

NEW: MOVI-C®
Modular automation system

The future of automation



NEW:
MOVI-C®, the modular
automation system
for complete solutions from a single source

MOVI-C® is the complete solution for automation tasks. Whether you're implementing standardized single- or multi-axis applications or customized and/or particularly complex applications from the areas of motion control or automation, MOVI-C® makes everything possible.

How you benefit: MOVI-C® is the all-in-one modular automation system; from the software for planning, startup and operation to the electronic control components, mechanical drive and gearmotor – SEW-EURODRIVE delivers every automation component you need from a single source. And each can naturally be fully integrated into all automation concepts.

MOVI-C® – automation from a single source – from a single automation specialist:

Four modules

- 1. Engineering software**
- 2. Control technology**
- 3. Inverter technology**
- 4. Drive technology**

form a complete modular automation system with components you can combine to best meet your needs.



www.sew-eurodrive.de/en/movi-c





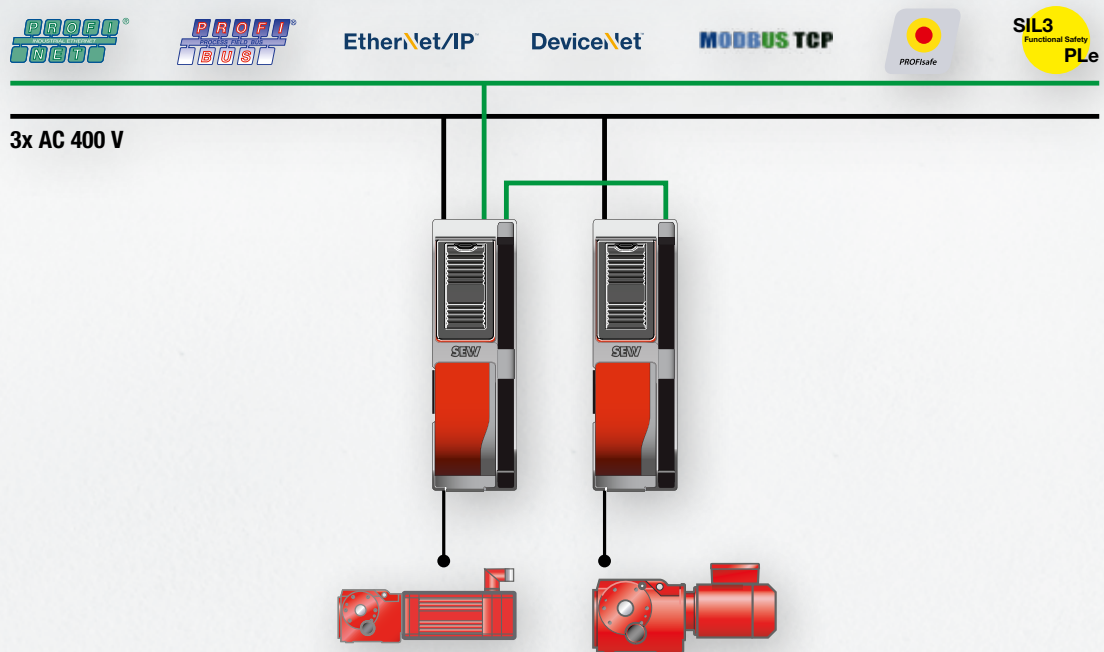
MOVI-C®, the all-in-one solution for any topology

1 Single-axis automation

The MOVIDRIVE® technology application inverters are directly connected with the higher-level controller via fieldbus interfaces. Predefined MOVIKIT® software modules are used to implement the drive function quickly and reliably using graphical editors. Each axis is controlled indi-

vidually. A memory card in the MOVIDRIVE® application inverter is used for data management.

