



**SEW**  
EURODRIVE

# Manual



## MOVI-C® Automation with MOVI-C® CONTROLLER



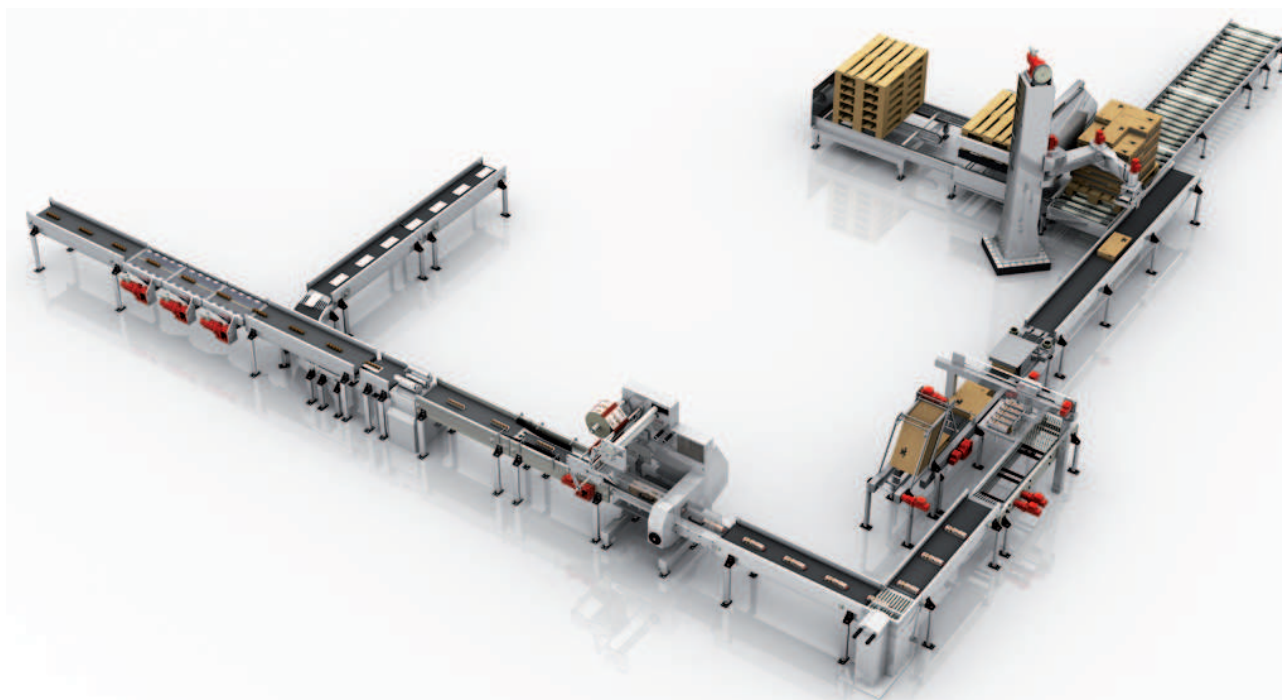
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## 1 MOVI-C® product description

With its brand MOVI-C®, SEW-EURODRIVE is launching a new generation of drive and automation technology. MOVI-C® is the modular automation system that enables the highest level of system and machine automation.

MOVI-C® comprises drive technology, MotionControl, control technology and visualization.



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The individual hardware and software components are optimally coordinated with one another.

Two types of controllers are available for the implementation:

- Purely parameterizable controllers.
- Freely programmable controllers.

In both cases, the foundation for solving movement and drive tasks is a large number of application modules. In MOVI-C®, these application modules are collected in the MOVIKIT® software module.

In the case of the purely parameterizable controllers with the designation MOVIRUN® smart, the MOVIKIT® modules are started up with graphical editors. After startup is complete, the functional scope is specified to a higher-level controller and documented. Programming of the controller is completely eliminated in this case.

The freely programmable controllers with the designation MOVIRUN® flexible are characterized in that these MOVIKIT® modules can be used with the same software behavior and the same graphical editors as MOVIRUN® smart. The interfaces of these MOVIKIT® modules are then within the programming environment on the basis of IEC 61131 and can be expanded to include a user program. There are also additional MOVIKIT® modules in the freely programmable controllers, such as electronic cam (MOVIKIT® MultiMotion Camming).

The parameterizable and the programmable controllers are combined in different modules of the MOVIRUN® software platform.

The MOVISUITE® engineering software, with its unique operating philosophy, prevails over all MOVI-C® hardware and software components.

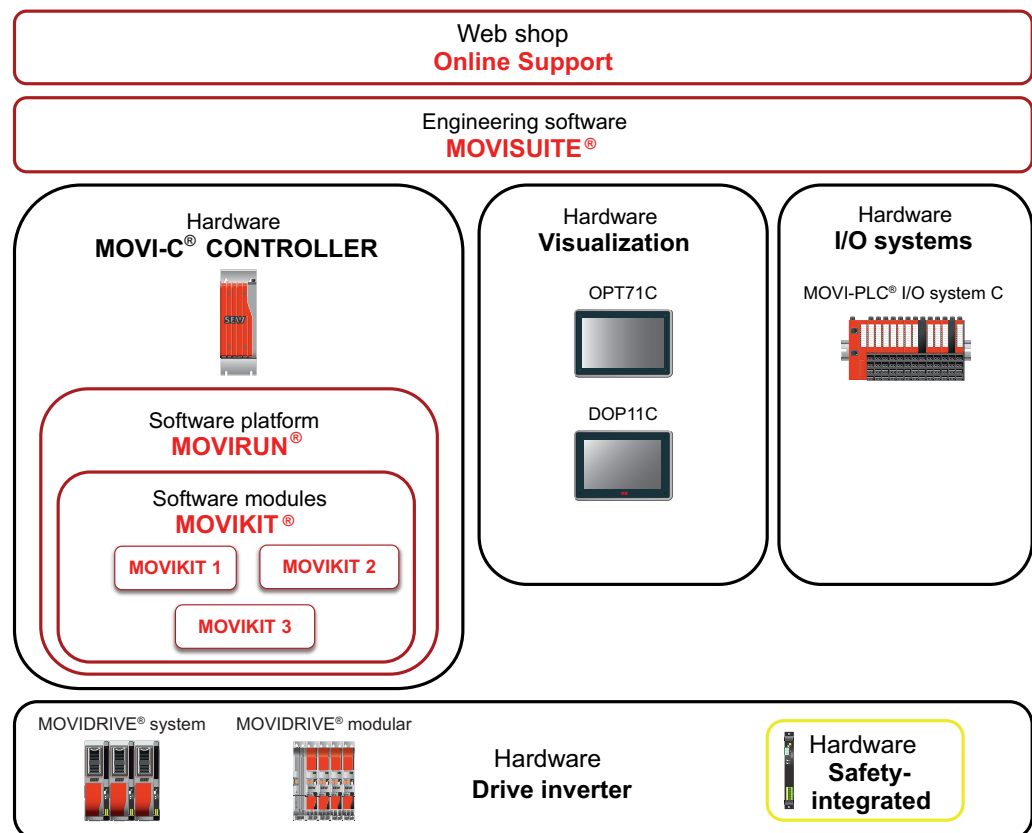
MOVISUITE® was developed with a focus on systematically shortening the startup time and covers the entire engineering process, from planning to diagnostics.

Ideally adapted application inverters are now available in the form of the newly developed inverters, MOVIDRIVE® modular and MOVIDRIVE® system. These inverters regulate SEW-EURODRIVE's entire asynchronous and synchronous motor spectrum, with and without encoder feedback. This reduces variance and consequently minimizes warehousing costs.

Fully integrated, functional safety technology rounds out the system. This makes safe movement, safe braking, safe end positions and safe vertical drives available by default.

Various I/O systems and visualizations are available for automation solutions.

Visualization can be implemented with touch panels of various sizes. In addition, a fully integrated visualization with many additional automation features is available for MOVI-C CONTROLLER® power.



