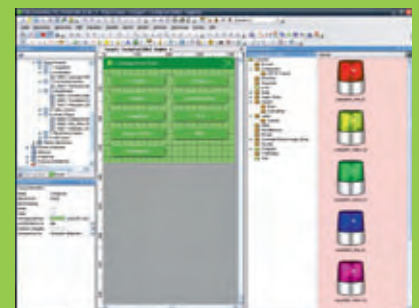
The PacDrive development environment covers every phase of a project, up to and including commissioning, while diagnostic tools help to ensure a high level of availability in day-to-day operation



EPAS-4



ECAM-4

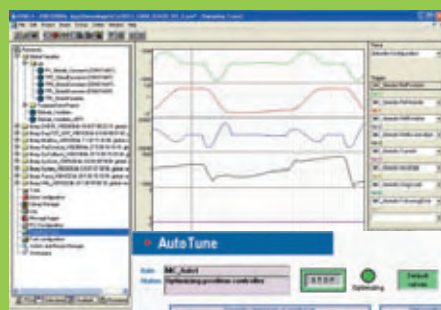


Vjeco Designer
configuration software

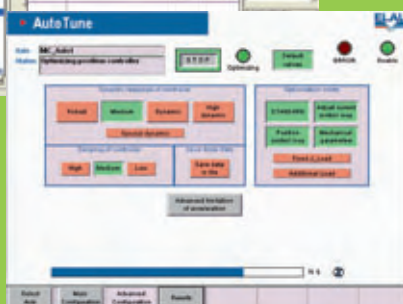
All of the tools work together and have the same look and feel. The development environment is ideally suited for managing mechatronic design projects, which increasingly integrate the mechanical, hardware, and electronics development into an interdisciplinary process.

Commissioning

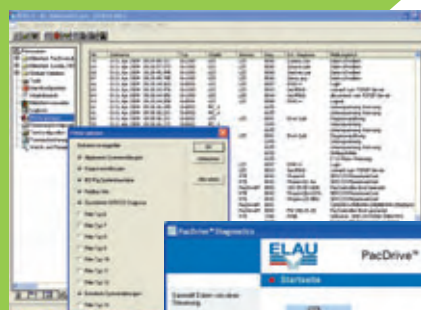
Maintenance & Service



EPAS-4



AutoTune



EPAS-4



PacDrive Diagnostics

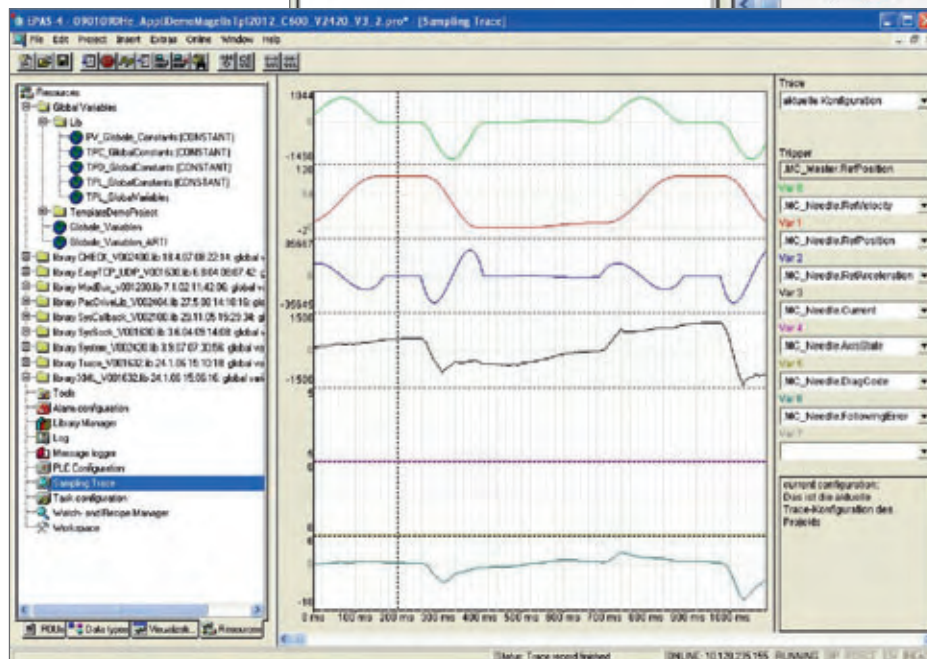
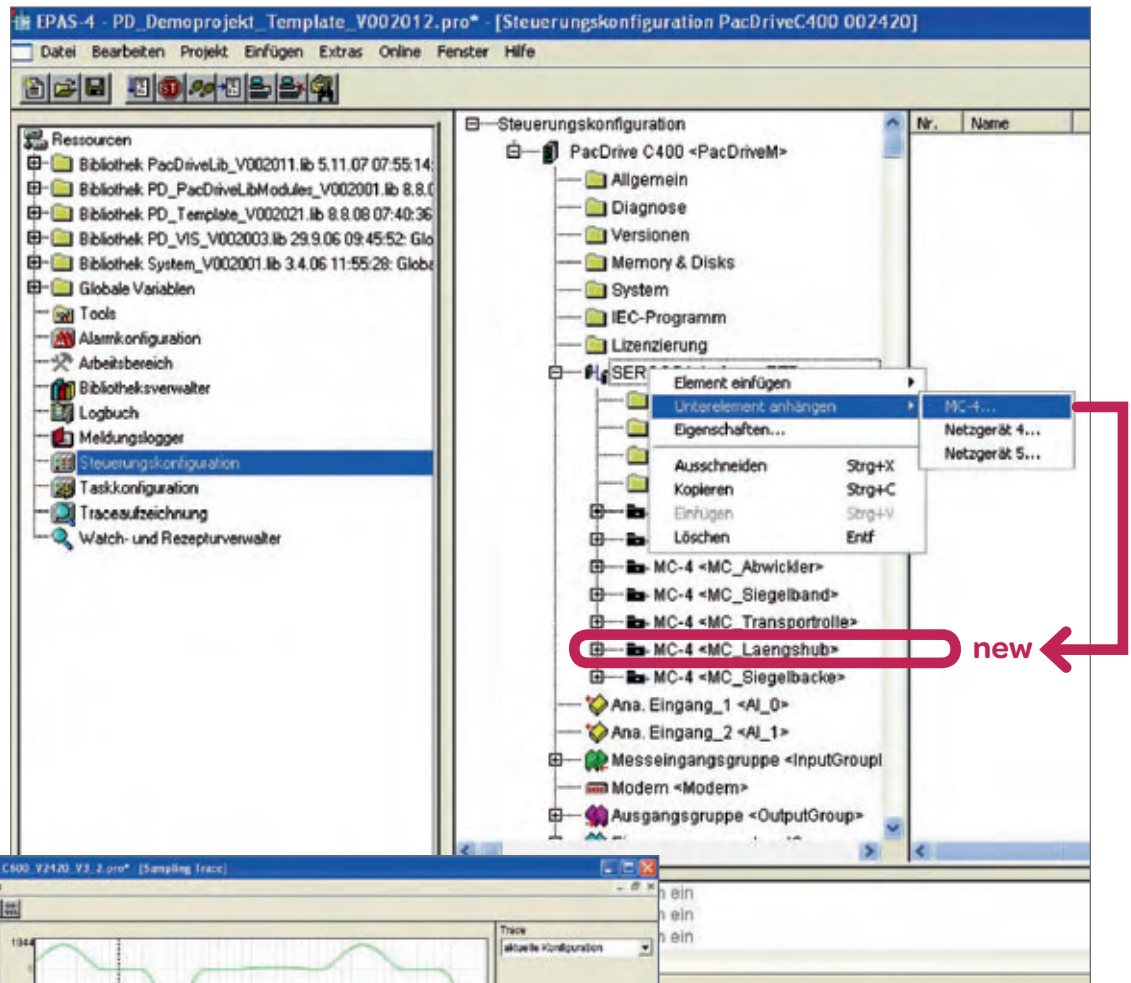
EPAS-4

Uniform programming and parameterization



Configuration editor:

All hardware components and field buses in the solution can be configured and parameterized in an editor. No other tools are required.

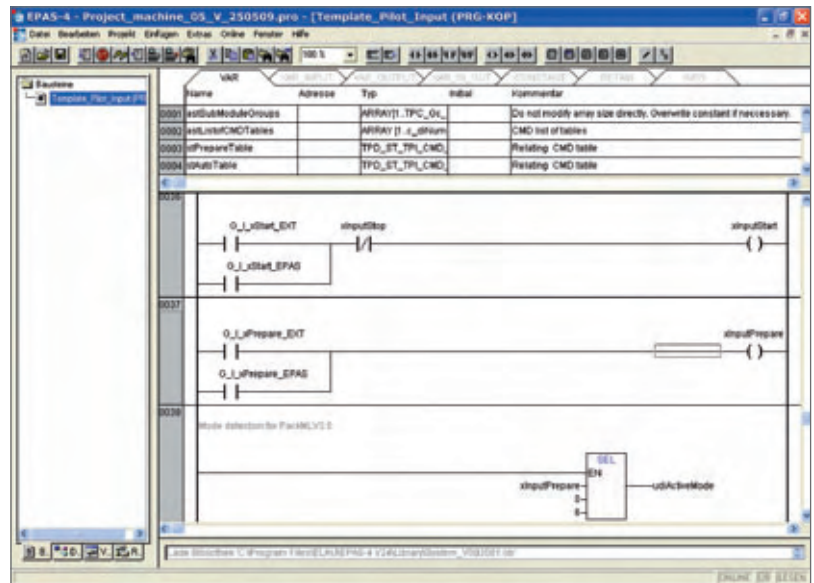


Trace Function:

The integrated oscilloscope in EPAS-4 permits simultaneous plotting and display of up to eight PLC and motion signals, as well as mixed PLC and motion signals with millisecond resolution

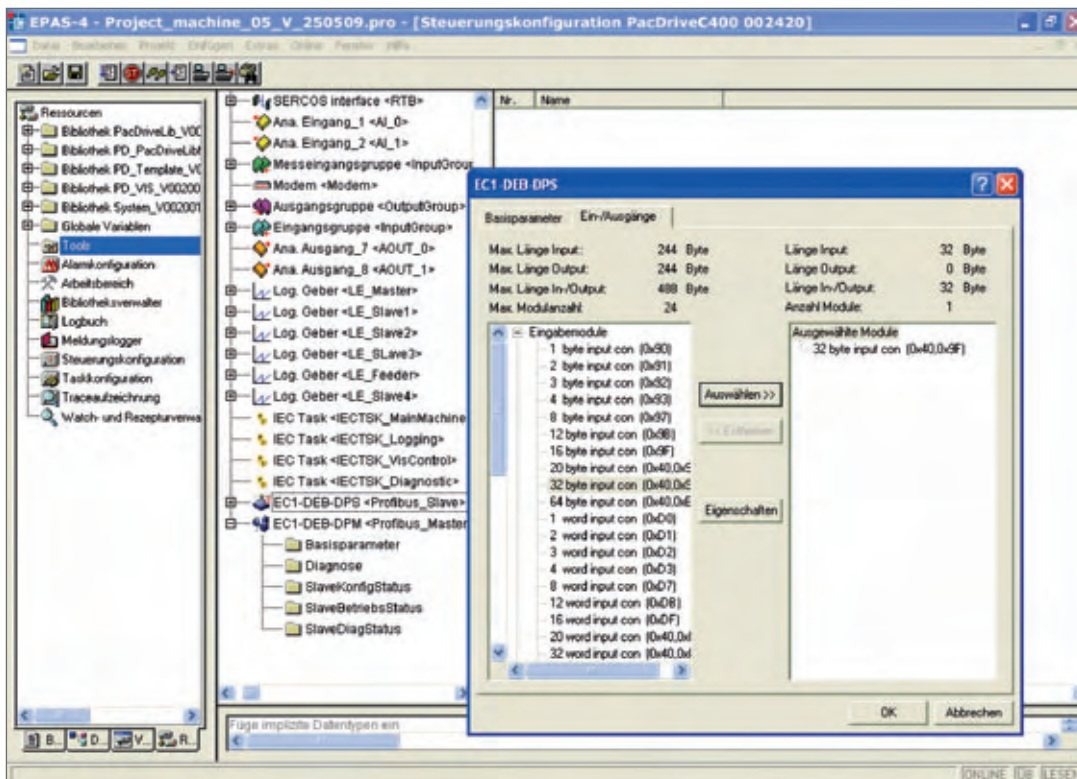
With its combination of comprehensive functionality and proven software tools, the EPAS-4 Automation Toolkit is a powerful programming tool for PacDrive applications. EPAS-4 can be installed on Windows PCs, and its interface has the look and feel of typical Windows applications. Easy navigation between editors and within the libraries help to ensure ease of use and transparency when creating and simulating programs and commissioning with EPAS-4.

EPAS-4 complies with the IEC 61131-3 standard and includes editors as well as debuggers for all six standard IEC languages.



Creating a program:

Modular machine programs can be created in the IEC languages. Screenshot shows a program written in Ladder Diagram



Integration of CAN or PROFIBUS DP interfaces:

Field bus interfaces, both masters and slaves, can be imported into the controller configuration of a programming project and parameterized using the field bus configurator



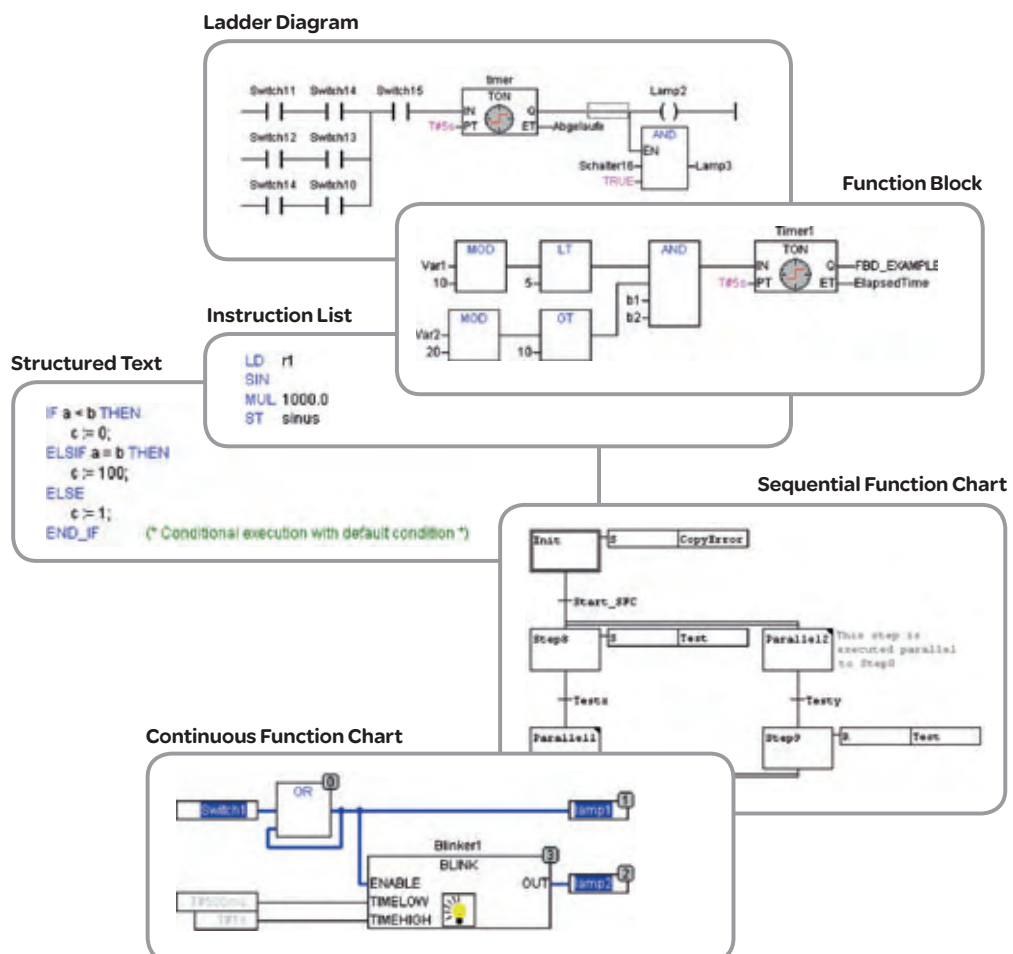
- Uniform programming and parameterization
- Program simulation without real axes
- Hardware configuration and parameterization without additional editors
- Visualization tool with preprogrammed commissioning and service screens
- Simultaneous trace plotting of PLC and motion signals (software oscilloscope)
- Diagnostics tool message logger
- All IEC 61131-3 editors
- CoDeSys - based Tool

EPAS-4 functionality takes all aspects of complete automation solutions into account: With the integrated configuration editor, all of the solution's hardware components and field buses can be configured, parameterized, modified, or expanded with a few entries. EPAS-4's customizable visualization offers assistance in developing, testing, and simulating the controller application. Preprogrammed screens are already available for the commissioning process.