Typical application: Material transportation

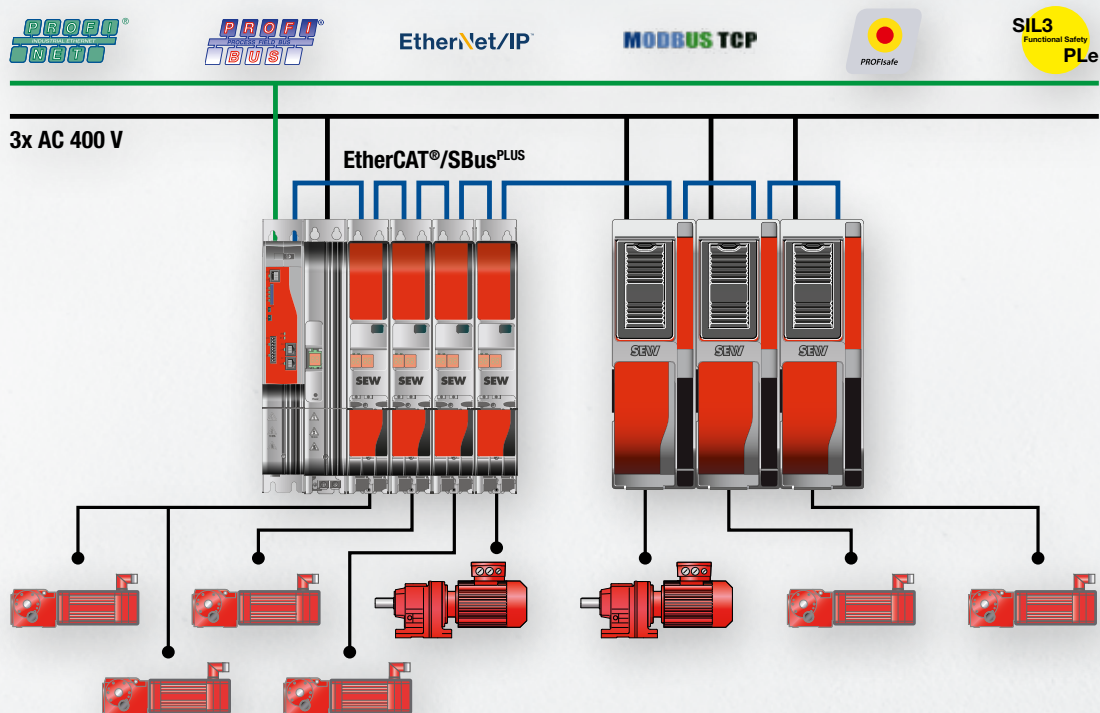


2 Motion Control

The MOVIDRIVE® modular and MOVIDRIVE® system application inverters are connected to the MOVI-C® CONTROLLER via EtherCAT®/SBus^{PLUS} with real-time capability. The MOVI-C® CONTROLLER receives setpoints from the higher-level controller via fieldbus for single-axis or coordinated movements. The MOVI-C® CONTROLLER determines the setpoints for the connected application inverters and in this way performs tasks, such as phase-synchronous operation, electronic cam function, or kinematics. Predefined MOVIKIT® software modules are used to implement the

motion control drive function quickly and reliably using graphical editors. More than 50 kinematic models are available that cover a great number of mechanical arrangements. New kinematic models can be custom-made by SEW-EURODRIVE. A memory card in the MOVI-C® CONTROLLER is used for data management.

Typical application:
Multiple column hoists, tripod mechanics, robots

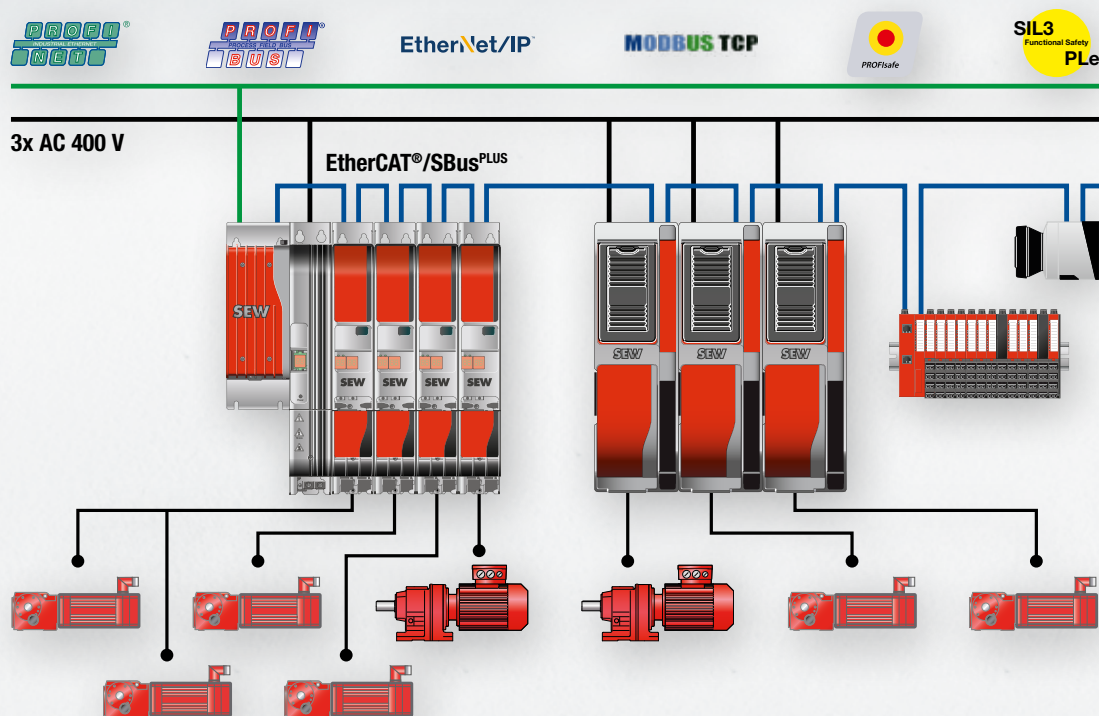


3 Module automation

All drive functions of the motion control topology are available in the module automation topology. In addition to the graphical editors for the drive functions, some or all automation tasks of the higher-level controller can be performed easily and flexibly using the programming system (IEC 61131) in the MOVI-C® CONTROLLER. In addition to the MOVIDRIVE®

application inverters, any EtherCAT® devices can be integrated for automation.