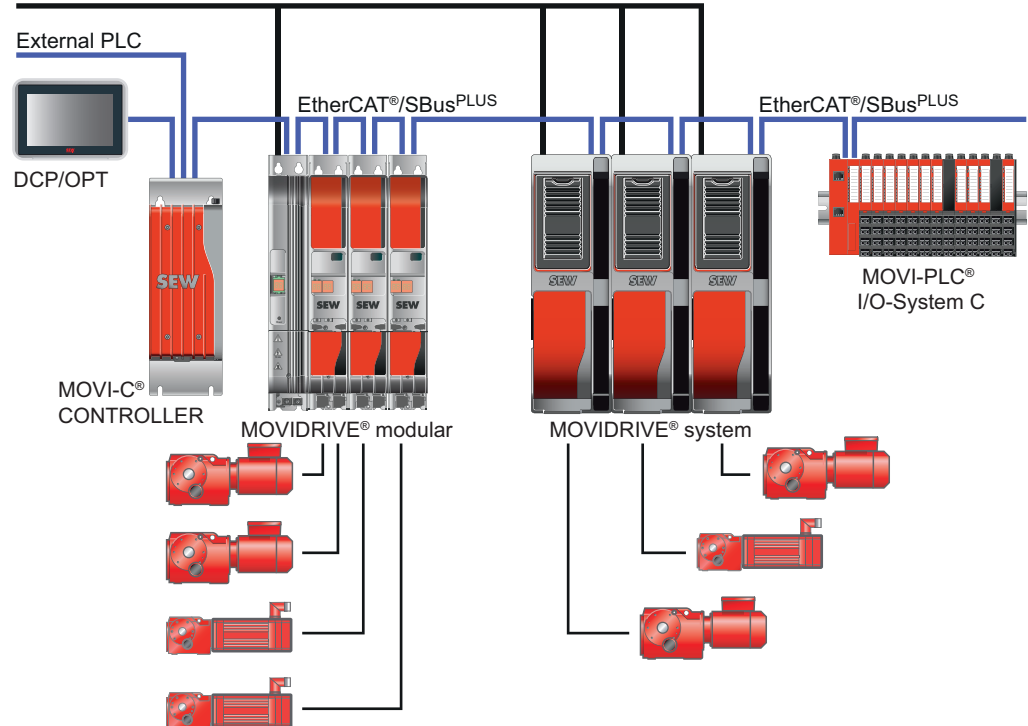
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The entire clock-synchronized communication between MOVI-C® CONTROLLER and all subordinate automation components is implemented with the EtherCAT®/SBus<sup>PLUS</sup> system bus.

Secure and non-secure process data, engineering and diagnostics data are transported via this bus.

Third-party components for importing the projection file that support EtherCAT® are also supported. A variety of addressing options for slave components enable simple data management in case of service incidents.

3 x AC 400V





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## 2 Overview of the components



This documentation displays devices and accessories for MOVI-C® that are not yet available at the time of the publication of this document.

Availability specifications are entered in the following table.

### 2.1 Hardware components

Controller	
<p>MOVI-C® CONTROLLER power</p> 	<p>MOVI-C® CONTROLLER power is characterized by:</p> <ul style="list-style-type: none"> <li>• Ethernet interface for engineering tasks or TCP/IP and UDP via IEC 61131-3.</li> <li>• 16 MB program memory and 64 MB data memory.</li> <li>• A maximum of 32 interpolating axes that can be connected.</li> <li>• Another 32 auxiliary axes that can be connected.</li> <li>• System bus master EtherCAT®/SBus<sup>PLUS</sup>.</li> <li>• Optional slave connection via PROFIBUS DPV2.</li> <li>• Optional device connection via PROFINET.</li> <li>• Internal, battery-buffered clock for time and date.</li> <li>• Windows® Embedded Standard 7 (optional as 2nd operating system).</li> </ul> <p>For further information, refer to the manual "MOVI-C® CONTROLLER power UHX85A and power eco UHX84A".</p>
<p>MOVI-C® CONTROLLER power eco</p> 	<p>MOVI-C® CONTROLLER power eco is characterized by:</p> <ul style="list-style-type: none"> <li>• Ethernet interface for engineering tasks or TCP/IP and UDP via IEC 61131-3.</li> <li>• 16 MB program memory and 64 MB data memory.</li> <li>• A maximum of 16 interpolating axes that can be connected.</li> <li>• Another 16 auxiliary axes that can be connected.</li> <li>• System bus master EtherCAT®/SBus<sup>PLUS</sup>.</li> <li>• Optional slave connection via PROFIBUS DPV2.</li> <li>• Optional device connection via PROFINET.</li> <li>• Internal, battery-buffered clock for time and date.</li> <li>• Windows® Embedded Standard 7 (optional as 2nd operating system).</li> </ul> <p>For further information, refer to the manual "MOVI-C® CONTROLLER power UHX85A and power eco UHX84A".</p>

Controller	
<p>MOVI-C® CONTROLLER advanced</p> 	<p>MOVI-C® CONTROLLER advanced is characterized by:</p> <ul style="list-style-type: none"> <li>• 2 Ethernet interfaces for engineering or TCP/IP and UDP via IEC 61131-3.</li> <li>• 2 CAN interfaces (1 floating, 1 non-floating)</li> <li>• 2 RS485 interfaces.</li> <li>• A maximum of 8 interpolating axes that can be connected.</li> <li>• Another 8 auxiliary axes that can be connected.</li> <li>• System bus master EtherCAT®/SBus<sup>PLUS</sup>.</li> <li>• Optional device connection via PROFINET.</li> <li>• Optional installation as master module for MOVIDRIVE® modular.</li> <li>• Internal, battery-buffered clock for time and date.</li> </ul> <p>MOVI-C® CONTROLLER advanced is in development.</p>
<p>MOVI-C® CONTROLLER standard</p> 	<p>MOVI-C® CONTROLLER standard is characterized by:</p> <ul style="list-style-type: none"> <li>• Ethernet interface for engineering tasks or TCP/IP and UDP via IEC 61131-3.</li> <li>• CAN interface (non-floating)</li> <li>• A maximum of 2 interpolating axes that can be connected.</li> <li>• Another 6 auxiliary axes that can be connected.</li> <li>• System bus master EtherCAT®/SBus<sup>PLUS</sup>.</li> <li>• Optional device connection via PROFINET.</li> <li>• Assembly on mounting rail.</li> <li>• Internal, battery-buffered clock for time and date.</li> </ul> <p>MOVI-C® CONTROLLER standard is in development.</p>

Visualization	
<p>DOP11C</p> 	<p>Operator panels are devices for the operation and diagnostics of industrial and commercial systems.</p> <p>Operator panels are the human-machine interface for process monitoring and control in a wide variety of applications.</p> <ul style="list-style-type: none"> <li>• Standardized, modern panel series with touchscreen.</li> <li>• High resolution color display with wide viewing angle.</li> <li>• Universal product range with screen sizes from 4.3" to 15.4".</li> <li>• Optimized on-screen keyboard makes it easier to input text, even for smaller panels.</li> <li>• Fast, powerful processors.</li> <li>• Large amounts of RAM for carrying out extensive visualization projects.</li> <li>• Option to expand memory by means of an SD card or USB flash drive, e.g. for logging visualization data.</li> <li>• Flexible communication connections due to sophisticated interfaces and protocol drivers.</li> <li>• Robust monitors in 12" and 15" sizes for demanding visualization tasks in connection with the Windows® operating system of MOVI-C® CONTROLLER.</li> <li>• Consistent appearance in both Windows®-based and panel-based systems.</li> </ul> <p>For additional information, refer to the "DOP11C" operating instructions.</p>
<p>OPT71C</p> 	<ul style="list-style-type: none"> <li>• Robust monitors in 12" and 15" sizes for demanding visualization tasks in connection with the Windows® operating system of MOVI-C® CONTROLLER.</li> </ul>

## Inverters

MOVIDRIVE® modular



## Modular application inverter:

- Control mode for asynchronous and synchronous motors with or without encoder feedback.
- Integrated SBus<sup>PLUS</sup> interface.
- Control mode for synchronous motors without encoders.
- Control mode for asynchronous motors with and without encoders.
- Energy-efficient.
- Motor startup for third-party asynchronous motors.
- Compact and space-saving.
- Standard STO safety function according to performance level e.
- Large power range:
  - Single-axis modules up to 180 A
  - Power supply modules up to 110 kW

## The following modules are available:

- Power supply modules.
- Axis modules.
- Capacitor modules.
- DC link discharge modules.
- 24 V switched-mode power supply module.

## The following devices are available:

- MDP90A-0100 – 0250-...
- MDA90A-0020 – 0480-...
- MDD90A-0020 – 0080-...

For additional information, refer to the "MOVIDRIVE® modular Application Inverters" product manual.

## Inverters

### MOVIDRIVE® system



#### Single-axis application inverter:

- Control mode for asynchronous and synchronous motors with or without encoder feedback.
- Integrated SBus<sup>PLUS</sup> interface.
- Control mode for synchronous motors without encoders.
- Control mode for asynchronous motors with and without encoders.
- Energy-efficient.
- Motor startup for third-party asynchronous motors.
- Standard STO safety function according to performance level e.

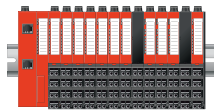
#### The following devices are available:

- MDX90A-0020 – 0320-5\_3-...
- MDX90A-0070 – 0290-2\_3-...