Machine programs can be simulated onscreen in EPAS-4 without real drives. An eight-channel software oscilloscope integrated into EPAS-4 permits the simultaneous plotting of up to eight

PLC and motion variables (including mixed variables). During commissioning, the tool's message logger makes it easy to track down the source of system and user diagnosis messages.

EPAS-4 can be used for all PacDrive II controller versions. Machine programs created for one controller type can be automatically converted with a few entries in the integrated Project Converter for porting to other PacDrive controllers.



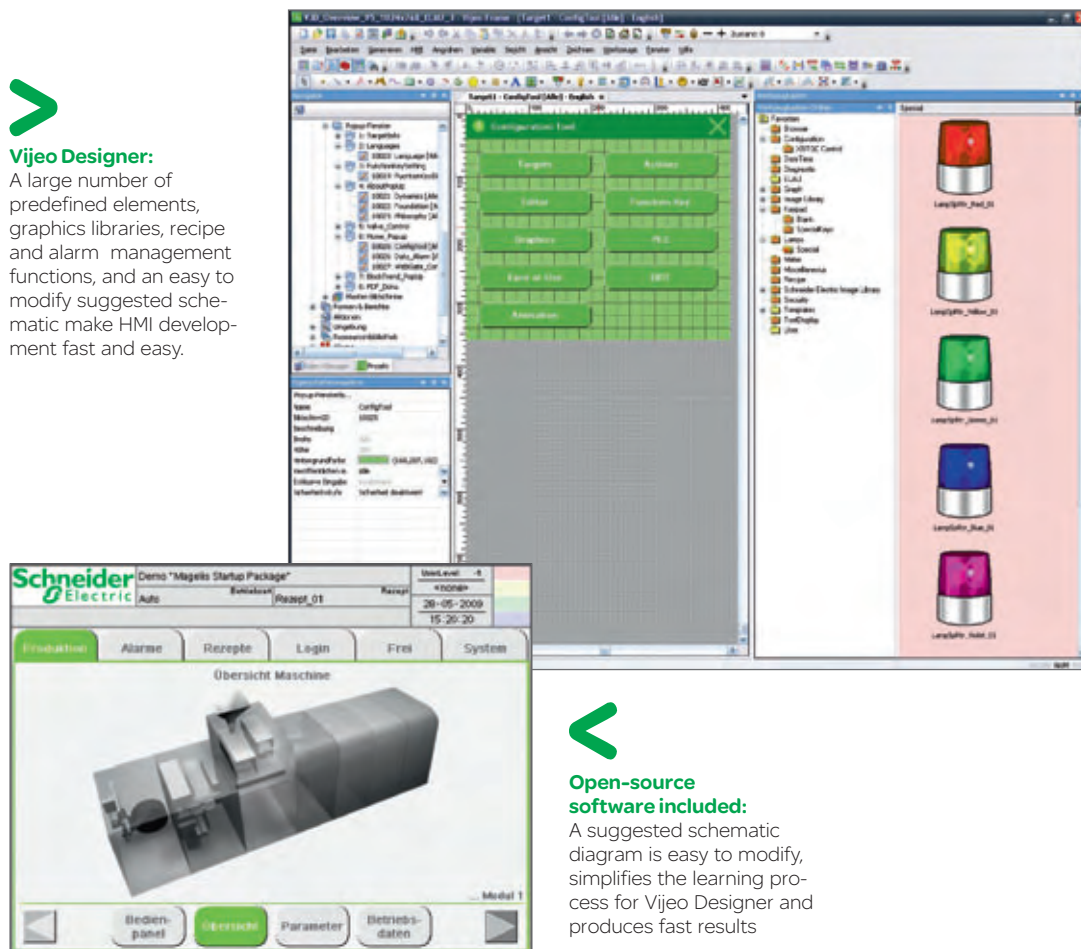
Vijeo® Designer configuration software

Customized design of HMI interfaces



Vijeo Designer:

A large number of predefined elements, graphics libraries, recipe and alarm management functions, and an easy to modify suggested schematic make HMI development fast and easy.



Open-source software included:

A suggested schematic diagram is easy to modify, simplifies the learning process for Vijeo Designer and produces fast results



Vijeo Designer can be used to configure all Magelis touchscreen panels, from the smallest 3.8" touchscreen panel up to complex HMI applications for the 15" touchscreen panels. The tool set also includes the ARTI protocol driver so that users can access runtime system variables via the browser. The tool's graphical editor provides a number of ready-made elements for customizing HMI interfaces. In addition, a graphics library has more than 4,000 predefined vector graphics. The integrated recipe maintenance program can manage 256 recipes with 1,024 ingredients in up to 32 recipe groups.

Users can perform periodic or event-driven processing of Java-based procedures to automate operations such as switching screens, mathematical logical calculations, as well as scaling of automatic changes in variable values. The alarm management system is designed for up to 9,999 alarms.

- One tool for all panels
- Pre-defined functions and graphic elements provide design support
- Fast solutions with open-source sample program
- ARTI driver for browsing control variables

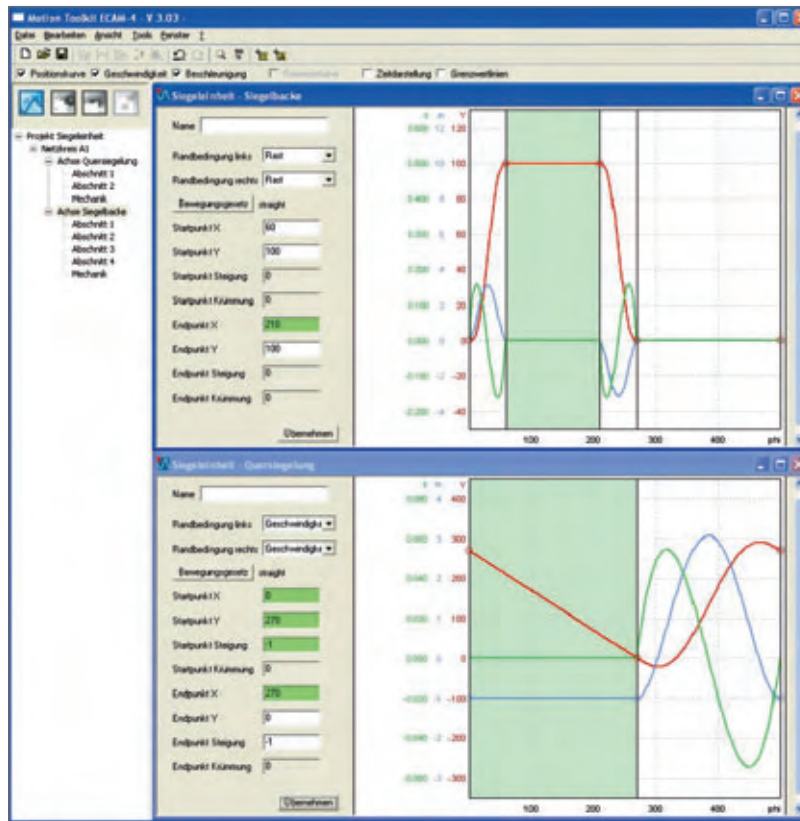
ECAM-4

Motion and Drivetrain Design



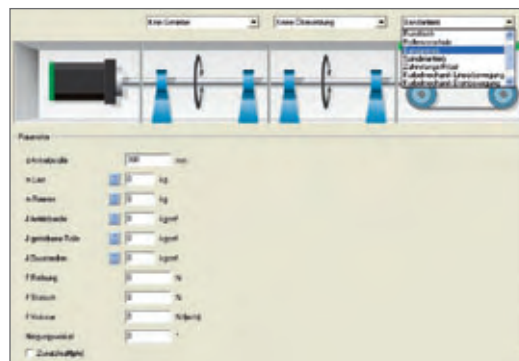
Graphical motion design:

By cascading editor windows, users can place movement patterns in chronological relationship to one another



- Multiaxis motion design with virtual or real master axes
- Use of an unlimited number of multisegment profiles, such as VDI 2143 profiles or fifth order polynomials
- Download of motion functions for all controllers
- Import of cam tables via Excel tables
- Database for servo motor/drive and gear reduction sizing and selection
- Predefined applications such as general loading condition, belt drive, spindle drive, rack-and-pinion drive, and crank drive

ECAM-4 combines graphical motion and drivetrain design tools for complex multiaxis systems with up to 99 axes. This modular software tool permits highly precise design of the complete system, from the mechanics to calculation of system power requirements. To streamline the engineering process, ECAM-4 includes a library of predefined standard mechanical drive configurations, simplified motion design with a graphical cam editor, the availability of standard motion profiles (such as the VDI 2143 Library), and the ability to perform harmonic analyses on motion profiles. ECAM-4 also includes tools for calculating energy-saving power regeneration between drives via the DC bus.



Drivetrain design

The predefined applications offer sufficient adaptability for typical power transmission configurations

Program data and comprehensive results lists provide information for making sound decisions at every step of the process.

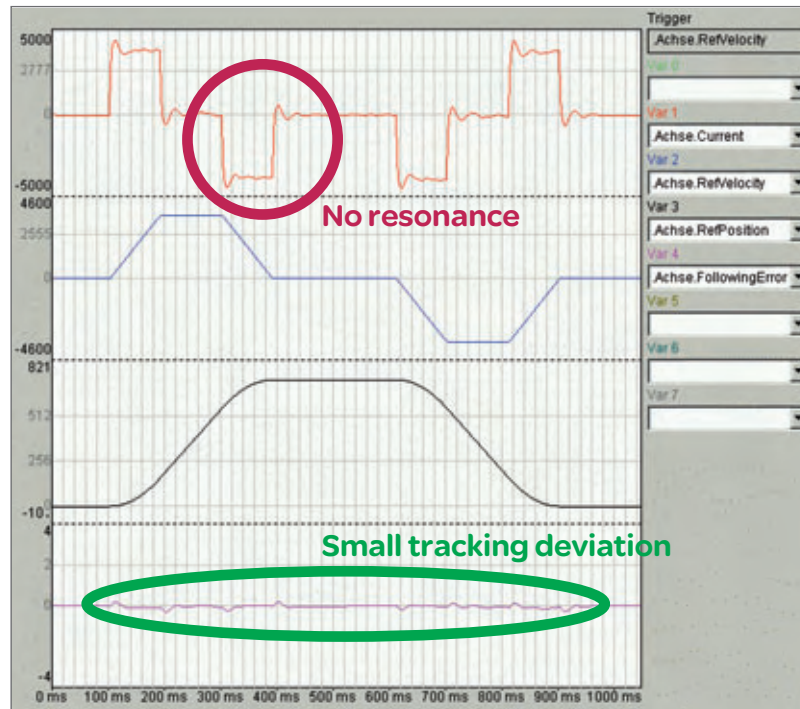
AutoTune

Automatic optimization of motor control parameters



Determining control parameters with AutoTune:

For critical applications, auto tuning automatically calculates the inertial loads for individual axes, which can be used to minimize tracking deviation or resonances.



Using predefined default values PacDrive servo drives provide sufficient performance out of the box for 95% of all applications. For those more critical situations, the AutoTune tool is available free of charge to PacDrive users to calculate the inertial load seen by individual axes. After entering a few limit values, AutoTune measures the feedback from preset signals, then independently calculates the optimal parameters for stable feedback loops. Optimization can be used to minimize tracking deviation or attenuate resonances.

AutoTune makes feedback loop optimization faster and simpler. Critical axes can be commissioned without the need for control technology expertise. AutoTune is an IEC 61131-compliant program that works in EPAS-4.

- Support for calculating the inertial load and drive parameters for individual axes
- Can be used to minimize tracking deviation or resonances
- Easy to use in EPAS-4

Backup

NetManage

SERCOS Firmware Assistant

Software tools for data management

Support tools make it easier for PacDrive users to handle program and firmware data and to perform program version management.

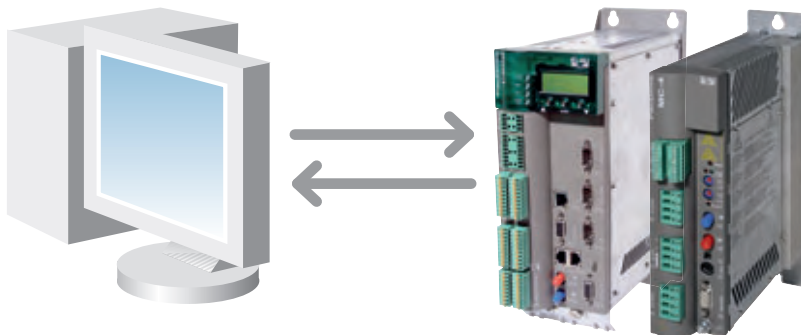
Backup converts program data into the data format needed for copying machine programs from the controller's Flash drive to a PC, and vice versa. The tool's functionality also includes the creation of CompactFlash cards for PacDrive controllers (including bootable cards), along with the VxWorks operating system and firmware. An integrated firmware assistant also simplifies the exchange of firmware between PacDrive controllers via LAN (IP) or serial port (RS-232).

NetManage identifies PacDrive controllers within the network and lists these together with their most important data.

With the SERCOS Firmware Assistant, users can exchange servo drive firmware via Ethernet as well as via the controller's serial port. The tool replaces the boot loader for all servo drive versions.