Typical application: Packaging machines, processing machines, complex transportation tasks

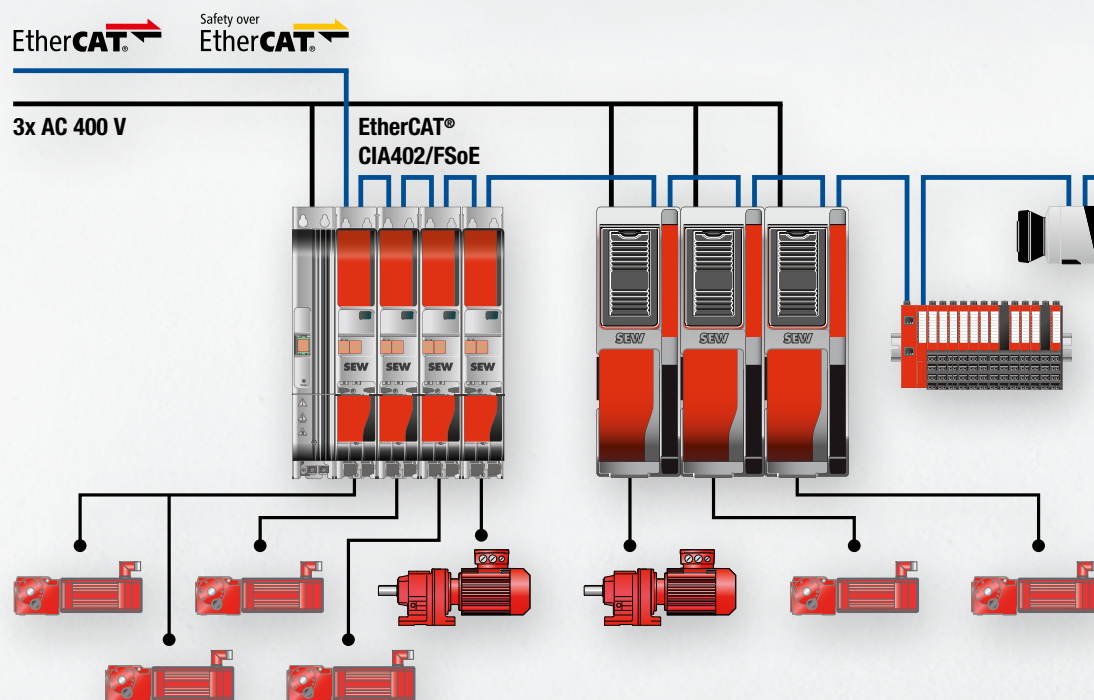


4 EtherCAT® Motion Slave

The CiA402 profile for controlling inverters has established itself in plants with very individual motion control functions that are calculated in the higher-level controller. For control via CiA402, the MOVIDRIVE® modular and MOVIDRIVE® system application inverters can be directly connected to the controller using the integrated EtherCAT® interface. This means inte-

gration into the higher-level controller is particularly fast, simple, and without extensive conversion effort.

Typical application: Series machines with many axes, kinematic calculation in the higher-level PLC



In all topologies, the higher-level controller uses safe communication to activate safety functions that are executed in the MOVISAFE® CS..A safety card in the application inverter.

Module 1

Engineering software: MOVISUITE®

Save time and cut costs

MOVISUITE® sets new standards for engineering software in drive technology. In addition to marked savings in terms of time and cost thanks to accelerated engineering, the software is especially convincing for its unique usability: Planning, startup, operation and diagnostics are quicker and easier than ever before.



MOVISUITE® standard properties

- Startup and parameter setting of MOVIDRIVE® application inverters
- Startup and parameter setting of MOVISAFE® safety cards
- Optimized workflows for professional and occasional users
- Quick and easy familiarization for users thanks to state-of-the-art interactive design
- Intuitive handling of inverter functions such as manual mode and startup of the drive train
- Configuration and creating IEC programs for MOVI-C® CONTROLLERS
- Parameter setting and diagnostics for MOVIKIT® software modules
- Data management
- Project management
- Network scan and display of devices
- Scope function
- Electronic catalog for SEW-EURODRIVE products
- Comprehensive context-sensitive help function



Module 2

Control technology: MOVI-C® CONTROLLER

Cut complexity

The MOVI-C® CONTROLLER results in more flexible parameterization and less programming work. This is made possible by already standardized MOVIKIT® modules and the MOVIRUN® software platform, which help you reduce costs and complexity. What's more, the control technology is available in four different performance classes – power, power eco, advanced and standard. Further benefits include straightforward, centralized data management and an auto reload function for axis replacement. MOVI-C® CONTROLLERS can be used with all common control systems.



Hardware	Performance class MOVI-C® CONTROLLER standard	Performance class MOVI-C® CONTROLLER advanced	Performance class MOVI-C® CONTROLLER power eco	Performance class MOVI-C® CONTROLLER power
Features and equipment	<ul style="list-style-type: none"> – Straightforward and centralized data management – Can be connected to all standard control systems – High-performance and user-friendly – Auto reload function for axis replacement – Startup: MOVIRUN® software platform module for parameterization or programming – Operation: MOVIKIT® software modul function blocks for simple speed control, positioning, robotics, electronic cam, mechanically coupled axes, etc. – PROFIsafe routing to the axis modules – 1x Ethernet (10/100 BaseT) for engineering or TCP/IP and UDP via IEC 61131-3 – 1x EtherCAT® / SBus^{PLUS} Master 			
	<ul style="list-style-type: none"> – 1x CAN, non-isolated – PROFINET slave, EtherNet/IP™ slave, Modbus TCP/IP slave – Status display for PLC and fieldbus – SD memory card – ≤ 2 interpolating axes – ≤ 6 auxiliary axes 	<ul style="list-style-type: none"> – 2x CAN, 1 of which is electrically isolated – 1x RS485 – PROFINET slave, EtherNet/IP™ slave, Modbus TCP/IP slave – Status display for PLC and fieldbus – optional: Installation in a master module, can be added to MOVIDRIVE® modular – SD memory card – ≤ 8 interpolating axes – ≤ 8 auxiliary axes 	<ul style="list-style-type: none"> – PROFINET slave, EtherNet/IP™ slave, Modbus TCP/IP slave – 2 GB CFast memory card – ≤ 16 interpolating axes – ≤ 16 auxiliary axes – PC-based 	<ul style="list-style-type: none"> – PROFINET slave, EtherNet/IP™ slave, Modbus TCP/IP slave – 7x USB 2.0 – 2 GB CFast memory card – ≤ 32 interpolating axes – ≤ 32 auxiliary axes – optional: thanks to state-of-the-art Hypervisor technology, connected 2nd Windows 7 operating system embedded, e.g. for integrated visualization – PC-based