For additional information, refer to the "MOVIDRIVE® system Application Inverters" product manual.

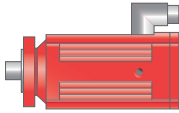
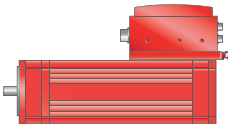
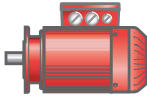
## I/O systems

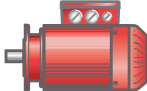
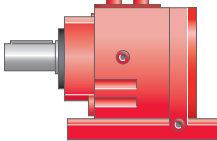

MOVI-PLC® I/O system C



- Bus coupler EtherCAT® OCE11C
- OPM11C power supply modules  
The power supply module is used when 10 A for the voltage supply of the I/O level within a bus coupler is exceeded.
- Terminal modules OPV..  
Terminal modules are potential distributors.
  - OPV81C: 24 V over 8 terminals
  - OPV82C: 0 V over 8 terminals
  - OPV41C: 0 V over 4 terminals and 24 V over 4 terminals
- Digital input modules ODI..  
The digital input module records the binary control signals from the process level and transports them, galvanically isolated, to the higher-level bus system.
  - ODI24C: 2 inputs
  - ODI42C: 4 inputs
  - ODI43C: 4 inputs, 3-conductor connection
  - ODI81C: 8 inputs
- Digital output modules ODO..  
The digital output module records the binary control signals from the higher-level bus system and transports them to the process levels via the outputs.
  - ODO81C: 8 outputs
- Analog input modules OAI..  
The analog module converts each process signal into a digital form and passes this signal on as a word.
  - OAI41C: 4 inputs
  - OAI42C: 4 inputs
  - OAI44C: 2 inputs
  - OAI45C: 4 inputs
- Analog output modules OAO..  
  - OAO41C: 4 outputs
  - OAO42C: 4 outputs
- RS422/485 interface ORS11C.
  - Transmission rate of 150 bit/s – 115 kbit/s
  - Serial bus connection
  - Protocols: ASCII, STX/ETX, 3964(R)
  - Modbus with 25-byte telegram length

For additional information, refer to the "MOVI-PLC® I/O System C" manual.

Motors	
<p>CMP.. motors</p> 	<p>CMP.. motors are compact, highly dynamic synchronous servomotors. The motors can be attached directly to all gear units from SEW-EURODRIVE.</p> <ul style="list-style-type: none"> <li>• Speed classes: 2000, 3000, 4500, 6000 min<sup>-1</sup>.</li> <li>• Torque: 0.5 – 95 Nm.</li> <li>• BK brake: CMP40 – CMP63.</li> <li>• BP brake: CMP71 – CMP100.</li> <li>• BY brake: CMP112.</li> </ul> <p>CMPZ.. motors have an increased intrinsic inertia for high external loads.</p> <ul style="list-style-type: none"> <li>• Speed classes: 2000, 3000, 4500, 6000 min<sup>-1</sup>.</li> <li>• Torque: 6.4 – 47 Nm.</li> <li>• BY brake: CMPZ71 – CMPZ100.</li> </ul> <p>For more information, refer to the "CMP.. Synchronous Servomotors" catalog.</p>
<p>ELVCD motors</p> 	<p>48-V low-voltage synchronous motors for third-party inverters</p>
<p>DRL.. motors</p> 	<p>The DRL.. motors are asynchronous servomotors that are the link between the classical asynchronous motor and the synchronous servomotor.</p> <ul style="list-style-type: none"> <li>• Speed classes: 1200, 1700, 2100, 3000 min<sup>-1</sup>.</li> <li>• Torque: 2.7 – 290 Nm.</li> <li>• BE brake.</li> </ul> <p>Refer to the "AC Motors" catalog for more information.</p>

Motors	
<p>DR motors</p> 	<p>The DR.. motor series is comprised of the following motors:</p> <ul style="list-style-type: none"> <li>• DR.. motor: 2-pole, 4-pole and 6-pole energy-efficient motors, each in the DRN.., DRS.., DRE.., and DRP.. classes.</li> <li>• DR..J motor: 4-pole Line Start Permanent Magnet (LSPM) energy-efficient motors in the classes DRE, DRP, and DRU.</li> <li>• DRL.. motor: 4-pole asynchronous servomotors.</li> <li>• EDR.. motor: 4-pole explosion-proof EDNR.., EDRS.. and EDRE.. motors according to: <ul style="list-style-type: none"> <li>– European 94/9/EC (ATEX) Directive: Category 2 and 3</li> <li>– International IECEx agreement: EPL b and c</li> <li>– North American HazLoc-NA® classification: Class I and Class II in division 2</li> </ul> </li> <li>• DRK.. motor: 4-pole single-phase motors with running capacitor.</li> <li>• DRM.. motor: 12-pole torque motors.</li> <li>• DRS.. motor: 4/2, 8/4, and 8/2-pole standard motors DRS.. with 2 nominal speeds.</li> </ul> <p>Refer to the "AC Motors" catalog for more information.</p>
Gear units	
<p>Standard gear units</p> 	<p>The standard gear units are available as</p> <ul style="list-style-type: none"> <li>• Helical gear units. <ul style="list-style-type: none"> <li>– Output torque: 50 – 18000 Nm</li> </ul> </li> <li>• Parallel-shaft helical gear unit. <ul style="list-style-type: none"> <li>– Output torque: 130 – 18000 Nm</li> </ul> </li> <li>• Helical-bevel gear units. <ul style="list-style-type: none"> <li>– Output torque: 80 – 50000 Nm</li> </ul> </li> <li>• Helical-worm gear units. <ul style="list-style-type: none"> <li>– Output torque: 92 – 4000 Nm</li> </ul> </li> <li>• SPIROPLAN® gear units. <ul style="list-style-type: none"> <li>– Output torque: 25 – 180 Nm</li> </ul> </li> </ul> <p>The gear units are also available in a reduced backlash design.</p> <p>Refer to the "Gear Units" catalog for more information.</p>
<p>PS.F/PS.C gear units</p> 	<p>The reduced backlash planetary servo gear units are designed for position-accurate and highly dynamic servo applications.</p> <ul style="list-style-type: none"> <li>• PS.F gear units. <ul style="list-style-type: none"> <li>– Output torque: 25 – 3000 Nm</li> </ul> </li> <li>• PS.C gear units. <ul style="list-style-type: none"> <li>– Output torque: 30 – 320 Nm</li> </ul> </li> </ul> <p>Refer to the "Servo Gear Units" catalog for more information.</p>

## Gear units

### BS.F gear units



The reduced backlash helical-bevel servo gear units are designed for position-accurate and highly dynamic servo applications.

- BS.F gear units.
  - Output torque: 40 – 1200 Nm

Refer to the "Servo Gear Units" catalog for more information.

## 2.2 Software components

Engineering software	
MOVISUITE®	<ul style="list-style-type: none"> <li>• MOVISUITE® standard</li> <li>• MOVISUITE® professional</li> <li>• MOVISUITE® enterprise</li> </ul> <p>MOVISUITE® standard is available.</p> <p>For further information, refer to chapter "MOVISUITE® engineering software" (→ 17).</p>
Software platform	
MOVIRUN®	<ul style="list-style-type: none"> <li>• MOVIRUN® base</li> <li>• MOVIRUN® smart</li> <li>• MOVIRUN® flexible</li> </ul> <p>MOVIRUN® flexible is available.</p> <p>For further information, refer to chapter "MOVIRUN software platform" (→ 20).</p>
Modular software system	
MOVIKIT®	<ul style="list-style-type: none"> <li>• DRIVE category               <ul style="list-style-type: none"> <li>– MOVIKIT® Velocity</li> <li>– MOVIKIT® Positioning</li> <li>– MOVIKIT® Gearing</li> </ul> </li> <li>• MOTION category               <ul style="list-style-type: none"> <li>– MOVIKIT® MultiMotion</li> <li>– MOVIKIT® MultiMotion Camming</li> <li>– MOVIKIT® MultiAxesController</li> <li>– MOVIKIT® Robotics</li> </ul> </li> </ul> <p>For further information, refer to chapter "MOVIKIT software kit" (→ 22).</p>

### 3 MOVISUITE® engineering software

MOVISUITE® is the new engineering software from SEW-EURODRIVE and comprises the following modules in the full stage of construction:

- MOVISUITE® standard
- MOVISUITE® professional
- MOVISUITE® enterprise

The engineering software excels by a new design of user interface and user guidance. This interface concept enables the users to configure, parameterize and startup their applications practically intuitively.