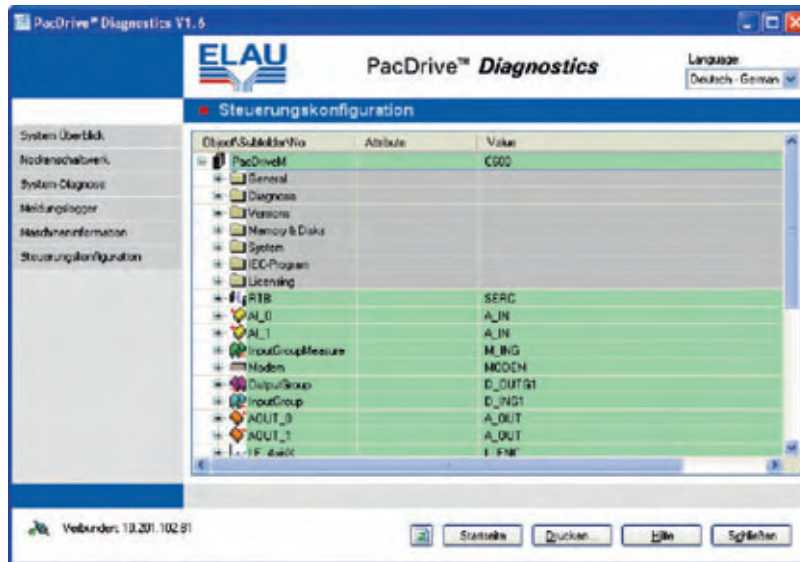


Data management:
Tools make it easier to transfer and handle program and firmware data



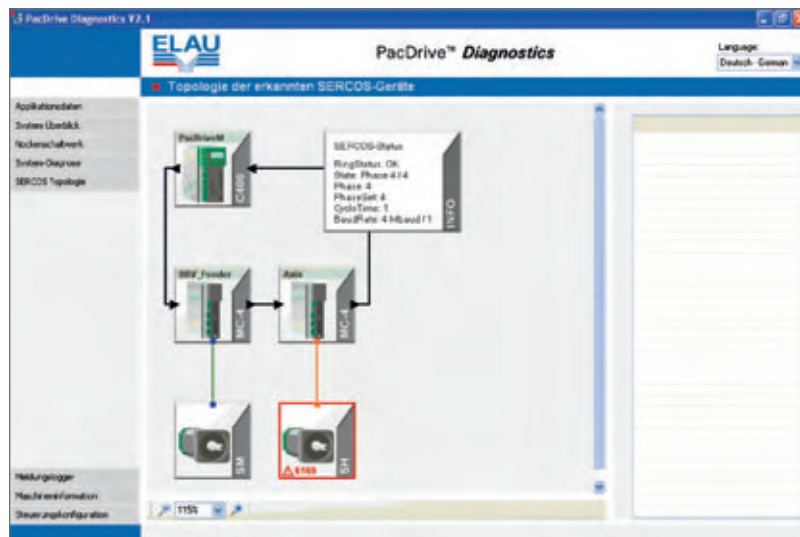
Diagnostics

Maintenance without EPAS-4



Diagnosis in the event of machine malfunctions:

Diagnostics can be used to perform comprehensive system diagnostics even without programming knowledge. The screenshot shows a check of the PLC configuration.



- Simple tool for collecting service-related system data
- No EPAS-4 license required
- Firmware-independent
- System map of all servo drive data (drives, message loggers, cam switch group, etc.)
- Intuitive user interface

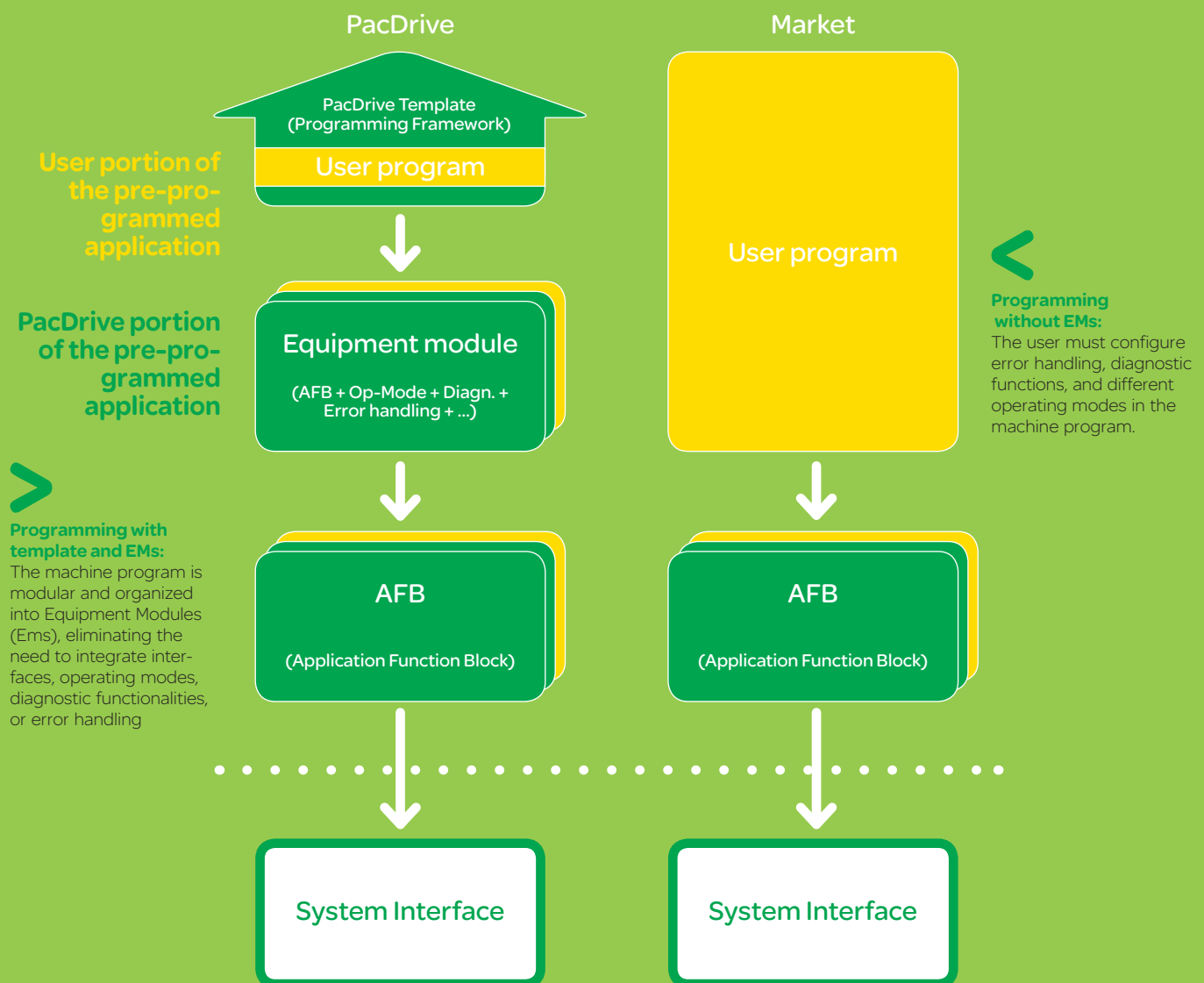


Topology of the detected SERCOS devices in the event of errors. The affected devices are highlighted

EPAS-4 includes integrated comprehensive diagnostic functionalities. EPAS is not always available, however, if a machine breaks down during production. This is why PacDrive Diagnostics was developed specifically for servicing purposes. The tool offers full diagnostic functions, runs independently of EPAS, and is available at no cost to PacDrive users. It can

be used without any programming knowledge. The intuitive program interface allows users to quickly collect all of the necessary service data. Diagnostic information can be displayed upon demand, stored or forwarded directly to technical support. The tool can be used regardless of the firmware version.

Application Software – Solutions to counter rising engineering costs



PacDrive’s IEC 61131-3-compliant software development environment includes a large library of Function Blocks as well as a programming template. Library functions are performed by software that has undergone extensive testing and produces direct time savings. The template serves as a tool for creating standardized, modular software, and therefore also improves machine module reusability. The user can decide whether to use only the Function Block library or the template as well.

Function Blocks for a broad spectrum of tasks

ELAU software libraries consist of Function Blocks (known as AFBs, or Application Function Blocks), which map a variety of motion, PLC, visualization, and basic IT functions in pre-programmed software objects. These range from AFBs for universal generation of positioning and motion functions to temperature control. The libraries also contain AFBs for complete mechatronic functions, such as robots, synchronization functions, film unwinds, and seal bars.

All AFBs are IEC 61131-3-compliant. With their simple interfaces, they can be quickly implemented to significantly reduce the time and effort required to create a program. In addition, AFBs have been documented and field-tested thousands of times as off-the-shelf software. For users, this translates into increased software quality and simplified certification procedures. New AFBs are constantly being

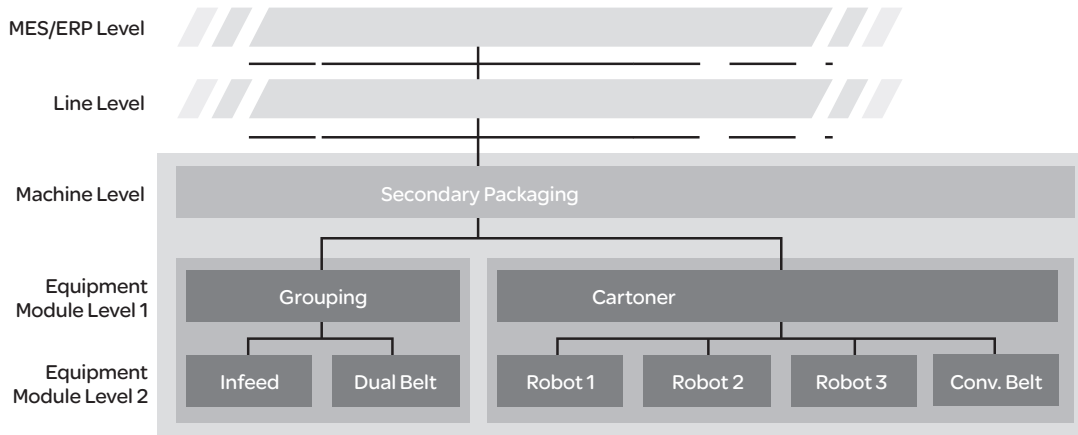
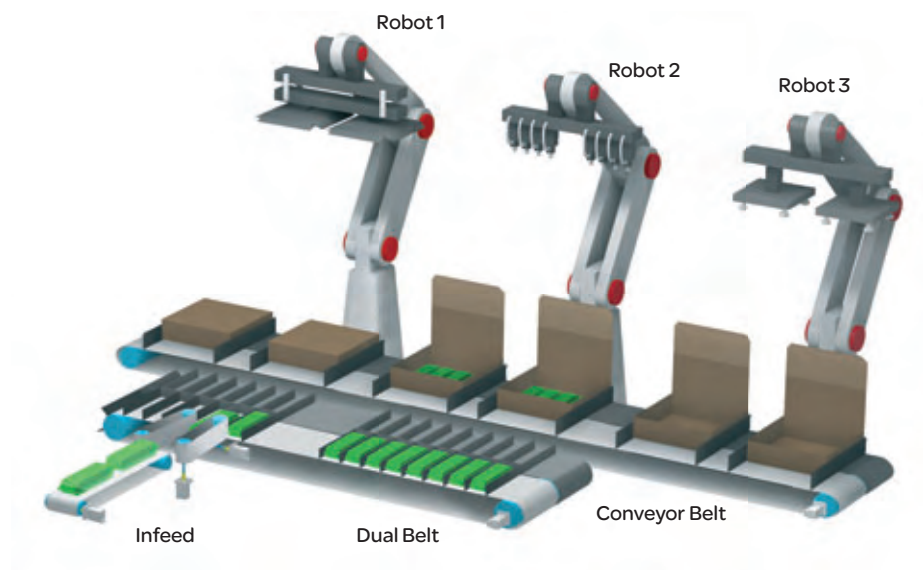
created to perform tasks rapidly, simply, and in a standardized format.



Example of an AFB:
The AFB FlyingShear-RotaryKnife contains the algorithms ‘flying shear’ and ‘rotary knife’, in conformance with IEC 61131-3.

Creating programs with a template and equipment modules

The PacDrive template enables consistently structured programming of individual machines or complete lines. Users can map software modules to the corresponding mechanical modules on the machine. Just as the mechatronic Function Blocks in a modular machine can be reused for new projects, the relevant parts of the program can also be reused in programs for other machines with minimal programming effort.



Programming template: Machine programs can be developed by combining Equipment Modules, resulting in a modular software structure that mirrors the machine's modular, mechatronic design.

The programming template includes core machine functionalities, such as mode control and error handling. It's important to apply machine modes and error status consistently, especially when integrating multiple machines in a production line.

Equipment Modules are the template's equivalent of the Application Function Blocks which can be used without the template. AFBs become Equipment Modules when

they are implemented within the template, often with other Equipment Modules, to create a cohesive, well structured program. An Equipment Modules also includes the interfaces for error handling, diagnostics and operating modes.

Fulfilling national and international standards

Every step of the PacDrive programming concept is based upon standards and simplifies certification of the products produced according to such standards: All libraries are based upon the PLCopen and IEC 61131-3 guidelines. All AFBs and Equipment Modules are documented and tested in practice, a basic requirement for high software quality and rapid commissioning. They also make FDA certification of machines much easier.

The template is also strongly influenced by standards. For example, the available operating modes meet **ISA 88.05 (PackML)** requirements. The template is an important component for creating machine programs based upon the PackML standards, and also facilitates compliance with the Weihenstephan standard.

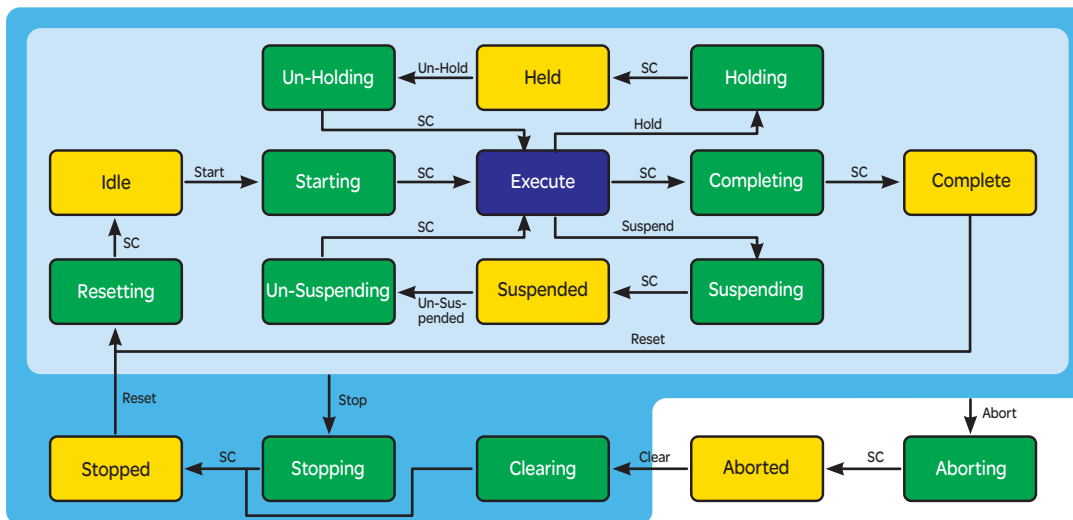


- Extensive Function Block libraries, including PLCopen
- Enhanced software quality thanks to off-the-shelf software (FDA, cGMP, 21CFR Part 11-compliant)
- Template programming for modular, reusable software
- Compliance with OMAC and Weihenstephan helps to ensure machine and line standardization



PackML state model included:

Designing operating modes with the template fulfills ISA 88.05 requirements



The PackML state model can also be created without the template and Equipment Modules, using Function Blocks from the AFB library.