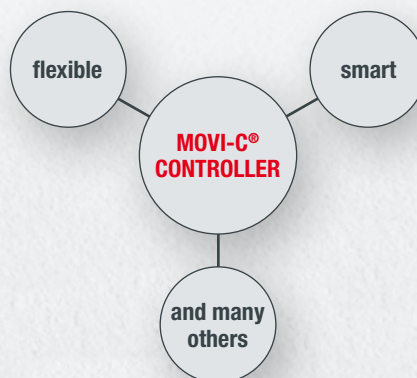
Module 2

Control technology software: MOVIRUN® and MOVIKIT®

Control applications more easily

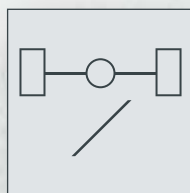
Software	MOVIRUN® The software platform for MOVI-C® CONTROLLER	MOVIKIT® The software modules for MOVI-C® CONTROLLER
Features and equipment	<p>Startup with MOVIRUN® flexible, the flexible and open platform</p> <ul style="list-style-type: none"> – Automation with MOVI-C® and third-party components – Interpolated operating modes for demanding motion control applications – State-of-the-art programming system (IEC 61131) – Ready-to-use: MOVIKIT® software modules can be integrated into the user program <p>MOVIRUN® smart, the intelligent, purely parameterizable motion control platform</p> <ul style="list-style-type: none"> – Parameterization instead of programming – Ready-to-use: MOVIKIT® software modules can be easily connected to higher-level controllers via the defined fieldbus interface – No additional programming work – Guaranteed, documented functionality 	<p>Operation with MOVIKIT®</p> <p>For simple drive functions all the way to complex motion control functions</p> <ul style="list-style-type: none"> – Graphic configuration and diagnostics – Available for MOVIDRIVE® technology, MOVIRUN® smart as purely parameterizable solution with fieldbus connection and MOVIRUN® flexible for integration in the IEC program with user-friendly IEC interface <p>Modules:</p> <ul style="list-style-type: none"> – MOVIKIT® Velocity, Positioning – MOVIKIT® MultiMotion, MultiMotion Camming – MOVIKIT® MultiAxesController – MOVIKIT® Robotics – and many others
Advantages	<ul style="list-style-type: none"> – High functionality and intuitive user interface – Choose between parameter setting and programming – Parameterization instead of programming: <ul style="list-style-type: none"> - Startup shortened by using standardized software modules - Only parameters required for the application need to be entered - Guided parameter setting instead of complex programming - No lengthy familiarization, which means fast project planning and startup 	

MOVIRUN®
Software platform

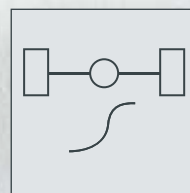




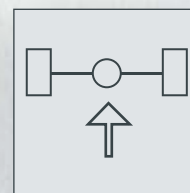
MOVIKIT®
software modules



Gearing



Camming



MAC

Module 3

Inverter technology: MOVIDRIVE®

Control every motor

MOVIDRIVE® application inverters control and monitor synchronous, asynchronous and linear motors, with and without encoders. They are available as a modular multi-axis system with single- and double-axis modules up to a rated current of 180 A, and as a single-axis application inverter with mains connection up to a rated power of 315 kW. The basic unit already incorporates the STO in PL e safety function. Safety option cards add over 15 extra safety functions. In addition to benefiting from extremely easy startup and exceptionally energy-saving operation, the application can be implemented quickly and easily using MOVIKIT® modules.