Using the various views, the users can switch to the suitable display mode, depending on their requirements. In the circle view, for example, individual components can be edited in a clear structure.

Circle view



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The tree view provides an overview of the entire network.

Tree view



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The view can be selected depending on application and personal preference; the functionality is identical in both views.

The interface concept of MOVISUITE® makes it possible to visualize the system structure using structure nodes that can be named according to user preference. These structure nodes are displayed with varying levels of detail in the views mentioned above.

Data management has clearly marked transfer directions, and thus is structured for easy comprehension during data transmission.

The scan function enables the reading of connected devices, and the creation of these devices as projects in MOVISUITE®.

The drive train from motor to gear unit can be set up via the product catalog. Furthermore, encoders, brakes, control modes, and user units can be selected and parameterized.

The data required for the drive train can typically be read off the nameplates of the motor and gear unit and entered, or selected via a catalog function in the engineering software.

Another variant is automatic identification of the gear unit motor data by output of the electronic nameplate stored in the motor encoder. During startup, the engineering software checks whether an electronic nameplate is present in the encoder and suggests the use of this data.

A recording function is available for diagnostic purposes. This enables a diagnostics overview of the connected devices and functions. Long-term data acquisition on the engineering PC hard disk is also possible.

In the case of motors from SEW-EURODRIVE, an electronic nameplate can be read-in for simplified startup. MOVISUITE® suggests standard drive trains. Various drive functions are summarized in function control blocks, referred to as FCBs.

Manual operation can also be intuitively applied for each application via the new interface.



## Startup procedure

The following steps illustrate in exemplary fashion the startup procedure for an application inverter.



## Drive trains

Drive train		Configuring drive trains.
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## Interfaces

Built-in interfaces		Basic settings of the standard interfaces <ul style="list-style-type: none"> <li>• EtherCAT®</li> <li>• Standard I/O</li> <li>• Encoder 1</li> </ul>
Options		Basic settings of the options <ul style="list-style-type: none"> <li>• Fieldbus</li> <li>• I/O card</li> <li>• Encoder 2</li> <li>• DriveSafety®</li> </ul>

## Functions




I/O configuration		<ul style="list-style-type: none"> <li>• Standard I/O</li> <li>• I/O card DI/DO</li> <li>• I/O card AI/AO</li> </ul>
PO configuration		<ul style="list-style-type: none"> <li>• Basic settings</li> <li>• PO data</li> <li>• Setpoint buffer</li> <li>• Fixed setpoints</li> <li>• Control word 1 – 3</li> </ul>

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PI configuration		<ul style="list-style-type: none"> <li>PI data</li> <li>Status word 1 – 3</li> </ul>
Drive functions		<ul style="list-style-type: none"> <li>FCB05 Speed control</li> <li>FCB06 Interpolated speed control</li> <li>FCB08 Interpolated torque control</li> <li>FCB09 Positioning</li> <li>FCB10 Interpolated position control</li> <li>FCB12 Reference travel</li> </ul>
Advanced drive functions		<ul style="list-style-type: none"> <li>FCB01 Output stage inhibit</li> <li>FCB20 Jog mode</li> <li>FCB21 Brake test</li> <li>FCB26 Stop at user limit</li> </ul>
Event-driven functions		<ul style="list-style-type: none"> <li>Touchprobe 1</li> <li>Touchprobe 2</li> <li>Cam switch</li> </ul>
Monitoring		<ul style="list-style-type: none"> <li>Reference signals</li> <li>Limit values 1</li> <li>Limit values 2</li> <li>Monitoring functions 1</li> <li>Monitoring functions 2</li> <li>Energy-saving function</li> </ul>
User units		Converting system units into user units.

Information on the application inverter

Device data is available via the project nodes.

Device data		<ul style="list-style-type: none"> <li>Device identification</li> <li>Main component</li> <li>Subcomponent</li> <li>Production label</li> </ul>
Overview of error responses		<ul style="list-style-type: none"> <li>Axis module</li> <li>Power supply monitoring</li> <li>Functions</li> </ul>
Setup		<ul style="list-style-type: none"> <li>Parameter set selection</li> <li>Access authorizations</li> <li>Resetting device parameters.</li> </ul>

## 4 MOVIRUN® software platform

MOVIRUN® is the platform for all movement tasks and the basis for the MOVIKIT® software kit.

MOVIRUN® is available in the following designs:

- MOVIRUN® flexible

Freely programmable controller for using MOVIKIT® modules with subsequent programming. The interfaces to these MOVIKIT® modules are available in the form of function blocks in accordance with IEC 6-1131 and must then be expanded to include a user program.

MOVIRUN® flexible is characterized by the following features:

- Graphical editors for configuration of the MOVIKIT® modules.
- MOVIKIT® diagnostics monitors with control mode.
- DRIVE category MOVIKIT® modules for torque and speed control and positioning on a single-axis basis.
- MOVIKIT® MultiMotion as universally parameterizable module for torque and speed control and positioning in a multi-axis system.
- Data management with auto reload function for the MOVIKIT® inverters in case of service (the MOVI-C® CONTROLLER recognizes a new client on the system bus and automatically loads the data set into the device).
- IEC editor based on IEC 6-1131.

MOVIRUN® flexible contains the following MOVIKIT® modules:

- MOVIKIT® Velocity.
- MOVIKIT® Positioning.
- MOVIKIT® MultiMotion for synchronized movement functions.

- MOVIRUN® base (in preparation)

- Free platform for simple PLC tasks.
- No clock-synchronous operation of the system bus.
- No MOVIKIT® modules operable.
- No data management functions (auto reload in case of service incident).

- MOVIRUN® smart (in preparation)

Purely parameterizable controller for use of MOVIKIT® modules. After startup is complete, the functional scope is specified to a higher-level controller and documented. Programming of the controller is completely eliminated in this case.

MOVIRUN® smart is characterized by the following features:

- Graphical editors for configuration of the MOVIKIT® modules.
- MOVIKIT® diagnostics monitors with control mode.
- Data management with auto reload function for the MOVIKIT® inverters in case of service (the MOVI-C® CONTROLLER recognizes a new client on the system bus and automatically loads the data set into the device).
- Recording function in the controller.

MOVIRUN® smart contains the following MOVIKIT® modules:

- MOVIKIT® Velocity.
- MOVIKIT® Positioning.

Overview of the possible combinations of MOVIKIT® and MOVIRUN® modules:

MOVIKIT®	MOVIRUN®		
	base	smart	flexible
DRIVE category (included in price)			
MOVIKIT® Velocity		x	x
MOVIKIT® Positioning		x	x
MOVIKIT® Gearing		x	x
MOTION category (additional price shown)			
MOVIKIT® MultiMotion			x
MOVIKIT® MultiMotion Camming			x
MOVIKIT® MultiAxesControl		x	x
MOVIKIT® Robotics		x	x

## 5 MOVIKIT® modular software kit

MOVIKIT® is the software kit for MOVI-C®.

MOVIKIT® includes prefabricated software modules that provide everything from simple drive functions to complex MotionControl functions. The goal is to reduce start-up time by providing configurable automation and MotionControl functions.

The configuration takes place via graphical editors that also support control mode and diagnostics.

MOVIKIT® modules are available in purely parameterizable form in the MOVIRUN® smart software platform as and in freely programmable form in MOVIRUN® flexible.

### 5.1 DRIVE category

The MOVIKIT® modules in the DRIVE category are a component of the MOVIRUN® smart and MOVIRUN® flexible software platforms. The DRIVE category modules relate to single-axis functions such as speed or torque control and positioning. Typical applications are multi-axis functions in which each individual axis is used independently of the other. Examples are variable-speed gear units, feed and discharge conveyors, push-offs.

#### 5.1.1 MOVIKIT® Velocity

- Velocity control.
- Graphical configuration and diagnostics.
- Predefined fieldbus interface.
- Modular functional system – basic module always the same, additional functions are easily configurable.
- Also available for MOVIDRIVE® technology<sup>1)</sup>.

1) In preparation

#### 5.1.2 MOVIKIT® Positioning

- Velocity control, positioning, Touchprobe positioning.
- Graphical configuration and diagnostics.
- Predefined fieldbus interface.
- Modular functional system – basic module always the same, additional functions are easily configurable.
- Also available for MOVIDRIVE® technology<sup>1)</sup>.

1) In preparation

#### 5.1.3 MOVIKIT® Gearing

- Velocity control, positioning, Touchprobe positioning.
- Graphical configuration and diagnostics.
- Predefined fieldbus interface.
- Modular functional system – basic module always the same, additional functions are easily configurable.