Integrated drives, network – standardized for e

Quick interconnects and hybrid cables for signal and power level, automatic network configuration, and diagnostic functions: iSH Series servo modules with integrated onboard drive electronics are more than just compact drives. The drive and network solution together form a true plug-and-play solution that enables modularity and generates tangible cost advantages



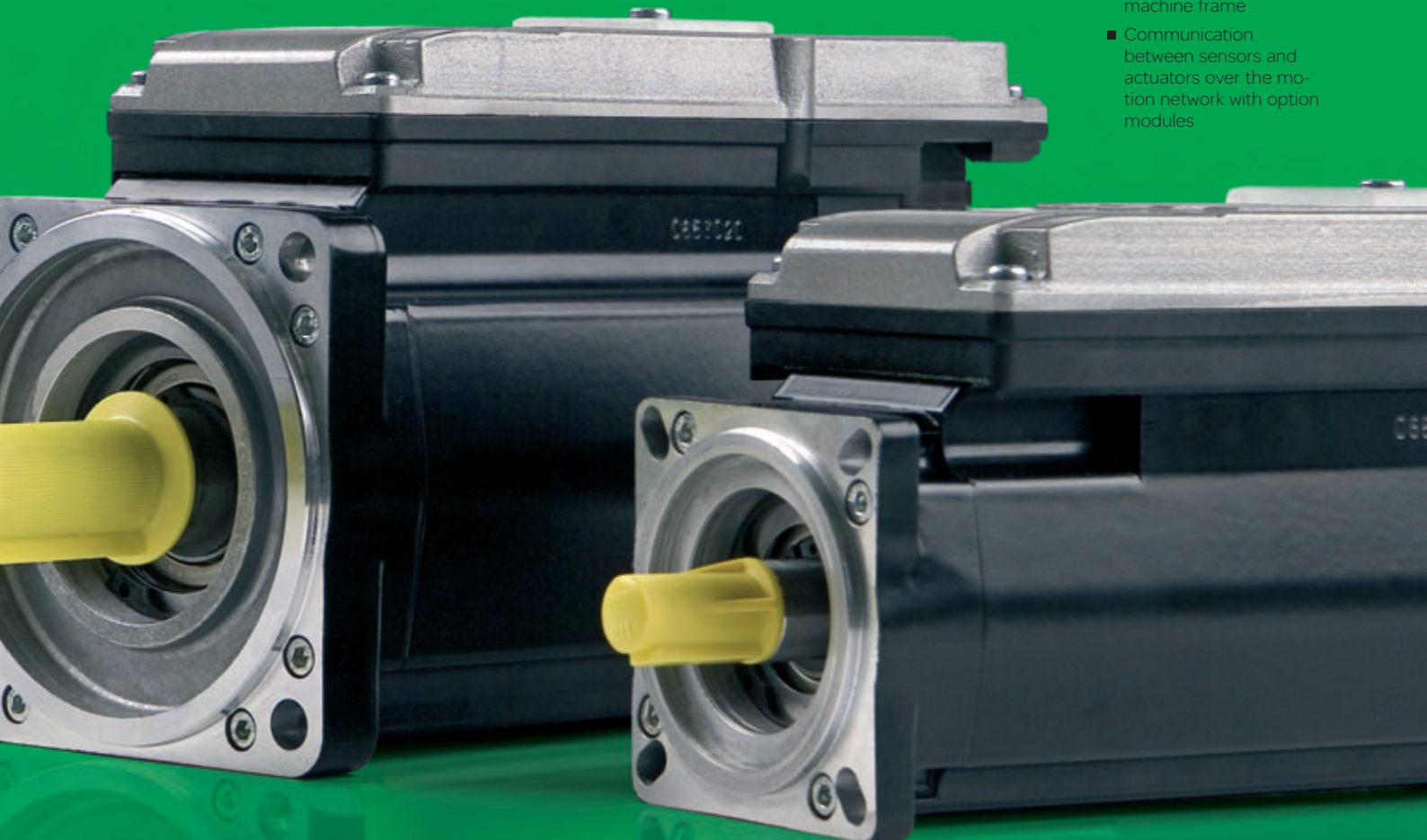
Plug-and-play solution:

Intelligent servo modules, flexible networking, and a shared power supply are combined in servo drives with holding torques of 1.1 to 12.5 Nm

Wiring, and power easy design and operation



- Flexible network topologies
- 70% shorter cable lengths
- 90% less control cabinet space required for the servo drive solution
- 90% less wiring required in the control cabinet
- 50% less cable installation required on the machine frame
- Communication between sensors and actuators over the motion network with option modules



Smaller control cabinets - less wiring and installation work

iSH Series servo modules reduce the control cabinet space needed for servo drives by up to 90%: Conventional servo drives are eliminated, the only components remaining in the control cabinet are the automation controller and a shared power supply for up to 25 servo modules. In many cases, this eliminates the need for cabinet fans or air conditioning. Eliminating the servo drives also reduces cabinet wiring by up to 90%, for a significant reduction in installation cost.



Servo drives take up less cabinet space:

iSH Series servo modules reduce the control cabinet space required for servo drives by up to 90%

Flexible networking

iSH Series servo modules use a flexible approach to cabling, consisting of pre-terminated hybrid cables and distribution boxes. The specific application determines whether this will be a line structure, a tree structure, or a mixed design. One two-sided pluggable cable is sufficient to connect each servo module to the networking solution. Only one cable is connected to the control cabinet

(for up to 25 servo modules). The network itself is configured as a plug-and-play solution. Compared to classical servo solutions, this reduces the required cable by up to 70%, producing tangible savings. It also decreases the labor required for wiring the servo solution in the machine frame by approximately 50%.



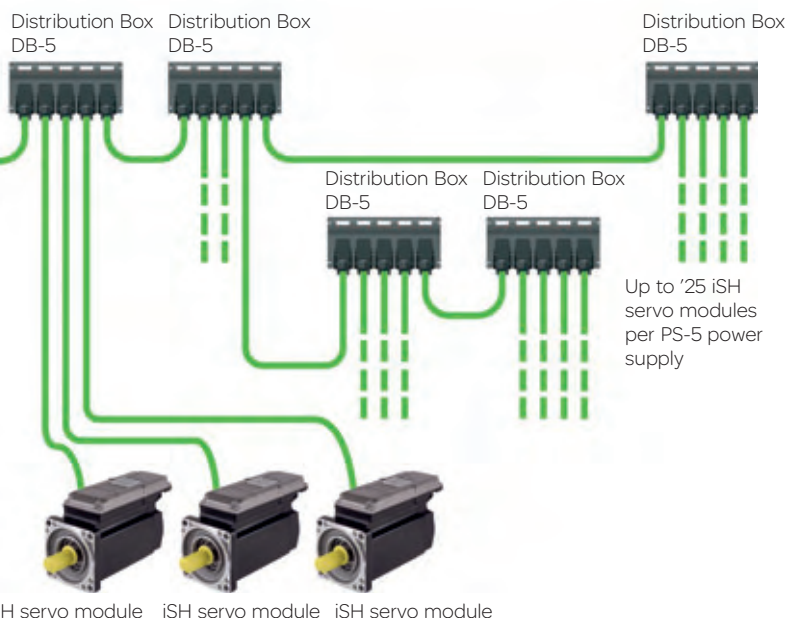
Up to 70% less cabling:

Flexible networking topology, thanks to pluggable hybrid cables and distributor boxes

PacDrive controller
Power Supply PS-5

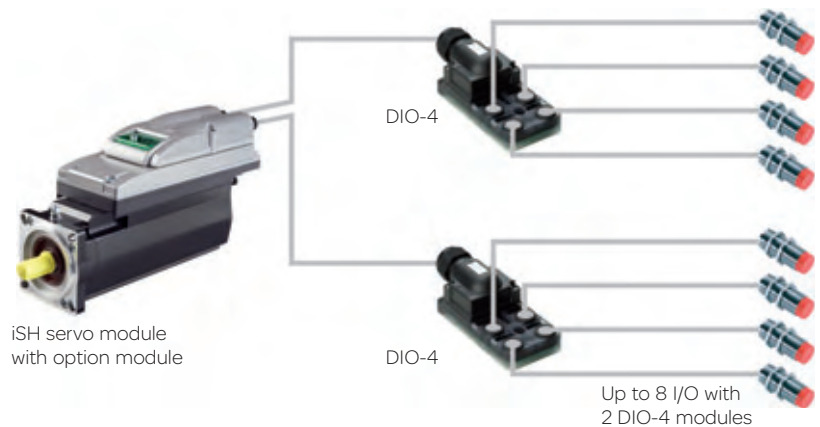


Smaller control cabinet, greater flexibility



Device communication over the motion network

Experience shows that sensors or actuators are typically mounted in the immediate vicinity of servo drives. With the I/O option module for iSH servo modules, up to eight sensors or actuators can communicate with the controller via the motion network, eliminating the need for a dedicated device bus. Up to two I/O can be connected directly to the servo module, and DIO-4 I/O interconnect modules expand the number of connections. All eight connections can be configured as inputs or outputs, depending upon requirements.



Sensor/actuator communication:

With an I/O option module mounted to the iSH servo module, up to eight sensors or actuators can communicate with the automation controller over the motion bus without the need for a separate field bus.

Holding torque of 1.1 to 12.5 Nm

iSH servo modules are available in flange sizes of 70, 100, and 140 mm, covering a holding torque range of 1.1 to 12.5 Nm. All models are software-compatible with one another and with MC-4 Series servo drives. All servo modules can

be equipped with optional I/O modules. Additional options include the integration of a holding brake, a feathered key groove, a multi-turn encoder with electronic name plate and an IP65 shaft seal.



High power density:

Thanks to their compact design and smooth surfaces, the iSH Series intelligent servo modules have space requirements comparable to standard servomotors.



Technical Data

Types	Standstill torque M_0 [Nm]	Peak torque M_{max} [Nm]	Rotor inertia J_M [kgcm ²]	Rated speed n_N [min ⁻¹]
iSH-070 / 60011	1,1	3,5	0,25	6000
iSH-070 / 60017	1,7	7,6	0,41	6000
iSH-070 / 60022	2,2	8,7	0,58	6000
iSH-100 / 30025	2,5	9,6	1,40	3000
iSH-100 / 30044	4,4	18,3	2,31	3000
iSH-100 / 30058	5,8	28,3	3,22	3000
iSH-140 / 30075	7,5	27	7,41	3000
iSH-140 / 15085	8,5	27	7,41	1500
iSH-140 / 20125	12,5	55	12,68	2000

Constantly updated data available at
www.elau.de/servodrives

Subject to modifications

Servo drives for installation in control cabinets



Fewer models:

With five models in only three form factors, the MC-4 Series covers a power range of 1.1 to 34.5 kVA.

Universal MC-4 Series compact servo drives can be used for both rotary and linear servo motors as well as torque motors. They cover a wide performance range with a small number of individual models. All models are software-compatible with one another. MC-4 servo drives are also compatible with iSH drive systems, which permits mixing of standard servo motors and iSH servo modules in a synchronized multi-axis system.

MC-4

Versatile with high peak current capability

The fully digital MC-4 servo drives are self-contained rack-mounted units consisting of a power supply, amplifier, brake bleeder, and power filter for one axis. Depending upon the type, MC-4 servo drives produce between 1.5 and 50 amps of continuous current. DC bus sharing is possible for multiaxis solutions.

MC-4 servo drives communicate with the controller via SERCOS II over fiber optic cable, which also makes them suitable for remote installation. They process signals from single and multi-turn encoders. All models have an electronic name plate and are automatically configured with the connected motor and the specified controller parameters during initial commissioning or replacement.

Technical Data

Type	MC-4/01	MC-4/03	MC-4/10	MC-4/22	MC-4/50
Rated current A_{eff}	1,5	3	10	22	50
Peak current A_{eff}	3,75	7,5	25	55	125
Rated power [kVA]	1,1	2,1	6,9	15,2	34,5
Supply voltage [V]	AC 342 ... 528				
Supply frequency [Hz]	48 ... 62				
Control voltage [V]	DC 20 ... 30				
Bleeder resistance	integrated				
Power supply and power filter	integrated				
Safety functions*	Safe Stop 1 (SS1)** and Safe Torque Off (STO)** via Inverter Enable				
Motion bus	SERCOS interface				
Width [mm]	69	69	69	124	312
Depth [mm]	230 without connector/ 260 with connector				
Height [mm]	240 without mounting brace / 310 with mounting brace				
Protection class	IP 20				
Ambient temperature [°C]	+5 ... +45; (...+55)				
Excess voltage category	KIII, T2 (DIN VDE 0110)				
Excess voltage resistance	Class 1 (DIN VDE 0160)				
Degree of radio interference	Class A EN 55011 / EN 61800-3				
Certifications	CE / cULus				CE

Constantly updated data available
at www.elau.de/servodrives

Subject to modifications



- Wide supply voltage range (from 380 VAC to 480 VAC, 3 phase)
- Integrated power supply
- Max. 34.5 / 69 kVA output
- Automatic motor detection
- Inverter Enable (according to IEC 61508:1998, EN/ISO 13849-1:2006)
- Up to 250% overload
- Simplified replacement part logistics due to minimized number of types