	MOVIDRIVE® modular	MOVIDRIVE® system	MOVIDRIVE® technology
Features and equipment	<p>One inverter family for all motors – they control</p> <ul style="list-style-type: none"> – Synchronous and asynchronous AC motors with/without encoder, as well as – Asynchronous motors with LSPM technology and – Synchronous and asynchronous linear motors <p>Available as</p> <ul style="list-style-type: none"> – Modular multi-axis system with single- and double-axis modules up to a nominal current of 180 A and – Single-axis application inverter with line connection up to a rated power of 315 kW <p>Their practical benefits:</p> <ul style="list-style-type: none"> – Extremely easy startup using electronic nameplate or electronic catalog – Easy startup of unknown motors using calibration function – Energy-saving functions for partial-load operation and standby mode – Achieve your goal faster and more easily: ready-made MOVIKIT® software modules are available for a multitude of applications 		
	<p>Features of all MOVIDRIVE® types</p> <ul style="list-style-type: none"> – Multi-encoder input in the basic unit – Torque-, speed- or position control – EtherCAT® / SBusPLUS in basic unit – State-of-the-art control modes for optimum control performance – Can be used in TN, TT and IT systems – IP20 degree of protection in all sizes – Suitable for extended storage without additional measures – DC link connection for connection to DC or regenerative power supply – Simple startup via MOVIKIT® software modules – Expansion for inputs and outputs, regenerative power supply, braking resistors, line choke, line filter, output choke, output filter 		
	<p>Compact multi-axis system consisting of power supply modules, regenerative power supply modules and single- and double-axis modules</p> <ul style="list-style-type: none"> – Up to 30 drives on one power supply module – Up to 800 m total motor line length – Control via MOVI-C® CONTROLLER – Particularly compact design – Master module for compact integration of the MOVI-C® CONTROLLER – Available as variant with EtherCAT CiA402 profile 	<p>Single-axis application inverter with own line connection</p> <ul style="list-style-type: none"> – Perfect addition to the multi-axis system for high motor power ratings or long motor cables – Up to 1200 m motor cable length – Control via MOVI-C® CONTROLLER – Available as variant with EtherCAT CiA402 profile 	<p>Single-axis application inverter with own line connection and direct fieldbus connection via pluggable fieldbus interfaces</p> <p>As well as the features of MOVIDRIVE® system, MOVIDRIVE® technology offers</p> <ul style="list-style-type: none"> – Startup via plug-in keypads or engineering software – Integrated memory card to back up device data – Integrated DC 24 V switched-mode power supply – Alphanumeric or fully-graphic keypad for starting up the application inverter and MOVIKIT® software modules
Integrated safety technology	<p>MOVISAFE®</p> <p>For all information, refer to pages 18+19</p>		
Explosion protection	<p>The application inverters also allow for operating explosion-proof motors</p>		

Module 3

Inverter technology: MOVIDRIVE®

Technical data

	MOVIDRIVE® modular	MOVIDRIVE® system	MOVIDRIVE® technology
Nominal line voltage V	3x AC 380 – 500	3x AC 200 – 240 3x AC 380 – 500	
Rated output – power supply module kW	10 – 110	–	
Nominal power of regenerative power supply module, block-shaped kW	50 – 75	–	
Nominal output current single-axis module A	2 – 180	–	
Nominal power kW	–	0.55 – 315	
Nominal output current double-axis module A	2 – 8	–	
Overload capacity	250%	200%	

Digital motor integration

A digital data line turns the motor into a station in the data network. The motor provides any motor data, such as encoder data, temperature data, startup data, and data of other sensors, to the application inverters and the connected networks at any time. This information can be used for detecting detailed operation data and for predicting maintenance work.

Intelligent, digital connection with just one standardized hybrid cable for data connection and power supply between the motors (synchronous and asynchronous) and the application inverters:

- The data line is connected to the application inverter with a standard coaxial connector
- Plug connector on the motor or field-terminated connection in the terminal box

- Available for motors up to size 315
- Extremely robust, high-performance data transmission with coaxial data line, ideal for compact installations
- Also suitable for very long cable lengths up to 200 m
- Fully integrated digital motor encoders in various designs
- Data memory in the motor for drive and application data, auto startup of the application inverter without engineering tool

NEW: digital MOVILINK® DDI data interface for transferring

- Information from the electronic nameplate
- Brake and diagnostic data (e.g. temperature sensor data)
- Safe and non-safe encoder data

NEW: Brake control integrated in the motor for synchronous and asynchronous motors:

- for holding brakes and working brakes
- no brake control device in the control cabinet required
- permanent electronic determination of the switching state and of the brake wear
- Transmission of the brake diagnostics data via data interface to the application inverter
- Maintenance intervals are based on the actual condition, maintenance work can be scheduled, information about wear is available even for drives that are difficult to access



Functional safety MOVISAFE® integrated in the inverter technology

Normative requirements and the option that man and machine are working hand in hand call for system areas with functional safety technology. This means functional safety becomes an integral part of every application.

With the MOVISAFE® CS..A safety cards, SEW-EURODRIVE has made functional safety an integral part of all MOVI-C® application inverters. STO in PL e is already included in the MOVIDRIVE® basic unit. All higher quality safety functions are achieved by plugging in an option card, includ-

ing all the necessary connections to the inverter technology – encoder, communication, STO. This keeps project costs to a minimum by focusing only on the function you actually need.

Functions in the basic unit

- STO (safe torque off)
- SIL 3 in line with EN 61800-5-2, EN 61508
- PL e according to EN ISO 13849-1
- Can be activated via safe inputs
- Can be activated via safe communication if a CS..A safety card is plugged in
- Extremely short response time of 2 ms enables short safety distances

MOVISAFE® – Functions of the safety cards

- Five scalable safety cards depending on application requirements
- Over 15 additional safety functions are possible by plugging option cards
- Can be plugged-in later at any time, no additional external cables needed
- Also with additional multi-encoder input
- Safe communication via PROFIsafe/PROFINET and FSoE – Fail Safe over EtherCAT®
- Safety card parameters are included in the device data set
- Easy replacement during servicing due to pluggable CRC memory on the safety card
- Parameterization and diagnostics using the MOVISUITE® engineering software
- Process data and safety data in one joint scope recording
- Safe output for activating functionally safe brake systems