- Synchronous operation, offset processing.
- Graphical configuration and diagnostics.
- Predefined fieldbus interface.
- Modular functional system – basic module always the same, additional functions are easily configurable in conjunction with it.
- Also available for MOVIDRIVE® technology<sup>1)</sup>.

1) In preparation

5

## 5.2 MOTION category

The MOVIKIT® modules of the MOTION category are specially developed for coordinated multi-axis functions. In this case, the individual drives are dependent on one another. This dependency can be time or position-based, or implemented mechanically. Applications include electronic cams, double pillar lifting gears or multi-axis gantry cranes.

### 5.2.1 MOVIKIT® MultiMotion

MOVIKIT® MultiMotion is the basic module that is always available in the scope of delivery of the MOVIRUN® flexible software platform.

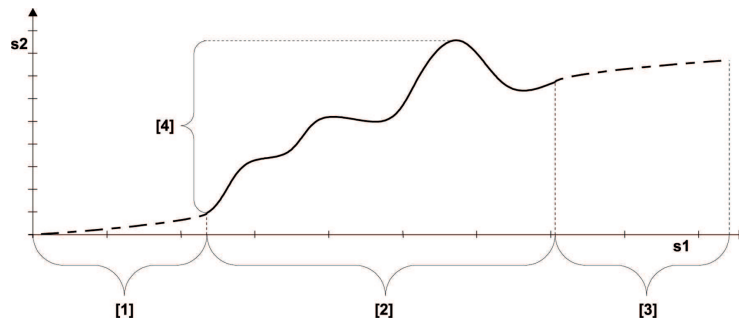
- Interpolated operating modes for speed, positioning and tracking.
- Graphical configuration and diagnostics.
- A structured variable interface is an option in the programming environment.
- For new software concepts, the module provides an object-oriented programming interface (OOP interface).

### 5.2.2 MOKIKIT® MultiMotion Camming

The term electronic cam or camming refers to a definite assignment of positions between a master drive and a slave drive.

The master drive can either be a drive that is physically present or a virtual master encoder.

The relationship between the positions of the master drive and the slave drive is often specified in a 2-dimensional graph. The position of the master drive is entered along the horizontal axis and the position of the slave drive along the vertical axis. The range of positions along the horizontal axis is referred to as the master cycle, the range of positions along the vertical axis as the slave cycle.



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- |  |                    |
|--|--------------------|
| [1] Startup cycle, is run through once   | [4] Slave cycle    |
| [2] Master cycle, is repeated cyclically | s1 Distance master |
| [3] Stop cycle, is run through once      | s2 Slave master    |

The graph normally consists of three sections:

- Engaging with startup cycle curve

The startup cycle curve permits the smooth, path-specific synchronization of the slave drive with the position of the master drive.

- Master cycle with main curve

After synchronization, the slave drive follows the master drive in accordance with the position specifications of the main curve. The slave drive passes through the main curve cyclically until it exits the synchronization with the master drive. This process is called desynchronizing.

- Stop cycle with stop cycle curve

The stop cycle curve makes it possible to exit the main curve along a specific path. Once the stop cycle is completed, the slave drive loses its position reference to the master drive and ceases to follow it.

The process involved in designing an electronic cam differs significantly from the mechanical solution. In contrast to the mechanical solution, the electronic cam has degrees of freedom by means of which the machine can be optimized with respect to the following ancillary conditions:

- Smooth running
- Maximum acceleration
- Fewer vibrations

You have two options when creating what is referred to as the motion plan:

- Curve point-based table of electronic cam

The curve point table stores the dependencies between master movement and slave movement. The curve point-based electronic cam has the advantage that the motion plan can be developed in external software in order to import it then afterwards. The curve can be changed online by compressing and expanding the table.

- Online-calculated, formula-based electronic cam

With the formula-based electronic cam, in contrast to the curve point-based electronic cam, one has a greater influence with respect to online changes. In this case, the curve values can be influenced in each cycle.

The motion plan includes the essential know-how of the machine designer. The master movement is normally represented as a machine angle between 0 and 360 degrees. A number of curve points is defined with reference to this machine angle. These curve points specify the particular position of the slave drive with reference to the master drive. The number of curve points and the interpolation between these points determine the accuracy of the electronic cam.

Advantages of the electronic cam:

- Smooth running
- High maximum acceleration
- Low tendency to vibrate
- Optimal diagnostics in monitor mode
- Virtual encoder (software counter) can be used as the master encoder.

### 5.2.3 MOVIKIT® MultiAxesController

The MOVIKIT® MultiAxesController module was developed for mechanically coupled drives. The mechanical coupling can be implemented in a variety of ways.

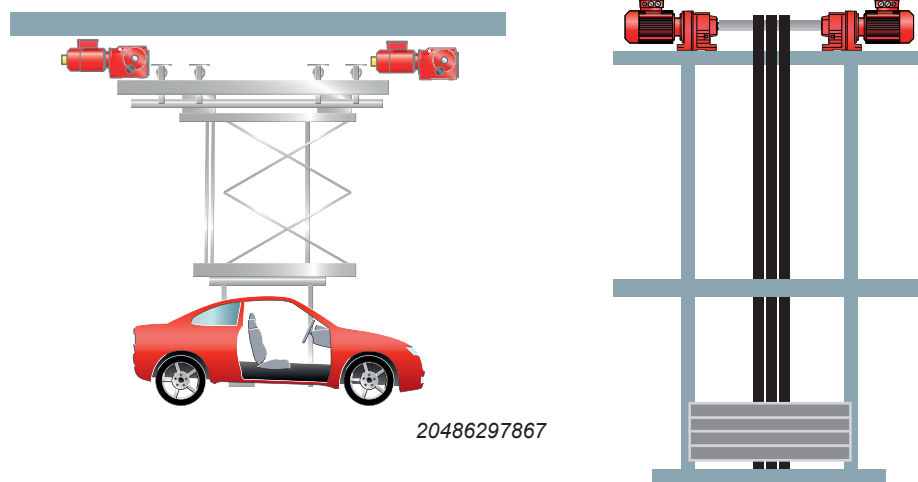
For example:

- Permanent coupling via the mechanical structure (connection via shafts, lifting trucks, gantries, wheel/rail)
- Temporary coupling via the product (extruder, sheet metal design from coil)

The coupling can also comprise multiple drives. The core function of the MultiAxesController is that multiple motors drive a single load together. The motors do not work against one another, however, as this can lead to vibrations and to system failure.

Classical master-slave connections are not suitable for this or manageable only with expert knowledge. The MultiAxesController breaks up this master-slave arrangement and handles each drive at the same level. Delays that occur due to the master starting and the slaves responding with a delay are thereby eliminated.

The elimination of the master-slave arrangement thereby leads to higher dynamics.



Because the MultiAxesController operates as a function within an axis group, the following operating modes are easily resolved:

- Processing multi-axis limit switches
- Multi-axis reference travel
- Multi-axis jog mode
- Multi-axis error handling
- Multi-axis alignment after an error

These operating modes are a component of the software module and do not have to be reprogrammed with every application. That saves time during startup.

Furthermore, the MultiAxesController also has the following features:

- Load distribution

Load distribution is provided for applications that do not always require 50% distribution. This can be dynamic wheel pressure caused by mass acceleration or static wheel pressure due to differing load. The distribution can be dynamically modified. The advantage can be greater acceleration, for example, which in turn reduces the cycle time.

- Anti-slip control

This increases system availability in the wheel/rail drive mode. A slip of the drive wheel can lead to shut-down of the system; in a worse case, a wheel or the rail will be damaged. The reason could be dirt or an oily spot on the rail. The anti-slip control recognizes the slip and limits it at a parameterizable threshold. A warning is output when doing so. Once the wheel has traction again, the drive continues to run, without damaging the mechanical systems.

- Electronic differential

The electronic differential is used when a mobile system is to travel around the curve. One drive undergoes thereby a speed increase while another drive undergoes a speed reduction. The MultiAxes controller then maintains the system at an average speed.

The MOVIKIT® MultiAxesController has 2 operating modes that are always unambiguously allocated to one application.

- "Position priority" operating mode

This operating mode is for applications in which a tilting of the structure leads to problems. This can lead to faulty positioning or overload with subsequent shut-down.

Application examples include dual-column hoists, SRS hoists, indoor cranes, parallel feeds.

- "Torque priority" operating mode

This operating mode is for applications in which torque control is of prime importance. Important control tasks here are allowing slip up to a parameterizable amount but limiting maximum slip (anti-slip control).

In addition, it can also occur that not all drives proceed along the same path, depending on position. This is the case, for example, during travel along a curve. For this reason, the MOVIKIT® MultiAxesController software module was expanded to include an electronic differential with disabling function (AllWheelDrive).