* according to IEC 61508:1998, EN/ISO 13849-1:2006

** according to IEC 61800-5-2:2007

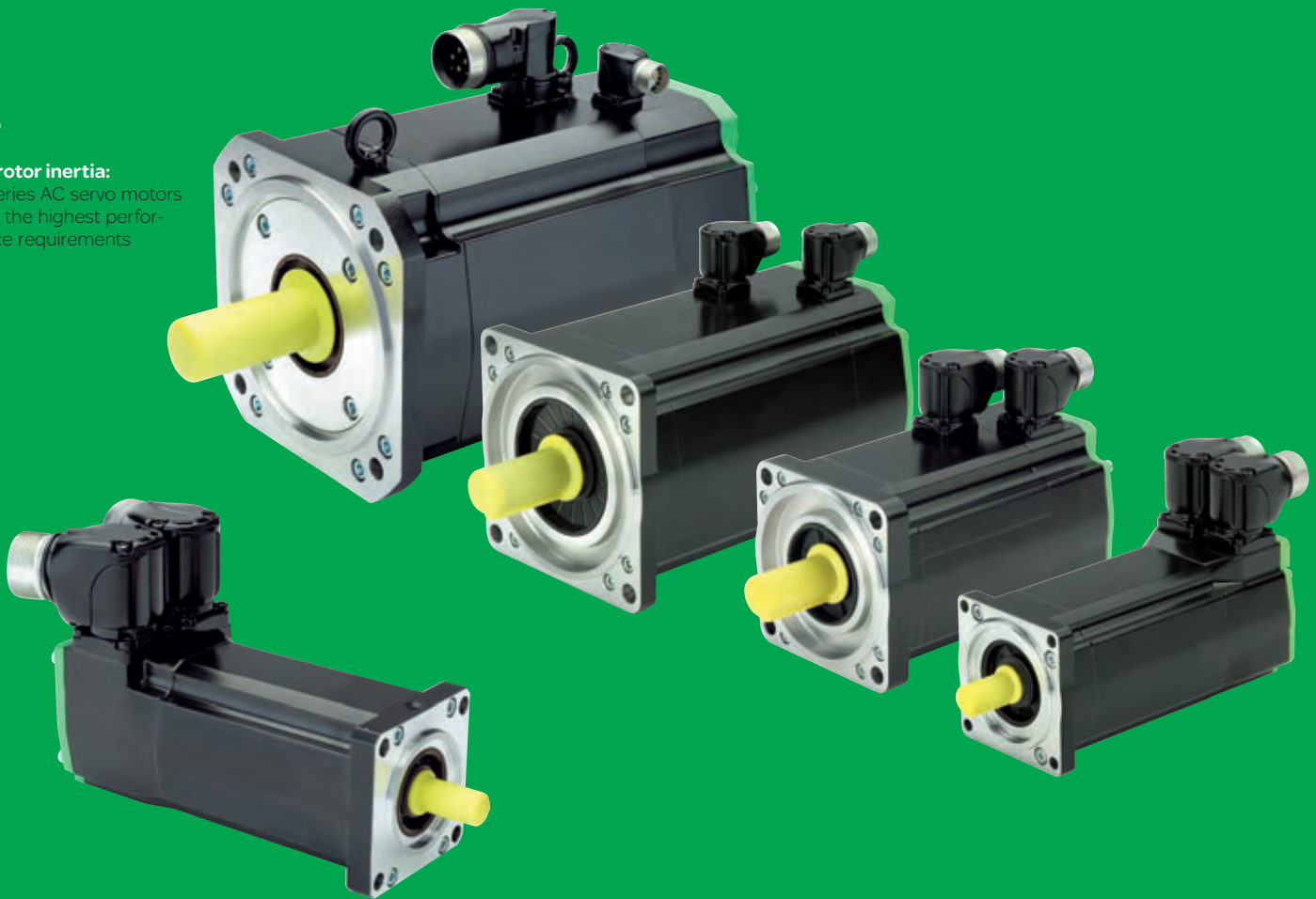
Rotary and linear servo motors

Modern, high-speed production machines require highly dynamic and precise AC servo motors with a wide power range. Brushless, overload-protected servomotors with high resolution encoders as well as torque and linear motors offer solutions for a variety of applications. All of the rotary and linear servo motor types can be operated by MC-4 servo drives and thus integrated into synchronized multiaxis systems over the SERCOS interface.



Low rotor inertia:

SH Series AC servo motors meet the highest performance requirements



SH

Servo motors in five flange sizes

Available in five flange sizes, from 55 mm to 205 mm, and a wide range of rated torques, SH motors are ideal for almost every application. Because of their low inertia compared to other servomotors, SH motors deliver impressive dynamics.

Despite their power, they are exceptionally compact thanks to salient pole winding technology. The sleek housing is equipped with plug connectors that can be rotated 300°. The electronic name plate makes the motors an integral component of the PacDrive automation system.

Technical Data

Motor	Holding torque Ambient cooling M_0 [Nm]	Holding torque Fan cooled M_0 [Nm]	Holding torque Flange water cooled M_0 [Nm]	Peak torque M_{max} [Nm]	Rotor inertia J_M [kgcm ²]	Rated speed n_n [min ⁻¹]
SH 055/80005	0,5			1,5	0,059	8000
SH 055/80009	0,8			2,5	0,096	8000
SH 055/80012	1,2			3,5	0,134	8000
SH 070/60010	1,4			3,5	0,25	6000
SH 070/60020	2,2			7,6	0,41	6000
SH 070/60030	3,1			11,3	0,58	6000
SH 100/50030	3,3	4,3	5,3	9,6	1,0	5000
SH 100/40060	5,8	7,5	8,9	18,3	2,31	4000
SH 100/40080	8,0	11,0	12,0	28,3	3,22	4000
SH 100/30100	10,0	14,2	13,8	40,5	4,22	3000
SH 140/30120	11,1	15,6	17,1	27,0	7,41	3000
SH 140/30200	19,5	30,8	29,8	60,1	12,68	3000
SH 140/30270	27,8	42,4	41,4	90,2	17,94	3000
SH 140/30330	33,4	54,8	48,9	131,9	23,0	3000
SH 205/30360	36,9	46,9		110	71,4	3000
SH 205/20650	64,9	87,2		220	129	2000
SH 205/20900	94,4	124,5		330	190	2000

Constantly updated data available
at www.elau.de/servodrives

Subject to modifications



- Compact design and high power density thanks to salient pole windings
- Low rotor inertia
- Electronic name plate
- Optional stainless steel shafts, shaft seals, integrated brakes
- Triple overload capacity
- Optional exterior fan cooling or water cooling for better capacity utilization
- Unpainted housing upon request for food applications
- Optional IP 67 rating for harsh environmental conditions
- Single-turn and multi-turn absolute value encoder

SM

Servo motors in three flange sizes

The SM series of AC servo motors combine flexibility with a high level of precision. All models are equipped with high resolution encoders providing one million steps per revolution. The motors, which are equipped with electronic name plates and come in three flange sizes and various stack lengths, cover a holding torque range of 1.1 to 57 Nm.



Low rotor inertia

SM series AC servo motors feature high peak torque capability



Technical Data

Motor	Holding torque Ambient cooling M_0 [Nm]	Holding torque Fan cooling M_0 [Nm]	Peak torque M_{max} [Nm]	Rotor inertia J_M [kgcm ²]	Rated speed n_N [min ⁻¹]
SM 070/60010	1,1	-	4,7	0,48	6000
SM 070/60020	2,0	-	7,7	0,79	6000
		-			
SM 100/50030	2,6	-	10,0	2,28	5000
SM 100/40050	4,8	8,0	16,0	3,64	4000
SM 100/40080	8,0	13,0	30,0	6,54	4000
SM 100/30080	8,0	13,0	27,0	6,54	3000
SM 140/30120	11	17,0	45	10,3	3000
SM 140/30210	20	35	76	18,1	3000
SM 140/30290	29	48	103	24,9	3000
SM 140/30370	36	57	126	33,1	3000

Constantly updated data available at www.elau.de/servodrives

Subject to modifications

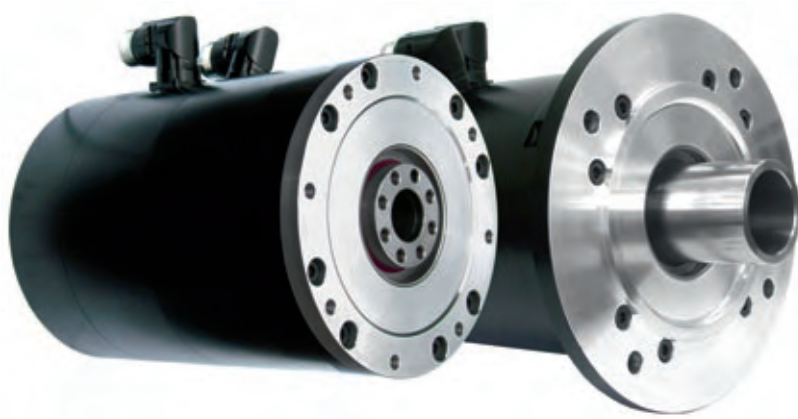


- Peak torque is 4 times rated torque
- Single-turn and multi-turn high resolution encoders
- Robust terminal box with plug-in connectors
- IP 64/65 protection rating
- Optional EExp rating, stainless steel shafts, shaft seals, integrated brakes
- Electronic name plate
- Optional IP 67 rating for harsh environmental conditions



TM Torque Motors

Torque motors can also be used in PacDrive automation solutions. Standard torque motors and application-specific custom designs can be driven by standard MC-4 servo drives with HIPERFACE® encoder feedback. Torque motors can therefore be totally integrated into synchronized multiaxis systems while maintaining their full functionality.



Torque Motors:

In addition to standard torque motors, application-specific custom designs are available

Technical Data

Motor	Holding torque Fan cooling M_0 [Nm]	Peak torque M_{max} [Nm]	Rotor inertia J_M [kgcm ²]	Rated speed n_N [min ⁻¹]
TM 250/041	32	96	170	400
TM 250/042	62	186	265	400
TM 250/043	92	276	360	400
TM 250/044	120	360	455	400
TM 300/021	100	300	570	250
TM 300/022	150	450	755	250
TM 300/023	200	600	940	250
TM 300/024	240	720	1125	250



- Capable of extremely high torque without gear reduction
- Minimal length
- Hollow shafts possible

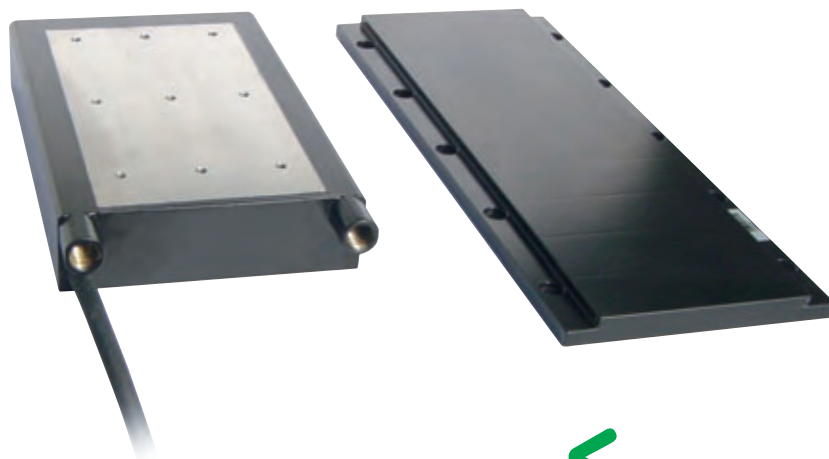
Constantly updated data available
at www.elau.de/servodrives

Subject to modifications

LM

Linear motors

The LM series consists of 12 three-phase linear motors in three different stator widths and with various secondaries. The motors can be operated with Hiperface TTK 70 linear encoders by MC-4 servo drives. Depending upon the type, they can generate continuous force of 150 to 3750 N. The motors can be cooled by convection or water when generating higher continuous force. The offset arrangement of the poles minimizes residual torque. All of the motor parts are potted with cast epoxy resin insulation and fulfill IP 55 requirements. An integrated PTC thermal fuse protects the motors from overload.



Linear motors

High dynamic direct drive technology

Technical Data

Motor	Continuous force Convection cooled	Continuous force Watercooled	Peak force	Maximum speed
	F_n [N]	F_n [N]	F_{max} [N]	V_{max} [m/s]
LM 030/101	150	300	400	10
LM 030/102	300	600	800	10
LM 030/103	450	900	1200	10
LM 050/061	280	500	650	6
LM 050/062	560	1000	1300	6
LM 050/063	840	1500	1950	6
LM 050/064	1120	2000	2600	6
LM 075/041	440	750	1000	4
LM 075/042	880	1500	2000	4
LM 075/043	1320	2250	3000	4
LM 075/044	1760	3000	4000	4
LM 075/045	2200	3750	5000	4



- Continuous forces of 150 to 3750 N
- Minimal mechanical wear
- High precision thanks to tight tolerances by design
- Can be operated with or without water cooling

Constantly updated data available
at www.elau.de/servodrives

Max. 4 m length – Subject to modifications

Automation components on the field bus

Positioning solutions, variable frequency drives, and motor protection components communicating via field bus supplement the automation solution to meet application needs. Profibus, CANopen and DeviceNet connections and I/O are available for PacDrive drives. Various IP 20 and IP 67 rated I/O configurations are available.

Lexium® ILx

Integrated Positioning Drives

The Lexium line of integrated drives combines the motor, positioning control, power electronics, field bus, and the “Safe Torque off” (STO according to IEC 61508:1998, EN/ISO 13849-1:2006) safety function in a single assembly. Three variants are available:

The **Lexium ILA**, with a servo motor, delivers a high degree of flexibility. It generates high torque even during acceleration. Different winding types are available for application-specific requirements.

The **Lexium ILE**, with an electronically commutated motor, offers maximum flexibility. The 3-phase synchronous electronic electronically commutated brushless DC motor has a high holding torque of up to 8 Nm (with spur I gear drive), often eliminating the need for a holding brake. The integrated electronics communicate absolute position as to the automation controller.

The **Lexium ILS**, with a step motor, is the most precise of the three. The 3-phase step motor generates high torque at low speeds. This often eliminates the need for gear reduction, permitting space saving direct drive solutions. The Lexium ILS is the optimal solution for high resolution positioning with good synchronization. Commissioning involves minimal effort -- the user merely needs to adjust the power supply.

All integrated Lexium drives can communicate via Profibus DP, CANopen, or DeviceNet.



- 40% less wiring required
- 25% less cabling required
- Three different motor technologies enable optimal adaptation to each application
- Can be used with popular field buses
- Simple installation and commissioning
- Integrated safety thanks to safety function
- Safe Torque off (STO according to IEC 61508:1998, EN/ISO 13849-1:2006)



Lexium integrated drives:
Three variants with three different motors

Technical Data

Motor	Speed range[rpm] (direct drive) [1/min]	Continuous torque (direct drive) [Nm]	Peak torque (direct drive) [Nm]	Encoder	Holding brake	Optional gearing
ILA servo motor drive	< 7500	< 0,26	< 1,62	High-resolution encoder (16384 increments)	Yes	Planetary gear unit (Gear ratios from 3:1 to 40:1)
ILE EC motor drive	< 5000	< 0,24	< 0,80	Hall sensors	No	Cylindrical and planetary gear unit (Gear ratios from 18:1 to 115:1)
ILS step motor drive	< 2000	< 6	< 6	With or without index pulse encoder (optional)	Yes	Planetary gear unit (Gear ratios from 3:1 to 8:1)

Further information available
at www.schneider-electric.com

Subject to modifications

Altivar® 312/71

Variable frequency drive

The Altivar family of variable frequency drives offers optimal price and functionality for every speed control application. The Altivar 312 is ideal for simple machines with a power range of up to 15 kW. For more complex machines with higher performance, the Altivar 71 with its power range of 0.37 to 1300 kW is the right solution.



Altivar:
Variable frequency drives for both simple and complex machines; pictured are the ATV 71 and ATV 312 models



The Altivar 312 and 71 models are suitable for applications such as packaging, transportation, conveyors, positioning systems, or textile machines. This makes them ideal for PacDrive automation solutions. Time saving Function Blocks for integrating these frequency drives

are provided in PacDrive software library. Both models can communicate via Mod bus or CANopen, and both can be connected to Profibus, Ethernet/IP, and DeviceNet via integrated communication cards.