Hardware	MOVISAFE® CSB21A	MOVISAFE® CSB31A	MOVISAFE® CSS21A	MOVISAFE® CSS31A	MOVISAFE® CSA31A
Safe inputs	4	4	4	4	4
Safe outputs	–	2	2	2	2
Safe stop functions	STO, SS1c	STO, SS1c, SBC	STO, SS1c, SBC	STO, SS1c, SBC	STO, SS1c, SBC, SBT
Safe motion functions	–	–	SOS, SS1b, SS2, SLS, SSR, SLA, SSM	SOS, SS1b, SS2, SLS, SSR, SLA, SSM	SOS, SS1b, SS2, SLS, SSR, SLA, SSM
Safe positioning functions	–	–	SLI, SDI	SLI, SDI	SLI, SDI, SCA, SLP
Safe communication	PROFIsafe, FSoE	PROFIsafe, FSoE	PROFIsafe, FSoE	PROFIsafe, FSoE	PROFIsafe, FSoE
Additional multi-encoder input	–	Yes	–	Yes	Yes

Module 4

Drive technology

Motion solutions for every application

All drive technology solutions support a wide range of applications: Select standard and servo gear units in various sizes and designs and with different ratings, torques and finishes – combined with asynchronous or synchronous AC motors. Linear motors, electric cylinders, brakes, built-in encoders and diagnostic units round off the diverse portfolio. It goes without saying that all the necessary global certifications are in place.

NEW to the range and available from 2018 – digital motor integration with single-cable technology: Standardized hybrid cable with uniform plug connector for synchronous and asynchronous motors alike. For more information, refer to pages 16 and 17.

	Standard and servo gear units	Motors
Overview	Five standard gear unit series <ul style="list-style-type: none"> – One-, two- and three-stage helical gear units, R series: output torque 50 – 18 000 Nm – Two- and three-stage parallel-shaft helical gear units, F series: output torque 130 – 18 000 Nm – Two- and three-stage helical-bevel gear units, K series: output torque 80 – 50 000 Nm – Two-stage helical-worm gear units, S series: output torque 92 – 4000 Nm – One- and two-stage right-angle gear units, W series: output torque 25 – 180 Nm – Other than a few exceptions, the standard gear units are also available as compound gear units 	<ul style="list-style-type: none"> – DR.. and DT56 series AC motors (1 speed), 2-, 4- and 6-pole and – Pole-changing DR.. series AC motors (2 speeds) cover outputs from 0.09 to 225 kW and energy efficiency classes from IE1 to IE4 <p>Also available: Torque motors, single-phase motors, aseptic motors and motors with explosion protection</p>
	Two servo gear unit series <ul style="list-style-type: none"> – Low backlash planetary servo gear units, PS.F series: Nominal torques 25 – 3000 Nm PS.C: Nominal torques 30 – 320 Nm – Low backlash helical-bevel servo gear units, BS.F series: Nominal torques 40 – 1200 Nm 	<ul style="list-style-type: none"> – Synchronous and asynchronous servomotors for highly dynamic requirements, also with explosion protection – and linear motors and electric cylinders complete the modular motor system <p>Combined with an extensive range of brakes, encoders, plug connectors, forced cooling fans, special coatings and surface treatments, the modular system offers the perfect drive for your application.</p>



Decentralized drives/ Mechatronics

Movement in decentralized installations

Thanks to their potential for total cost minimization, decentralized installation concepts offer an alternative to central installations for many system concepts.

In doing so, a high standard is demanded of decentralized drives with respect to efficiency, modularity and flexibility in conjunction with simultaneous standardization.

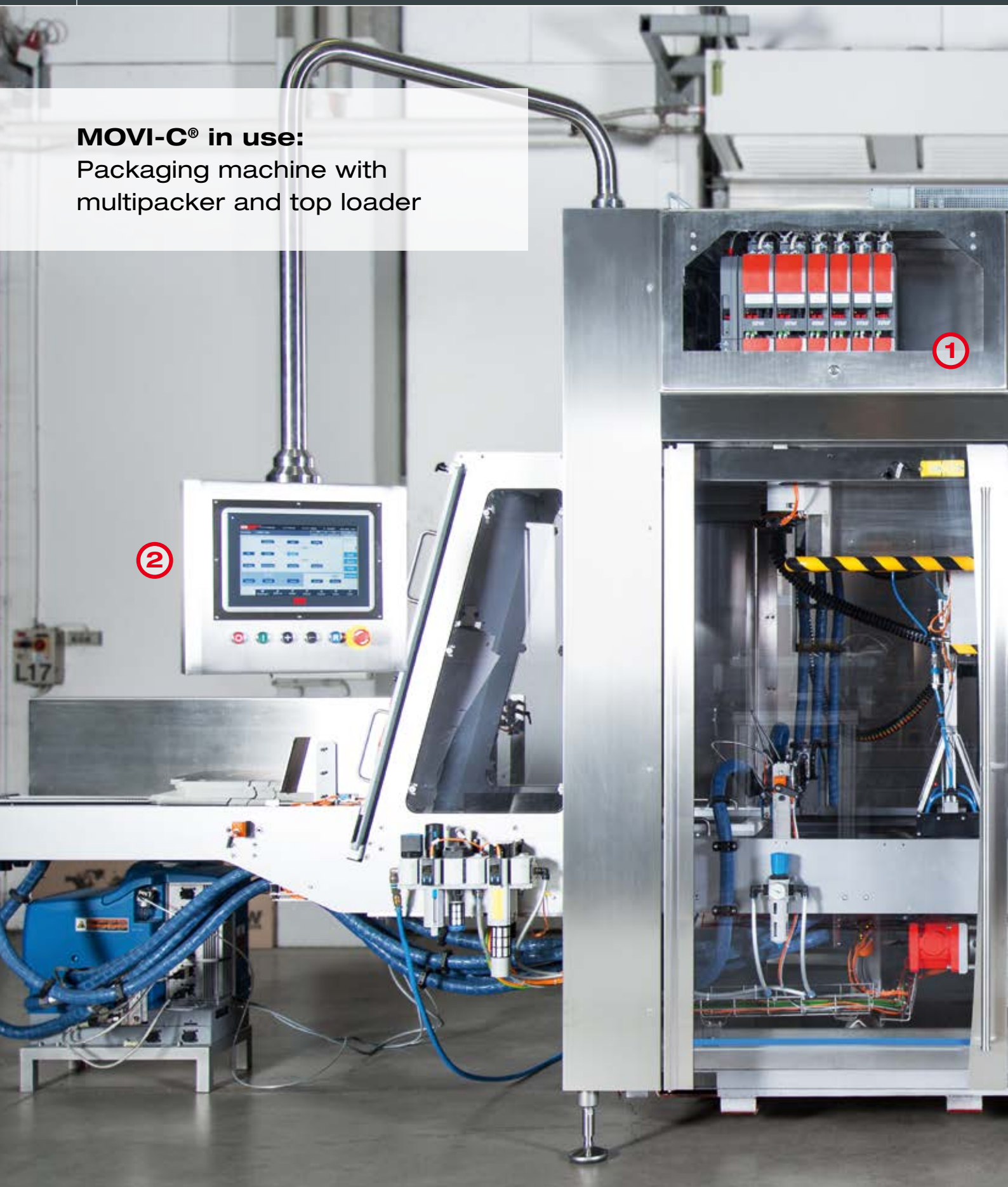
With its completely integrated, mechatronic drive system MOVIGEAR® performance or with the combination of MOVIGEAR® classic and electronics installed close to the motor, the MOVI-C® concept for automation systems offers unique components for utilization in decentral-