A load distribution with an adjustable feature for dynamically distributing torque to the individual drives via process data is also integrated. Using this function, drives can also be deliberately tensioned against one another in order to eliminate backlash, for example.

Diameter errors can also be compensated for.

Application examples include traction-optimized vehicles, RBG travel drives, curve travelers, fail-safe redundant drive systems, slick or poor-quality travel lanes and indexing tables.

The MOVIKIT® MultiAxesController can be used in combination with additional MOVIKIT® modules. This is the case, for example, in a double trolley in a storage/retrieval system. In addition, 2 MOVIKIT® MultiAxesControllers can also be used subordinatedly in both operating modes.

An example of this is a gantry crane that has multiple drives, right and left. The "Position priority" operating mode would then control the gantry, and subordinate groups, one each to the right and to the left would use the "Torque priority" operating mode.

## 5.2.4 MOVIKIT® Robotics

Product handling forms an important step in the process chain in automation. Loading and unloading go directly into the machine's cycle time. The motion profile must be fast and, at the same time, gentle on the product and the mechanical system.

A drive moves in one dimension if it positions a workpiece facing forwards or backwards. It is easy to optimize the positioning time and thus the process.

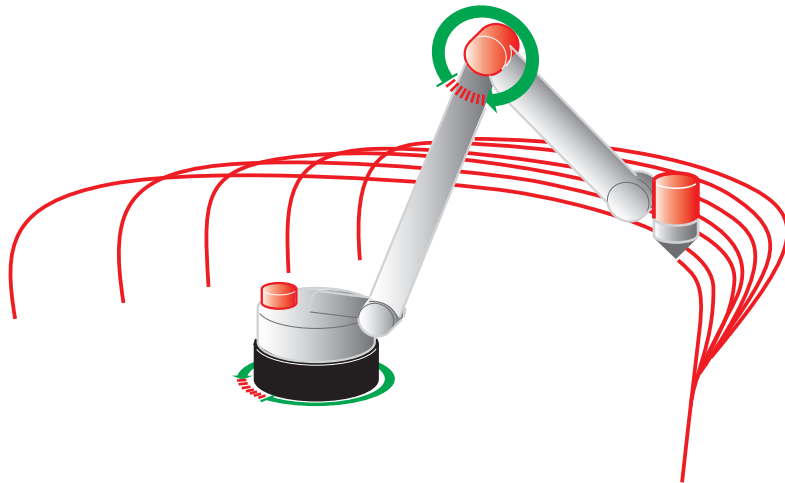
Two-dimensional movement of the workpiece is possible with as few as two axes. Here, it is difficult to determine the ideal motion profile so that items can be handed as quickly and yet as reliably as possible. Different positions in space often vary and can be reached using different paths. Typical applications include pick and place, palletizing and secondary packaging.

Applications such as plotting, glue application or product finishing, e.g. decorating foods, pose similar requirements. These processes can be carried out statically or dynamically.

The MOVIKIT® Robotics module was developed precisely for these fields of application. They form the ideal solutions platform that enables path movements to be implemented as simply and optimally as single-axis movements.

The MOVIKIT® Robotics software module in detail:

- Can run within the MOVIRUN® flexible and MOVIRUN® smart software platforms.
- Large selection available of standard kinematic models.  
Special kinematics also available on request.
- 3D simulation for significant reduction of startup time. Additional protection from faulty inputs.



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Benefit from the possibilities of the MOVIKIT® Robotics module and its extensions.

- Intuitive configuration thanks to adaptive 3D models.
- Programming and teaching in the programming environment from SEW-EURODRIVE – including directly on the panel.
- Simulation for shortening startup time.
- Optimum support for handling tasks such as pick & place and conveyor tracking.
- Bidirectional coupling to IEC 61131 runtime system for flexibility in a wide range of applications.

### **5.3 Purchase of fee-based software products from SEW-EURODRIVE**

Fee-based software products are divided into:

- Engineering software, which must be purchased once per workstation or engineering PC.
- Control software that must be purchased once per purchased control.

## 6 MOVI-C® CONTROLLER

The MOVI-C® CONTROLLER control family is characterized by a variety of performance classes and a suitable housing shape for every task. It ranges from a high quality cell controller to sophisticated automation control.

The MOVI-C® CONTROLLER comprises 4 performance classes in the following variants:

- MOVI-C® CONTROLLER standard is a compact profile rail controller and is optimized for coordinated two-axis applications (2 interpolating axes) paired with an additional 6 auxiliary axes.
- MOVI-C® CONTROLLER advanced is optimized for coordinated applications for up to 8 axes (interpolating axes) paired with an additional 8 auxiliary axes. It is installed with a stand-alone rear wall panel.





This controller also optionally offers installation in a master module that can then be installed as a module within the MOVIDRIVE® modular series in an axis system. This can result in additional wiring advantages.

- MOVI-C® CONTROLLER power eco is designed in the performance class as an industrial PC. It is optimized for coordinated applications for up to 16 axes (interpolating axes) paired with an additional 16 auxiliary axes.
- MOVI-C® CONTROLLER power is also designed in the performance class as an industrial PC. It is optimized for coordinated applications for up to 32 axes (interpolating axes) paired with an additional 32 auxiliary axes. Furthermore, a second operating system, running separately from the real time PLC via modern Hypervisor technology, can be optionally activated on this controller, e.g. for integrated visualization. Workload spikes in the real time PLC or the second Windows® Embedded Standard 7 operating system have no influence on the respective other side.

Difference between interpolating axes and auxiliary axes:

- interpolating axes are notable in that the motion profile is calculated cyclically in the controller and transmitted to the inverter via process data. The inverter then follows this cyclical setpoint by interpolation. The use of this operating mode ranges from coordinated positioning and electronic cams all the way to robotics.
- By contrast, auxiliary axes operate autonomously when it comes to the motion profile. Setpoint values, such as a target position, are transmitted to an auxiliary axis, which then approaches this target independently. This operating mode is suitable for single-axis applications, e.g. positioning, speed or torque control tasks.

6

			
MOVI-C® CONTROLLER ...			
standard UHX25A	advanced UHX45A	power eco UHX84A	UHX85A power
<ul style="list-style-type: none"> <li>• 2 interpolating axes</li> <li>• 6 auxiliary axes</li> </ul>	<ul style="list-style-type: none"> <li>• 8 interpolating axes</li> <li>• 8 auxiliary axes</li> </ul>	<ul style="list-style-type: none"> <li>• 16 interpolating axes</li> <li>• 16 auxiliary axes</li> </ul> PC-based	<ul style="list-style-type: none"> <li>• 32 interpolating axes</li> <li>• 32 auxiliary axes</li> </ul> PC-based Optional 2nd WIN7 operating system embedded
Allocated to MOVIRUN® ...			
smart/flexible	smart/flexible	flexible	flexible

All 4 controller classes can be optimally embedded in the system from SEW-EURODRIVE and have the following in common:

- Modern, clock-synchronized EtherCAT®/SBus<sup>PLUS</sup> system bus master for the interface to the inverters and peripherals from SEW-EURODRIVE.
- Connection to conventionally available higher-level controllers via standard field-bus-slave interface connections such as PROFIBUS, PROFINET, EtherNet/IP™ and Modbus TCP.
- Ethernet engineering interface with routing function to subordinate devices from SEW-EURODRIVE that are connected to the system bus.
- Common software world for engineering, programming, diagnostics, the MOVIRUN® software platform and the MOVIKIT® software kit.
- Freely programmable sequence control in accordance with IEC 6-1131 for automating drive and logic tasks (MOVIRUN® flexible).
- Central data storage for all MOVI-C® inverters from SEW-EURODRIVE.
- Plug-and-play device replacement through automatic data restoration.
- Routing of conventional security protocols from higher-level controllers to the drive inverters. In the first step, PROFIsafe was implemented via PROFINET.