- Wide performance range
- Integrate easily into PacDrive automation system
- CANopen integrated, additional field bus options available for ATV 71 variable frequency drive

Technical Data

Altivar type		ATV 312	ATV 71
Power range in kW (50...60 Hz power supply)	Single-phase 200...240 V	0,18...2,2	0,37...5,5
	3-phase 200...240 V	0,18...15	0,37...75
	3-phase 380...480 V	–	0,75...1300
	3-phase 380...500 V	0,37...15	–
	3-phase 525...600 V	0,75...15	–
Output frequency in Hz		0,5...500	1...1600 Hz bis 37 kW, 1...500 Hz von 45...500 kW
Short-term overload moment in % of the rated motor moment	for 2 s	170-200	220
	for 60 s	170-200	170
Communication	integrated	Modbus, CANopen	Modbus, CANopen
	optional	Ethernet TCP/IP, DeviceNet, Profibus DP	Ethernet TCP/IP, Modbus Plus, Profibus DP, Uni-Telway, DeviceNet, etc.

Further information available at www.schneider-electric.com

Subject to modifications

Lexium SD328

Step motors on the field bus

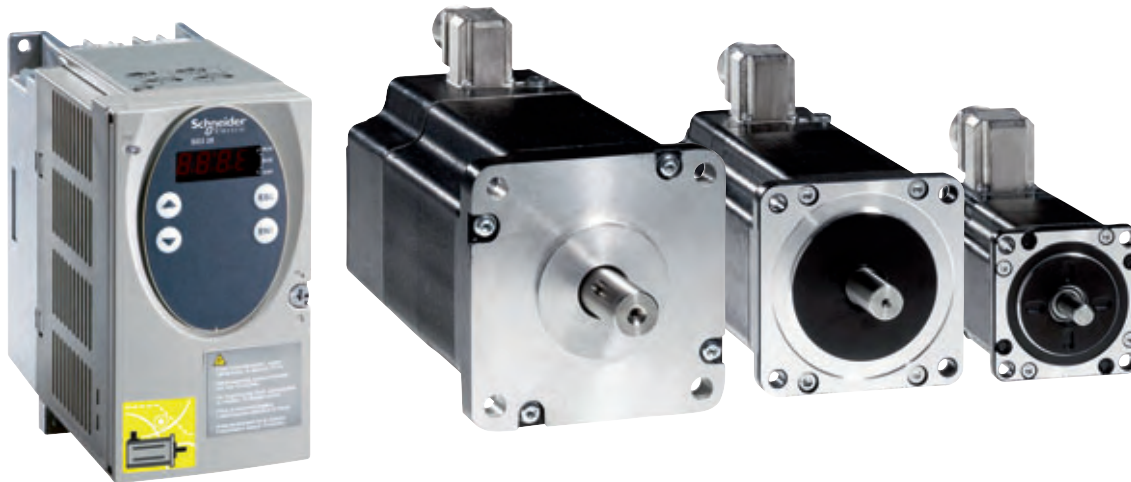
The Lexium SD328 step motor drive is a powerful positioning solution for communication via Profibus, CAN, and CANopen. The different variants are designed for holding torques of 17 to 19.7 Nm. The safety function "Safe Torque Off" (STO according to IEC 61508:1998, EN/ISO 13849-1:2006) is already integrated in the device. Drives are available in up to 6.8 A. The SD328 is suitable for a power supply with 1~115 VAC and 230 VAC (50/60 Hz). A power filter is integrated, and current is reduced automatically at zero speed. The SD328 can also be supplied with motion monitoring on request.



Lexium SD328

step motor drives:

Compact plug-and-play solutions with minimal space requirements in the control cabinet



Technical Data

3-phase step motor type	Step motor drive 115 V/230 V	Holding torque at zero speed	Maximum torque	Maximum speed (RPM)
	Type	[Nm]	[Nm]	[1/min]
BRS368/50 LWx	SD328 x U25 (2,5 A)	1,7	1,5	2000
BRS397/50 LWx		2,3	2,0	2000
BRS39A/50 LWx		4,5	4,0	2000
BRS39B/50 LWx		6,8	6,0	2000
BRS3AC/50 LWx	SD328 x U68 (6,8 A)	13,5	12,0	2000
BRS3AD/50 LWx		19,7	16,5	2000



- Plug-and-play without encoder systems and commissioning software.
- Excellent synchronization
- High torque even at low rotational speeds
- Integrated safety functionality:
(STO according to IEC 61508:1998, EN/ISO 13849-1:2006)

Further information available at www.schneider-electric.com

Subject to modifications

TeSys® U

Motor starter technology

TeSys U motor starters are an economical combination of motor overload switch and power protection in one device. Basic devices for direct or reversing starters (each available in 12 A and 32 A variants) combined with one of the six available motor control units create a complete, flexible solution. This multifunctionality saves space in the control cabinet, reduces the need for cabling, and simplifies logistics by reducing the number of components. Software Function Blocks also make it easier to integrate into PacDrive solutions.



TeSys U:

Reduced space and cabling thanks to the combination of motor protection switch and power protection

Advantys™

Distributed I/O systems

The Advantys family of products offers solutions for a variety of needs: Advantys OTB is an economical distributed I/O solution with an IP 20 protection rating, designed especially for small, compact machines. Advantys STB - also with an IP 20 protection rating - is a distributed, open I/O system that can be expanded to a maximum of 32 modules.

The Advantys FTM and FTB series offer IP 67 rated distributed I/O technology. The FTB series includes compact I/O units in various I/O combinations, with plastic or metal housings. By contrast, the FTM system is flexible enough to combine any number of I/O submodules as needed to create a customized I/O unit. Both Advantys series have integrated channel and module diagnostics, and are compatible with sensors/actuators having an integrated diagnostics function (DESINA).



Advantys OTB



Advantys STB



Advantys FTB



Advantys FTM



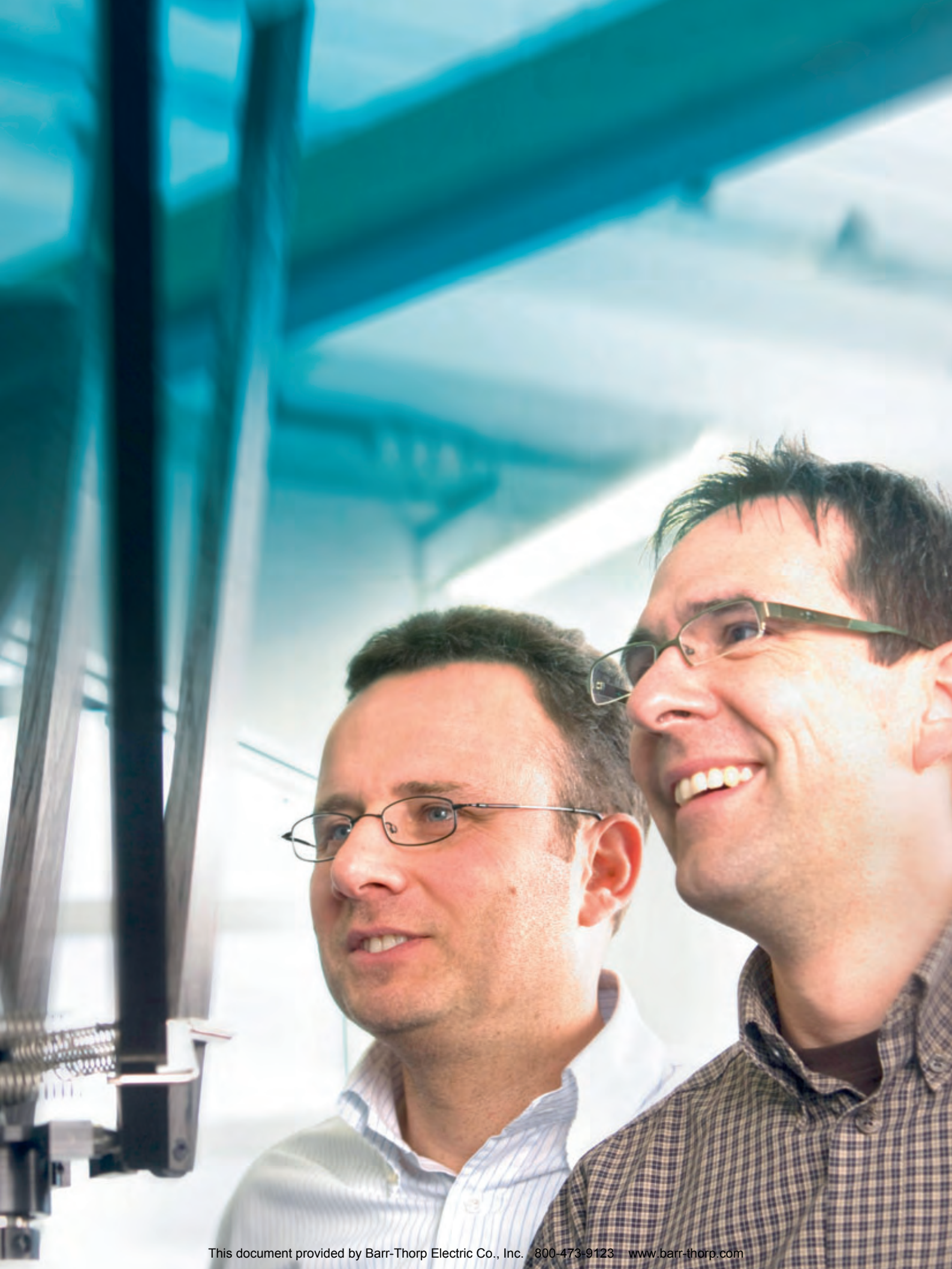
Distributed I/O technology, IP 20 rated:

Advantys OTB offers an economical solution for small, compact machines. With I/O units consisting of up to 32 individual modules, Advantys STB is the universal solution



Distributed I/O technology, IP 67 rated:

Cost effectiveness is the determining factor in choosing between the FTB series modules and the customizable FTM design



Safety functions for the entire machine

With a broad range of components for safe* signal recording, signal processing and dialog, comprehensive safety designs can be implemented in PacDrive automation solutions. The resulting safety functionalities meet current standards.

Signal processing

The Preventa™ product line of safety controllers and components includes a large selection of compact safety controllers and components, compact distributed safety I/O modules, and modular safety components. The devices' safety level fulfills requirements up to SIL 3 (Safety Integrity Level) in accordance with IEC 61508:1998 or IEC 62061:2005 and PL e (Performance Level) in accordance with EN ISO 13849-1:2006 or Category 4 according to EN 954-1:2004.

For small to midsize applications, for example, the Preventa XPS-AV safety module enables integration of the 'Safe Stop 1' (SS1)** and 'Safe torque off' (STO)** functions in PacDrive automation systems. The safety component is suitable for monitoring up to six positions or emergency stop switches. It has three status outputs and a number of diagnostics options. Sixteen different times can be set.

The BBH SMX Series modular safety controls can be used if the 'Safe Stop 2' (SS2)**, 'Safe Operating Stop' (SOS)** and 'Safely-Limited Speed' (SLS)** functions are also required for individual servo axes. The SMX safety controllers have an extremely fast response time of 4 ms. Interface modules for CAN or Profibus DP as well as an I/O expansion are available for both SMX variants. The safety functions, which can be implemented in combination with MC-4 servo drives, meet the requirements of SIL2 and PL d/Cat. 3.



Safe* signal processing:
The Preventa line of safety controllers and components offer scalable logic and I/O functionality



**Preventa XPS-AV:**

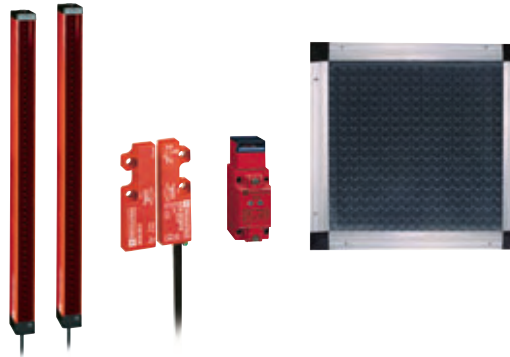
Safety component for creating safe automation solutions with the SS1 and STO safety functions

**Modular System:**

The SMX 11 safety switch devices (capable of monitoring one axis) or SMX 12 (capable of monitoring two axes) can be supplemented with field bus interface modules and an I/O assembly

Signal recording

Helping to ensure secure recording of signals, the Preventa program offers safety position switches, coded magnetic safety switches, a coded magnetic safety system, safety light curtains, and safety switch mats. The range of individual products included in this product series is suitable for a wide range of tasks, including the securing of doors, covers, and protective zones.

**Safe signal recording:**

With pullcord emergency switches, emergency stop buttons, enabling switches or foot switches as well as two-hand control units, the program includes all common solutions for safety related operating devices

Dialog

The Safe Dialog components of the Preventa product line offer a wide spectrum of solutions for safe operation and for triggering safety related responses. They cover the entire range of possibilities, from circumvention resistant emergency stop buttons, two-hand control consoles, foot operated and pullcord emergency switches, to enabling switches and operating mode switches.