ized installations and system topologies – and is already doing so today in the energy efficiency class IE5 and with unequalled overall system efficiency. These systems thus combine the advantages of a decentralized installation with those of the MOVI-C® modular automation system.

	Decentralized drives / mechatronics
Overview	<p>Mechatronic drive system with electronics integrated in the motor</p> <ul style="list-style-type: none"> – MOVIGEAR® performance (MGF.-xxx-C) in two torque and three performance classes between 0.8 – 2.2 kW <p>Control versions:</p> <ul style="list-style-type: none"> - DFC – Direct Fieldbus Control (PROFINET, EtherNet/IP™, Modbus TCP) <p>In preparation:</p> <ul style="list-style-type: none"> - DBC – Direct Binary Communication - DAC – Direct AS-Interface Communication - DSI – Direct System Bus Control - SNI – Single-Line Network Installation <p>Mechatronic drive for combination with electronics installed close to the motor or in the control cabinet</p> <ul style="list-style-type: none"> – MOVIGEAR® classic (MGF.-DSM-C) in three torque and four performance classes between 0.37 – 3.0 kW <p>More device types and variants are in preparation.</p>



MOVI-C® in use: Packaging machine with multipacker and top loader

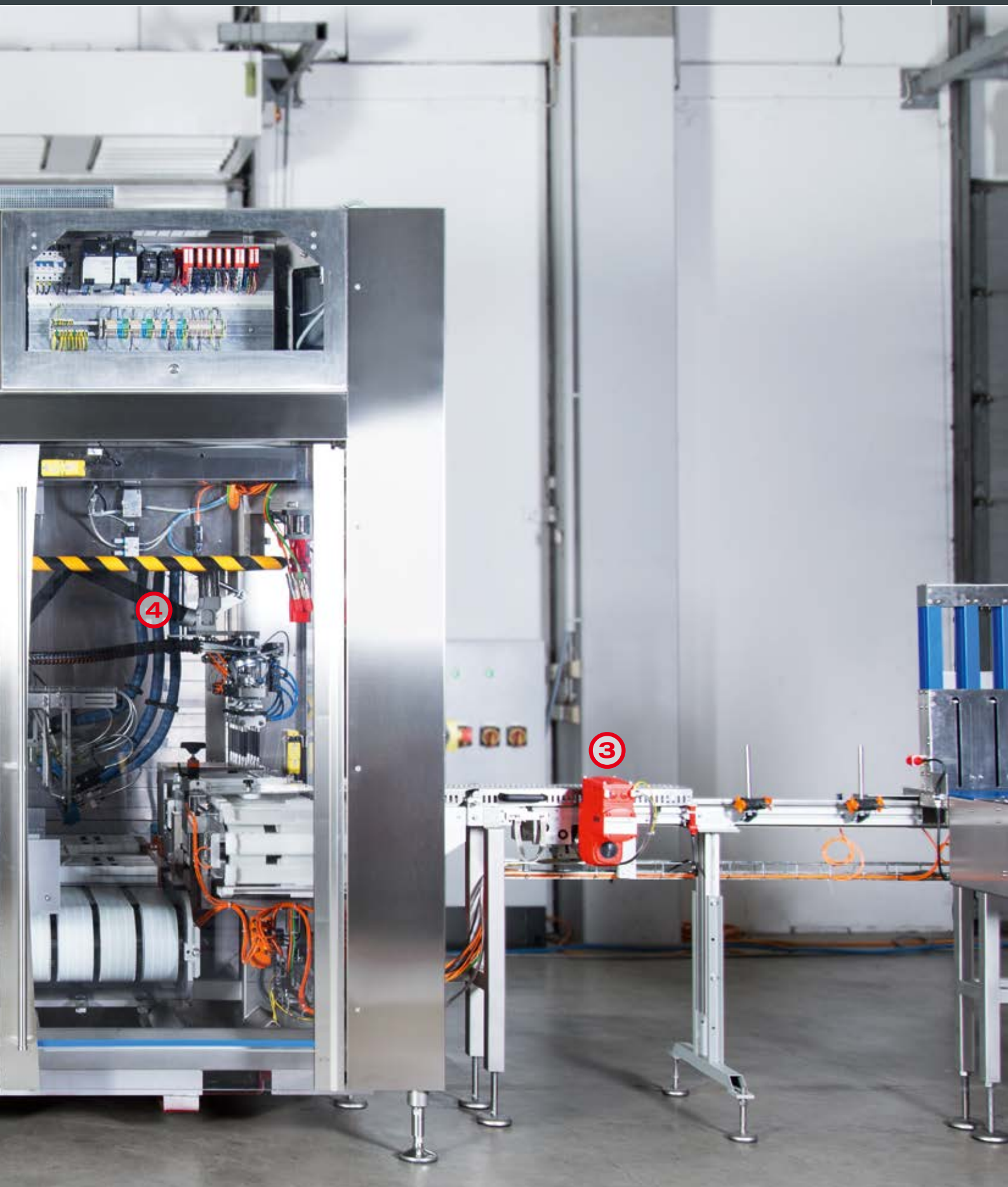


① Control cabinet:

Using a multi-axis system with double-axis inverter:
Higher power density, reduced power loss – can even be installed in
small machine control cabinets.

② Automation framework:

The machine is operated with software based on the automation
framework of SEW-EURODRIVE. This PackML-compliant framework
also offers a standardized user interface, for example, in addition to
the sequential program.



③ Controller algorithms:

New, universally used controller algorithms allow for controlling all motors with just one inverter.

④ Delta robot:

Robots as part of the machine: extensive kinematic libraries allow for integrating robots into machine control.

MOVI-C® in practice:

Carton erector achieved using automation framework based on PackML standard – full functionality integrated

The following software functions are already available in the automation framework (AFW):



1 Modes & States

Various modes (such as production, manual mode, maintenance mode) can be defined. All 17 PackML-compliant states are available within the individual modes. Either all 17 states can be used or only some of them, depending on the type of machine and mode in use.



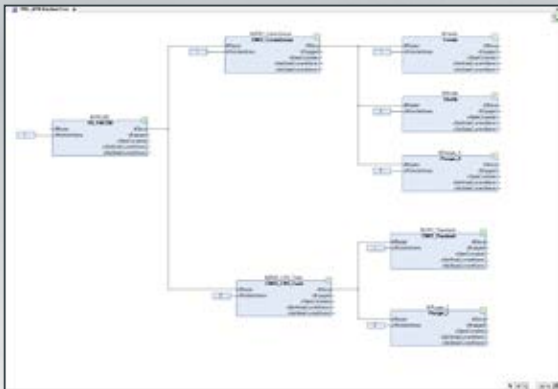
2 Modular software design and programming

The use and structure of SEW-AFW supports a modular software structure right from the start, resulting in a high level of reusable codes. The methods of the ISA88 industry standard are used as the basis for structuring the software. This standard is among the most common in the food industry.

3 Event (and error) handling

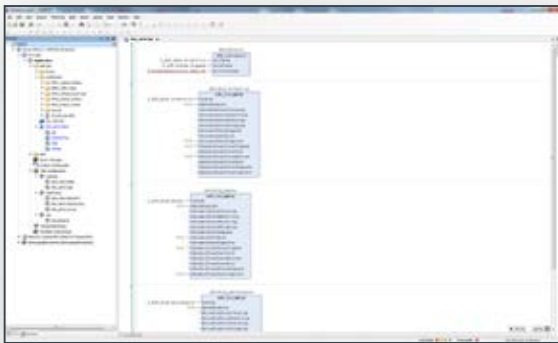
Using the integrated and predefined event handling, events (errors, warnings or information) can be easily viewed and sorted. Automated information processing allows for transferring data easily and quickly to external visualization systems.

Benefits



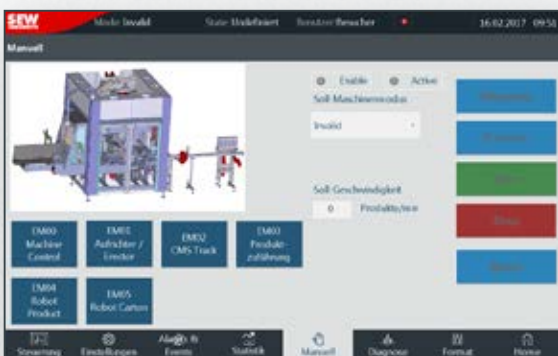
Reduced engineering effort

- Thanks to integrated functions and predefined standard modules
- Part of the machine program is parameterized instead of programmed
- Standard modules save the programmer time and help avoid mistakes.



Reduced integration costs

- Thanks to standardized "PackTags" data interface:
"PackTags" are used for communicating with other machines or with the higher-level controller. At the same time, they serve as a standardized interface for all incoming and outgoing machine information. This ensures open data exchange between the various machines and their manufacturers.



Increased productivity

- Thanks to improved diagnostics options and the same visualization behavior of different machines in a production line.



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