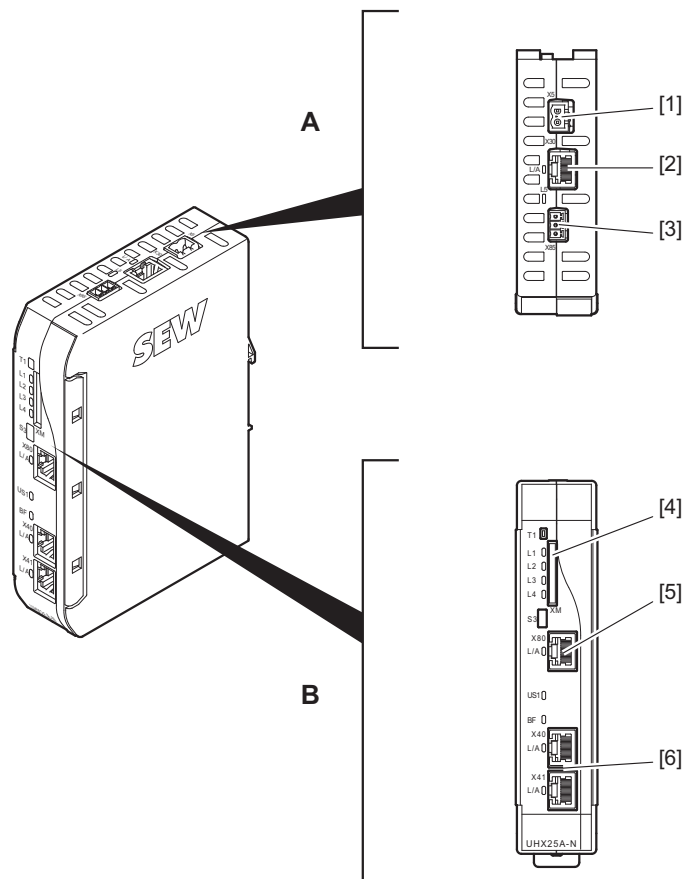
## 6.1 Description

### 6.1.1 MOVI-C® CONTROLLER standard UHX25A

The MOVI-C® CONTROLLER standard is available in 4 variants which differ in their fieldbus interface:

Variant	Connection	Maximum number of data words per controller
UHX25A <sup>1)</sup>	Without fieldbus - slave interface	
UHX25A-N	PROFINET slave	128 process data words
UHX25A-E <sup>1)</sup>	EtherNet/IP™-Slave or Modbus-Slave	
UHX25A-T <sup>1)</sup>	EtherCAT®-Slave for the interface to higher-level controllers from SEW-EURODRIVE with EtherCAT®-compatible SBus <sup>PLUS</sup> .	Not relevant

1) In preparation

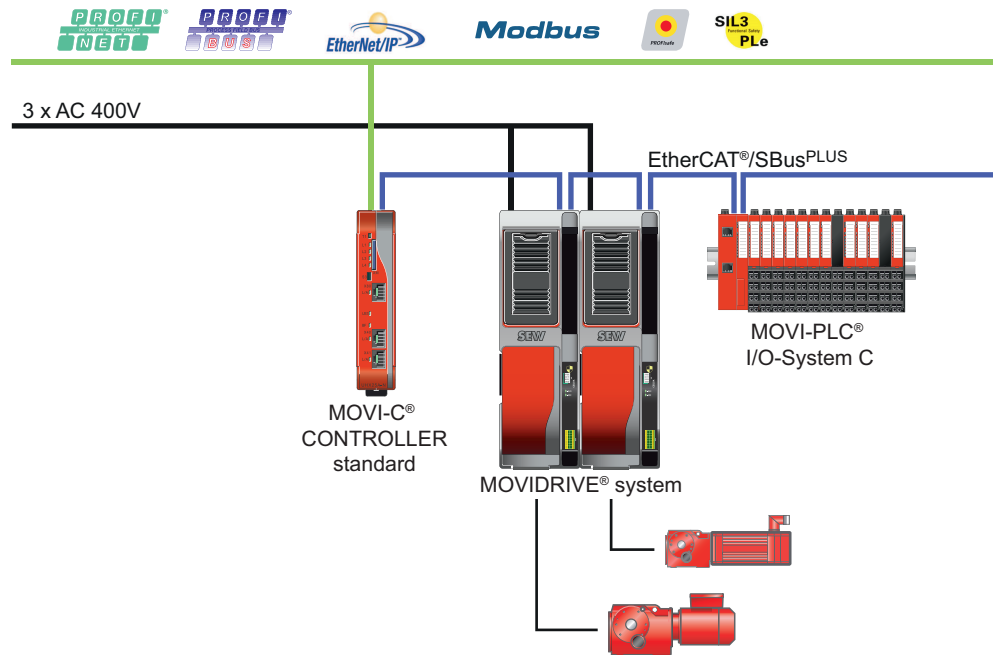


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- [1] DC 24 V supply
- [2] EtherCAT®-/SBus<sup>PLUS</sup>-Master
- [3] CAN bus

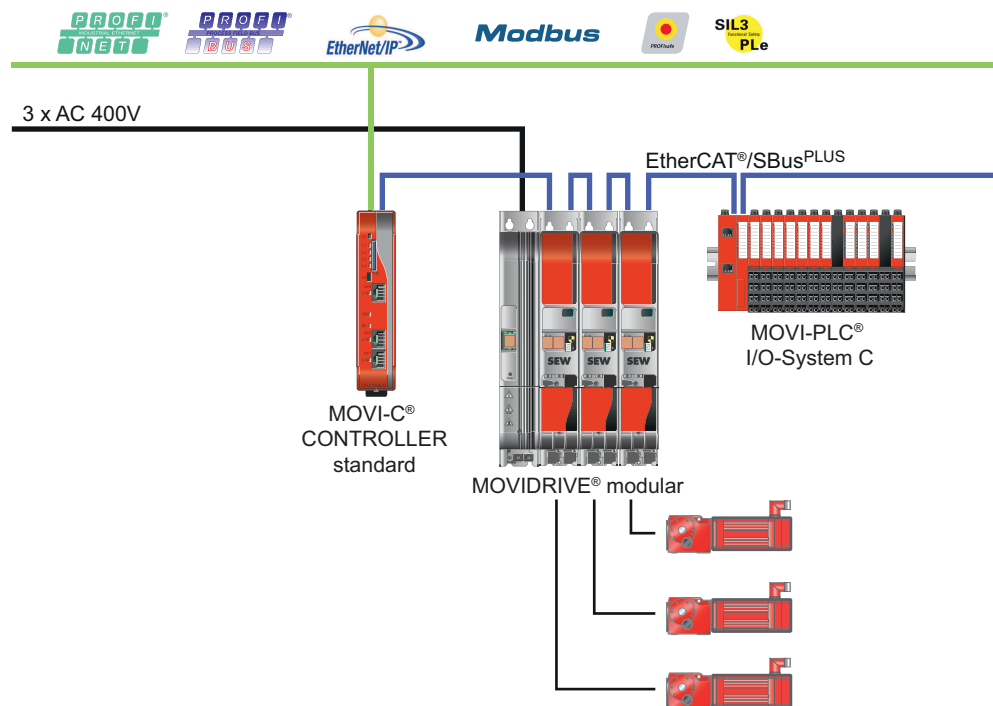
- [4] SD removable data storage
- [5] Engineering via Ethernet
- [6] Fieldbus - slave interface

Topology example of a two-axis application combined with MOVIDRIVE® system and additional EtherCAT® components.



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Topology example of a three-axis application (1 axis thereof is an auxiliary axis) combined with MOVIDRIVE® modular and additional EtherCAT® components.



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You can find more information on the controller in the following documents:

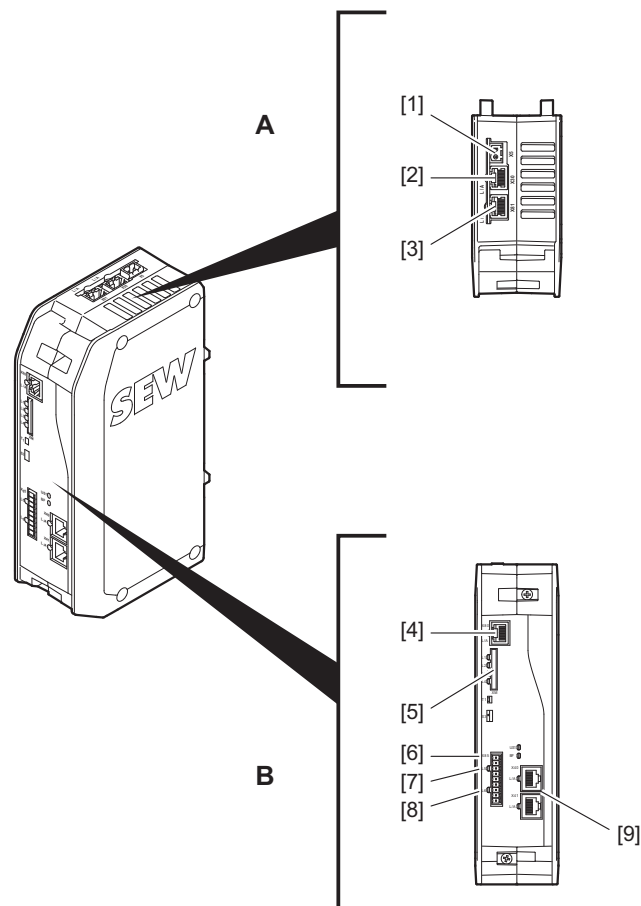
- Manual "MOVI-C® CONTROLLER standard UHX25A".
- Manual "MOVI-C® CONTROLLER with PROFINET fieldbus interface".