**Safe dialog:**

With pullcord emergency switches, emergency stop buttons, enabling switches or foot switches as well as two-hand control units, the program includes all common solutions for safety related operating devices

**Overview:**

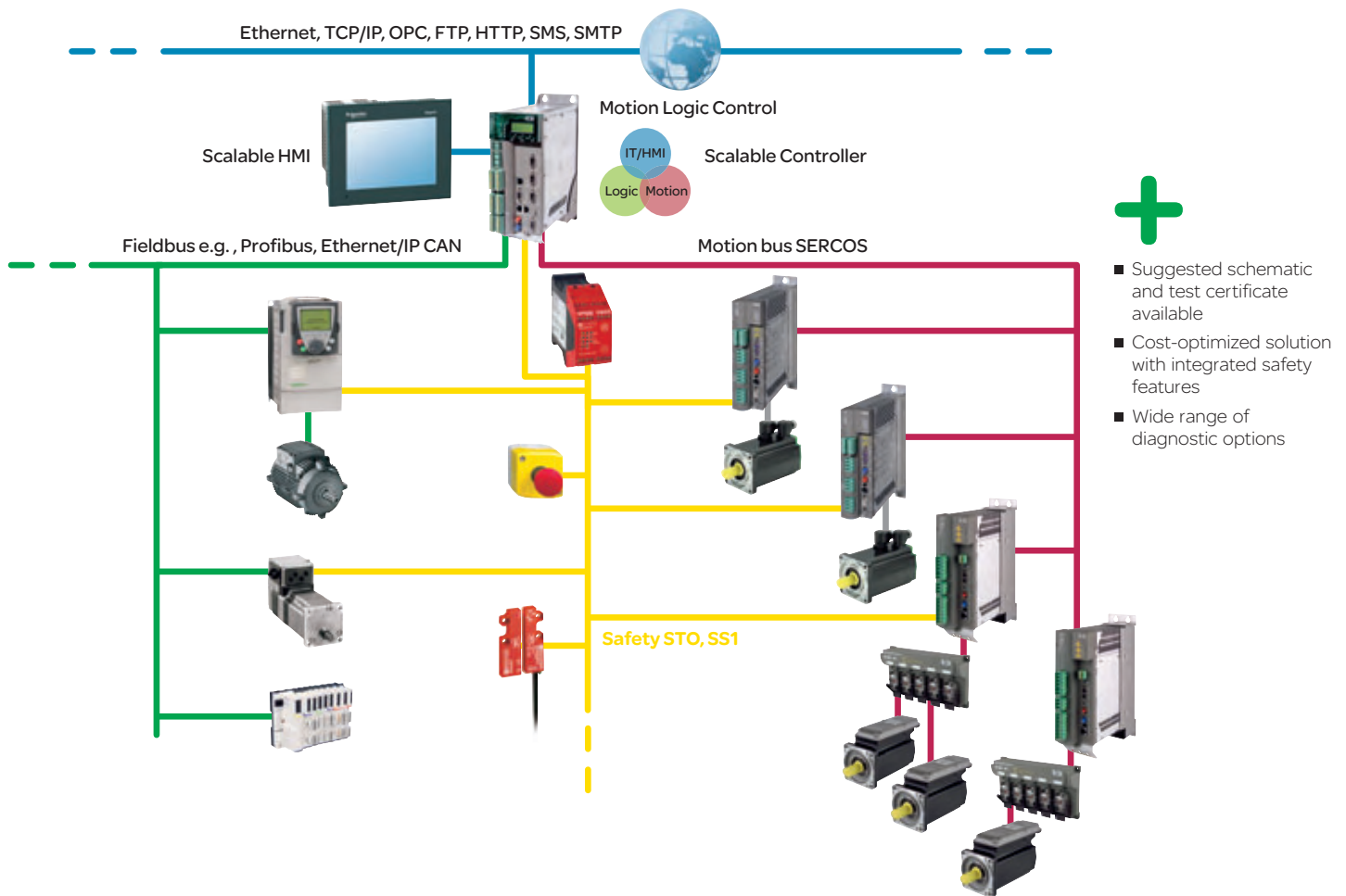
Safety functions that can be performed by Preventa XPS-AV and BBH SMX 11 or SMX 12

Function **	Pac Drive with		
	Preventa XPS-AV 1113Z002	SMX 11 bzw. SMX 12	
Safe Torque Off (STO)	✓	✓	Basic safety functions (Suggested schematic available)
Safe Stop (SS1)	✓	✓	
Safe Operating Stop (SS2, SOS)	-	✓	Enhanced safety functions (Suggested schematic available)
Safely-Limited Speed (SLS)	-	✓	
Safe Direction (SDS)	-	✓	Enhanced safety functions
Safely Limited Position (SLP)	-	✓	
Safe Maximum Speed (SMS)	-	✓	
Safely Limited Increment (SLI)	-	✓	
Safely Monitored Shutdown (SMD)	-	✓	
Safe I/Os (S IO)	-	✓	

Further information available at www.schneider-electric.com

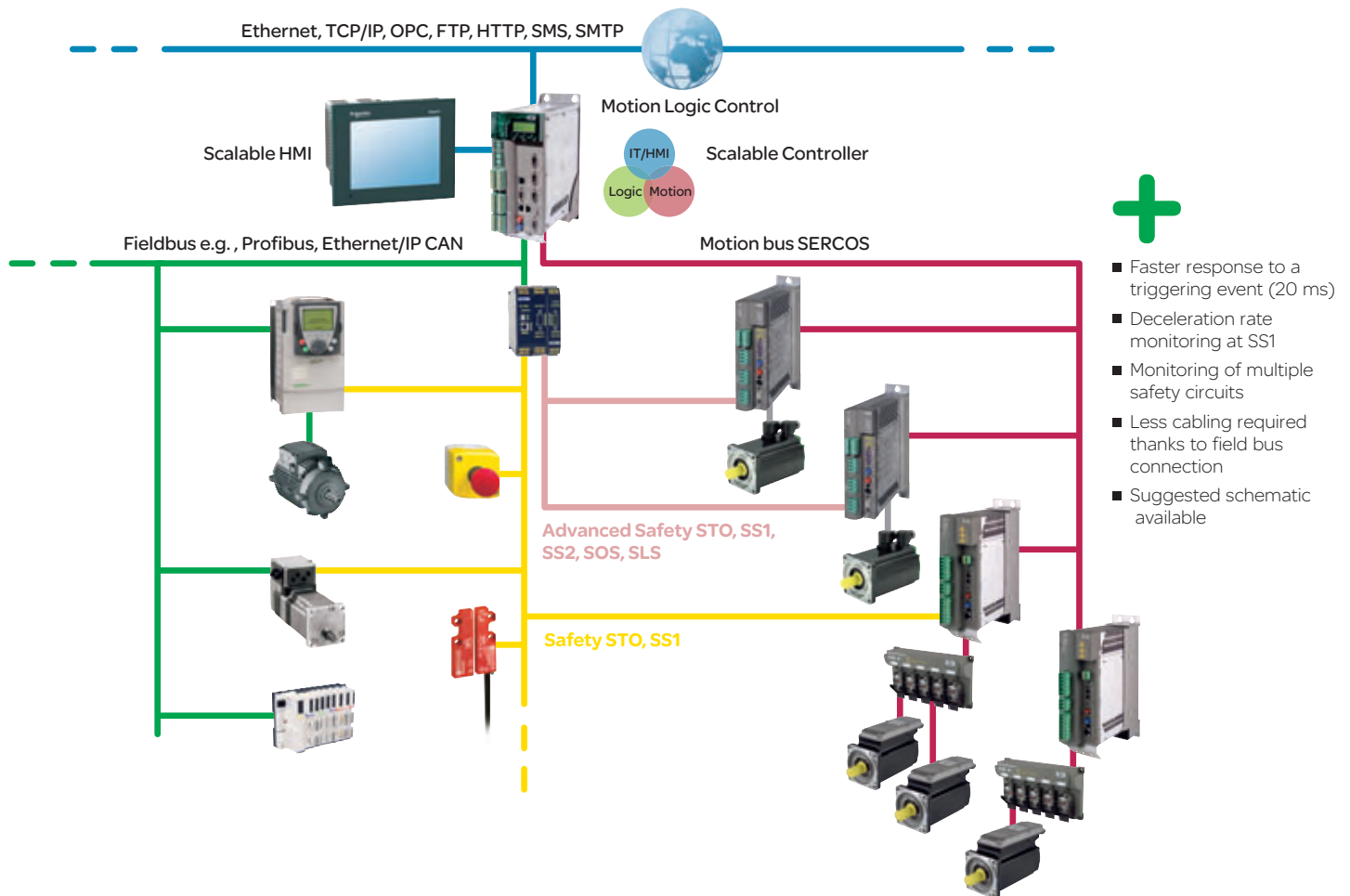
Basic Safety Functions SS1 and STO for PacDrive automation solutions

The 'Safe Stop 1' (SS1)** and 'Safe Torque off' (STO)** safety functions can be implemented with the Preventa XPS-AV safety module for all PacDrive servo motors and drives as well as for Lexium drive and positioning solutions and for Altivar variable frequency drives on a field bus. The SS1 and STO functions are required for machine shutdown in an emergency (emergency stop), Stop Category 0 and 1 according to EN 60204. A suggested schematic and a test certificate are available for Preventa XPS-AV safety solutions.



Advanced safety functions SS2, SOS, and SLS for PacDrive automation solutions

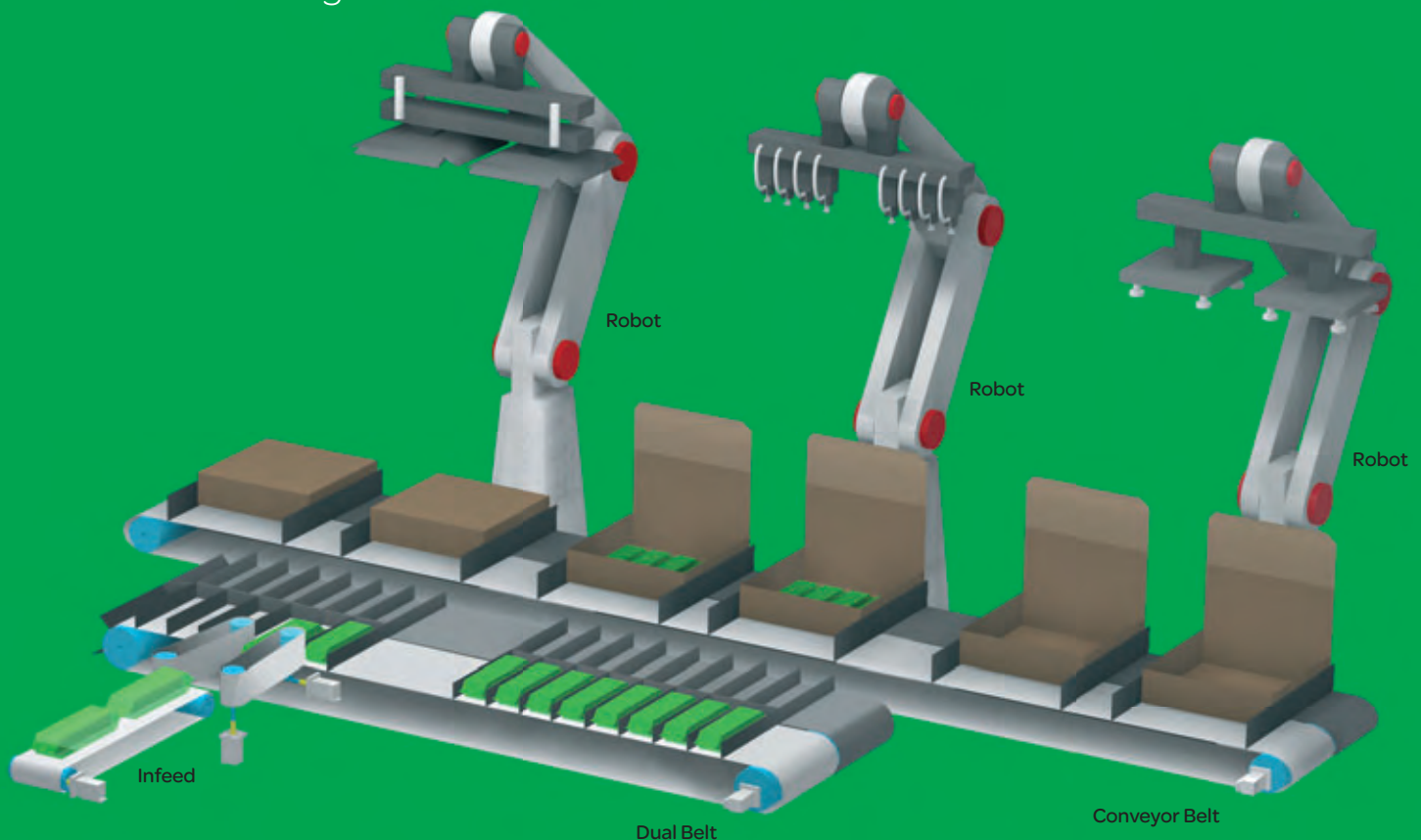
If the safety functions ‘Safely-limited Speed’ (SLS)**, ‘Safe Stop 2’ (SS2)**, and ‘Safe Operating Stop’ (SOS) are required in addition to the safety functions SS1 and STO for individual servo axes, these can be implemented with the safety switch devices found in the BBH SMX series. Safe Operating Stop can also be created with explicit deceleration rate monitoring. Thanks to the rapid 4 ms response times of the SMX11 and SMX12, it is possible to achieve servo drive responses of less than 20 ms to a triggering event. If necessary, users can monitor multiple protection circuits if emergency shutoff functions and protective doors affect different drives. A suggested schematic is also available for safety solutions with SMX assemblies.



** according to IEC 61800-5-2:2007

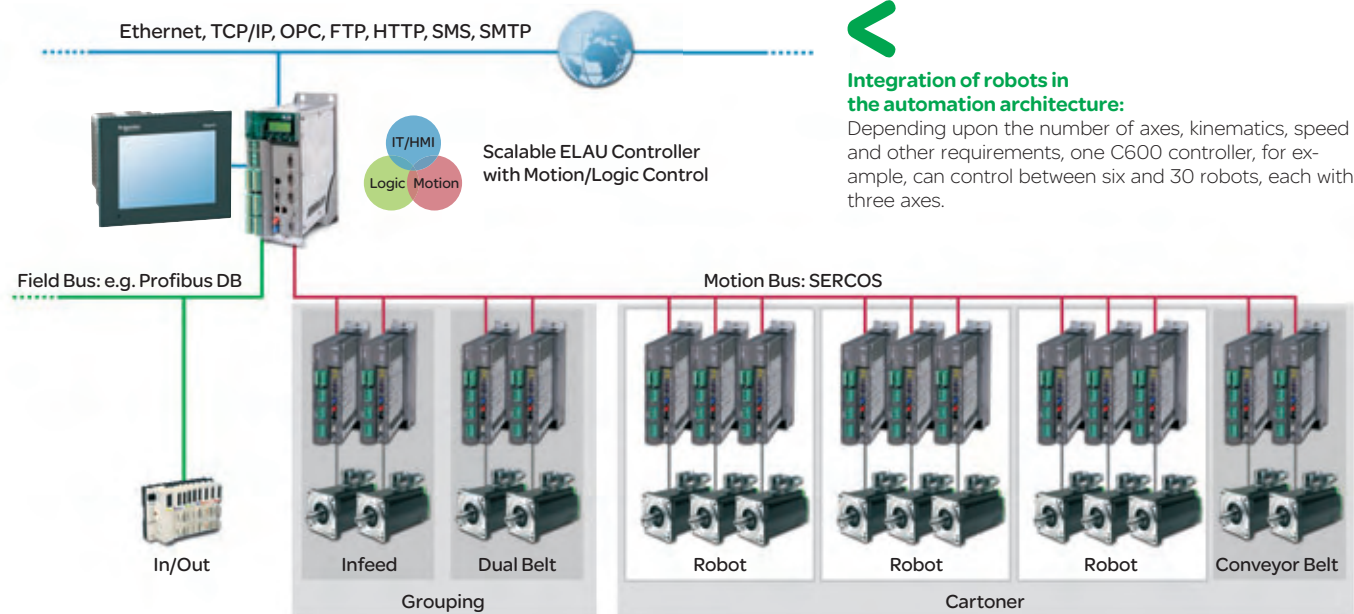
Robotics Integration

The integration of robotics into the machine control solution is one of the outstanding aspects of the PacDrive automation system. On the software side, the integration of robots is made simpler by an IEC-compliant library with Equipment Modules (Ems) and Application Function Blocks (AFBs) for motion programming and transformation to all commonly used kinematics. Thanks to the availability of complete robot arm mechanics, there is also no longer any need to develop customer-specific kinematics or to integrate third-party products. This permits even faster creation of robot-enabled machine designs.



Integral automation structure components

The PacDrive system supports an almost unlimited variety of kinematic configurations, allowing robotics to become an integral part of a machine's automation architecture. The high performance C400 and C600 automation controllers are capable of synchronizing up to 16 or 99 axes respectively into a real-time multiaxis system. From the controller perspective, therefore, a robot is reduced to a motion control system with a corresponding number of servo axes, which can operate under demanding real-time conditions. In this way, the controller can manage one or more robots in addition to other machine functions within an IEC 61131-3-compliant program.



- One controller can control machines and multiple robots
- Software integration using Function Block library
- Fully integrated IEC 61131-3-compliant software, no additional programming tools
- Easy access to process parameters
- One development environment for machines and robots
- Transformation modules for popular robot kinematics: Gantry, Scara, Portal, Articulated, Delta

Easy software integration thanks to AFB and EM libraries

The integration of robots into the PacDrive automation solution software almost completely eliminates complex software algorithms. The robots are mapped onto a software module, which is then inserted into modular, IEC-61131-3-compliant program structures, just as with other mechatronic machine modules. This structure is based upon library Function Blocks that are parameterized by the user or "fed" with motion data in the form of a program or a table. Once the motion paths have been defined, parameters can be specified in order to limit the acceleration forces that act on the transported product. The option to specify blending parameters provides further potential for optimizing the motion paths. The controller performs all of the other functions, up to actuation of the actual robot axes, based upon library Function Blocks.

Transformation modules for PacDrive and standard kinematics

In the PacDrive robotics solution, motion programming and its transformation to robot kinematics are separate processes. This means that the robot kinematics can be selected independently of the generated motion program. Regardless of whether the project uses standard kinematics developed by the customer, by third-party suppliers, or PacDrive mechanics (Delta-2, Delta-3, and portal kinematics are currently available), the appropriate transformation module adapts the selected solution to the motion program.



PacDrive robot mechanics -- P4 (upper right), MAX R (center-right), MAX P (center left) or custom designed kinematics:

Available transformation modules incorporate all typical kinematics into the controller software



Delta 2



Delta 3

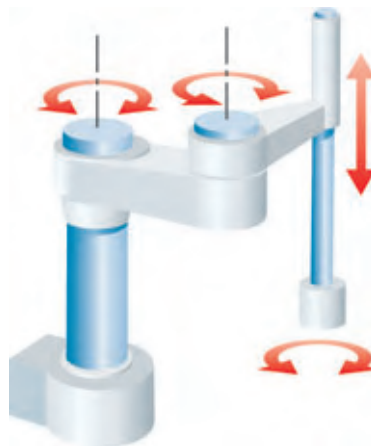


Gantry

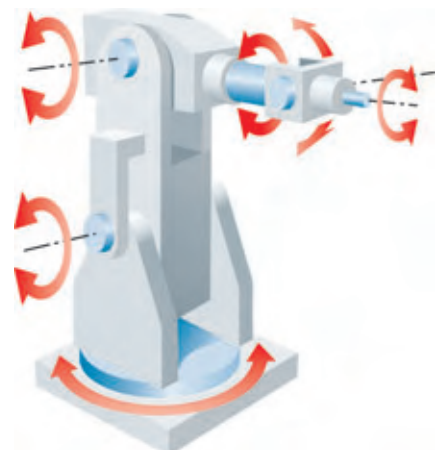


Portal

In addition to transformation modules mapped to these kinematics, a universal transformation module is also available for custom designed or third party kinematics, so that various robots can be controlled with ELAU controllers



Scara



Articulated



P4

Complete robotics packages for Delta 3 kinematics

Everything fits together: Robot mechanics, servo systems, and robotics library provide a ready-to-use solution. In addition, complete packages, including engineering, can accelerate the integration of robotics into an application.



P4 delta-3 robot kinematics:
With standard motors, available in washdown configuration up to IP 65

The P4 **delta-3 robot** (P4s-F standard version), featuring full stainless steel construction, is designed for pick & place applications. The software includes a preprogrammed interface for integration of the most commonly encountered vision solution. The P4 can be equipped with an optional rotational axis (P4s-R). The P4 robot arm is driven by conventional motors with cabinet-mounted servo drives (P4s-F or P4s-R) or by intelligent servo modules with integrated control electronics (P4i or P4i-R). Thanks to their IP 65 rated washdown configuration, the P4s-F and the P4s-R are also suitable for hygienic environments.

Type	P4s-F / P4s-R	P4i-F / P4i-R
Load capacity	1,5 [kg]	
Speed max.	10 [m/sec]	
Max. acceleration at 1kg	100 [m/sec ²]	
Max. acceleration at 1.5kg	75 [m/sec ²]	
Number of axes	3 (4*)	
Repeatable position accuracy	+/- 0,1 [mm]	
Work envelope height	225 [mm]	
Work envelope diameter	1200 [mm]	
Work envelope rotation*	Unlimited	
Protection rating	IP 65	—

* including rotational axis in the R version

Constantly updated data available at www.elau.de/robotics

Linear Motion

Single and multiaxis systems for linear motion



Portal axes:

Left: PAS S (spindle drive), center: PAS B (timing belt drive) and right: TAS linear table



The modular linear motion system consists of basic elements and complete solutions for a variety of 1, 2, and 3 dimensional motion tasks. Thanks to its fully modular structure, all elements can be configured as needed. The length and stroke of each axis system is individually determined.



Cantilever axes:

Left: CAS (round rod axis), right: CAS 4x (profile axis)



Portal axes in various sizes, with timing belt drive or spindle drive as desired, can move loads of up to 100 kg. The structural elements of these linear tables are extremely rigid, and the overall assembly has very compact dimensions. Cantilever axes with round rods or an extruded aluminum profile design are particularly well suited for limited spaces. Thanks to the fixed motor and moving body of the axis, cantilever axes can move flexibly into the work envelope.



MAX H double-axis system:

Designed for positioning over long distances

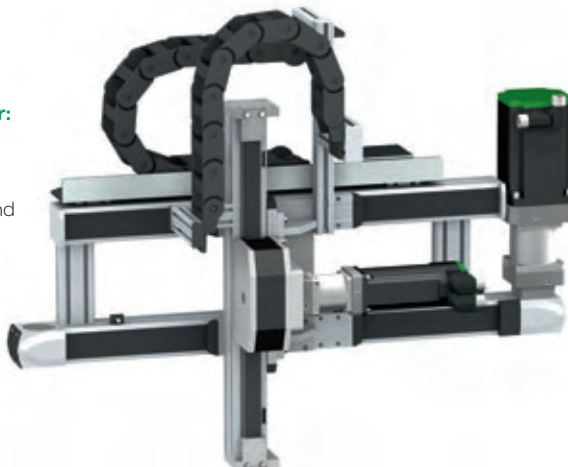


Double-axis systems move loads with great flexibility and speed across distances of up to 5 1/2 meters. They also serve as a basis for complete solutions for multidimensional motion tasks:



MAX P linear positioner:

The combination of double axis system and cantilever axes can be mounted both above and below the workspace.



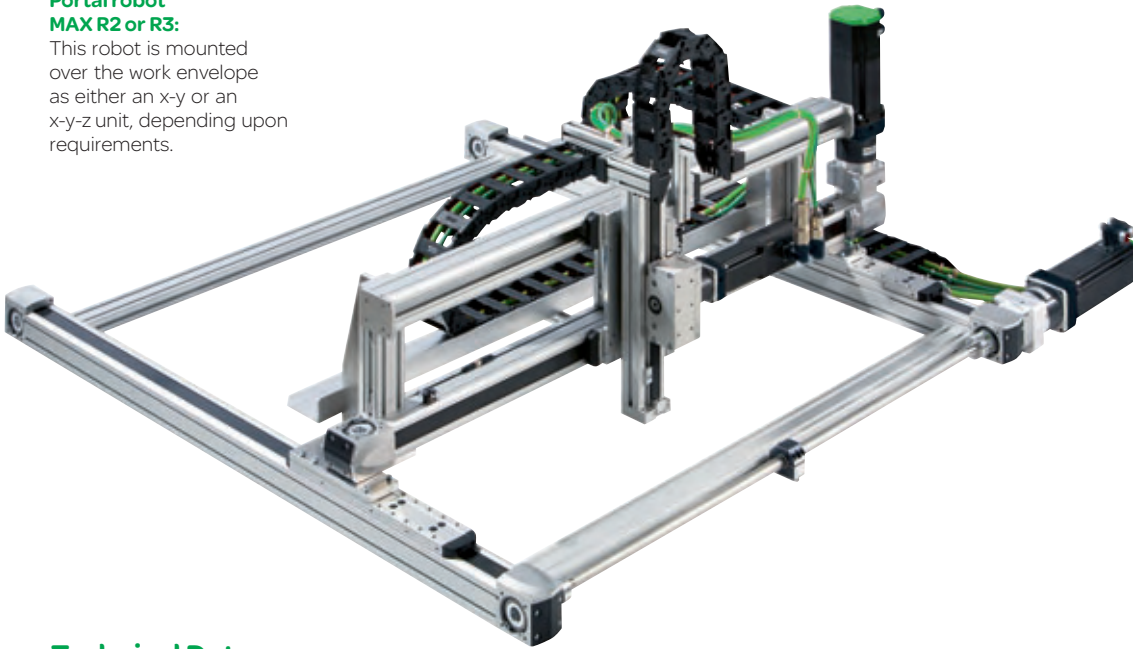
The MAX P linear positioner, a combination of double-axis system and cantilever axis, moves up to 50 kg with a high level of precision.

The MAX R portal robot with two servo axes and the MAX R 3 with three servo axes are the top-of-the-line designs for the modular linear motion system. A rotational axis can also be integrated as an option.

PacDrive offers complete or adaptable transformation modules for all conceivable variants of up to five axes for integrating robotic solutions into a machine's program structure.


**Portal robot
MAX R2 or R3:**

This robot is mounted over the work envelope as either an x-y or an x-y-z unit, depending upon requirements.



- Mechanics packages available for delta-3 and portal kinematics
- Fully compatible components
- Support and service from a single source for the entire automation solution
- Complete package of mechanics and engineering support available upon request

Technical Data

	Single-axis systems					
	PAS B	PAS S	TAS	CAS		
	Portal axis	Portal axis	Linear table	Cantilever		Telescoping axis
Design				Profile	Round rod	Profile
max. load [kg]	100	100	150	50	18	35
max. stroke [mm]	5500	3000	1500	1200	500	2400
Positioning speed [m/s]	8	1,25	1	5	2	5
Guides	Roller bearings/ball bearings	Ball bearings	Recirculating ball bearings	Roller bearings/Recirculating ball bearings	Recirculating ball bearings	Roller bearings/Recirculating ball bearings
Version				Profile	Round rod	Profile
Drive element	Timing belt	Spindle	Spindle	Timing belt	Timing belt	
	Double-axis and Multi-axis systems					
	MAX H	MAX S	MAX P	MAX D	MAX R2	MAX R3
	Double-axis system		Linear positioner		Portal robot	
Axes	1	1	2	2/2	2	3
max. load [kg]	250	300	50	2/5	137	50
max. stroke in x [mm]	5500	5500	5500	300/700	5500	5500
max. stroke in y [mm]	–	–	–	–	1500	1500
max. stroke in z [mm]	–	–	1200	150/300	–	1200

Further information available at www.schneider-electric.com

Recording, notification, and power distribution and switching

Schneider Electric offers an extensive product line of standard and auxiliary electrical equipment for machine construction, production lines, and entire production facilities: Power supplies, mounting and cabling systems for low voltage and medium voltage applications, control and signalling units

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Compact NSX circuit breaker:

Enhanced measurement and communication functions starting at 16 A



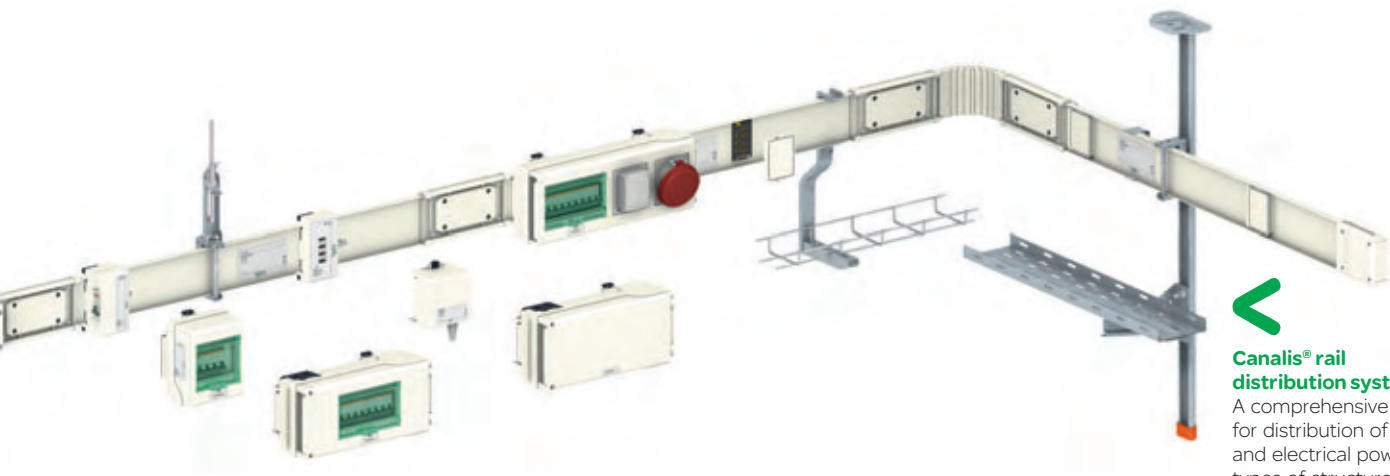
GV3 motor protection switch:

Triggers at motor currents of 9 to 65 A, with thermomagnetic or magnetic triggers if needed



Canalis® rail distribution system:

A comprehensive system for distribution of lighting and electrical power in all types of structures, from 20 to 4000 A





Switchgear and controlgear systems:
Switchgear and controlgear systems for individual solutions; shown at right: Okken in withdrawable-unit design up to 7300 A



Altistart® 01 und 48:
Soft starters for AC induction motors and three-phase AC induction motors for 0.18 to 630 kW, ideal for use in combination with Altivar ATV 312 and ATV 71 frequency converters



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Line and device protection as well as monitoring in many variants





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ELAU GmbH
Headquarters
Dillberg 12-16
97828 Marktheidenfeld
Germany
Phone +49 9391 606-0
Fax +49 9391 606-300
info@elau.de
www.elau.de

ELAU North America
+1 847 490-4270
info@elau.com
www.elau.com

ELAU UK
+44 1908 6280-14
info@elau.co.uk
www.elau.co.uk

ELAU Italy
+39 051 62767-11
info@elau.it
www.elau.it

ELAU France
+33 1 6959 14-14
info@elau.fr
www.elau.fr

ELAU Scandinavia
+46 42 2577-60
info@elau.se
www.elau.se

ELAU Switzerland
+41 62 85520-00
info@elau.ch
www.elau.ch

ELAU BeNeLux
+31 40 2350 710
info@elau.nl, www.elau.nl
info@elau.be, www.elau.be

ELAU China
+86 512 628773-29
info@elau.cc
www.elau.cc

Further Information
is available from
www.elau.com