### 6.1.2 MOVI-C® CONTROLLER advanced UHX45A

The MOVI-C® CONTROLLER advanced is available in 4 variants which differ in their fieldbus interface:

Variant	Connection	Maximum number of data words per controller
UHX45A <sup>1)</sup>	Without fieldbus - slave interface	
UHX45A-N	PROFINET slave	256 process data words
UHX45A-E	EtherNet/IP™-Slave or Modbus-Slave	
UHX45A-T	EtherCAT®-Slave for the interface to higher-level controllers from SEW-EURODRIVE with EtherCAT®-compatible SBus <sup>PLUS</sup> .	Not relevant

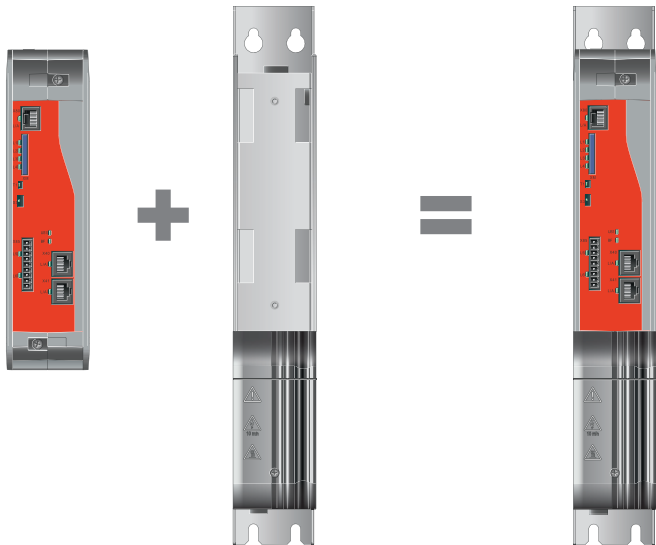
1) In preparation



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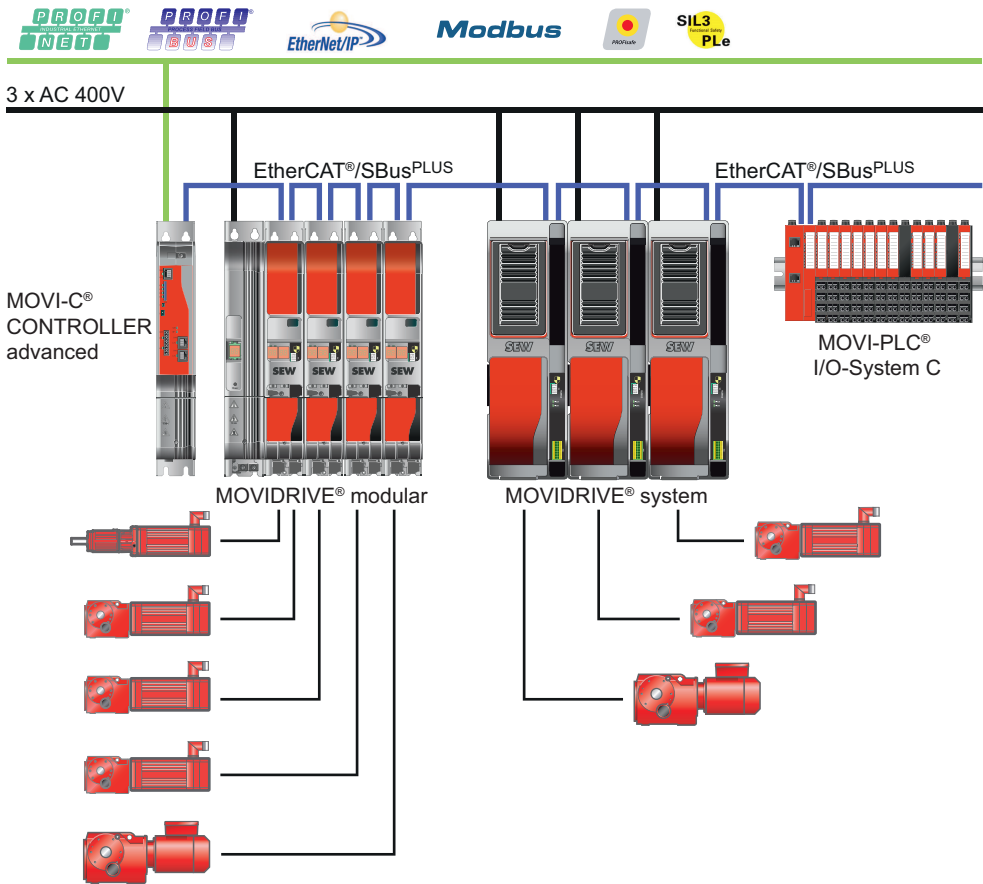
- |   |                                |
|---|--------------------------------|
| [1] DC 24 V supply                          | [6] CAN bus 1                  |
| [2] EtherCAT®-/SBus <sup>PLUS</sup> -Master | [7] CAN bus 2                  |
| [3] Ethernet port (reserved)                | [8] RS485                      |
| [4] Engineering via Ethernet                | [9] Fieldbus - slave interface |
| [5] SD removable data storage               |                                |

Optional installation in a master module.



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Topology example combined with MOVIDRIVE® modular, MOVIDRIVE® system and additional EtherCAT® components.

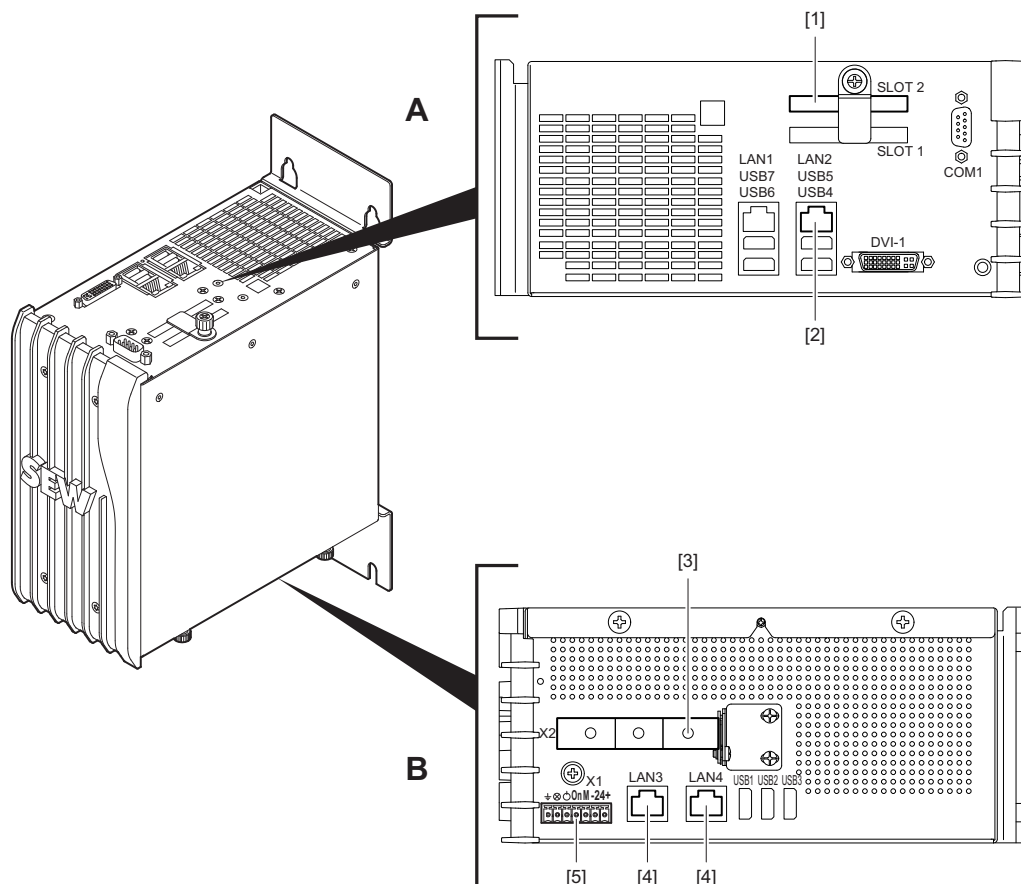


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### 6.1.3 MOVI-C® CONTROLLER performance class power eco UHX84A

The MOVI-C® CONTROLLER power eco is available in 3 variants which differ in their fieldbus interface:

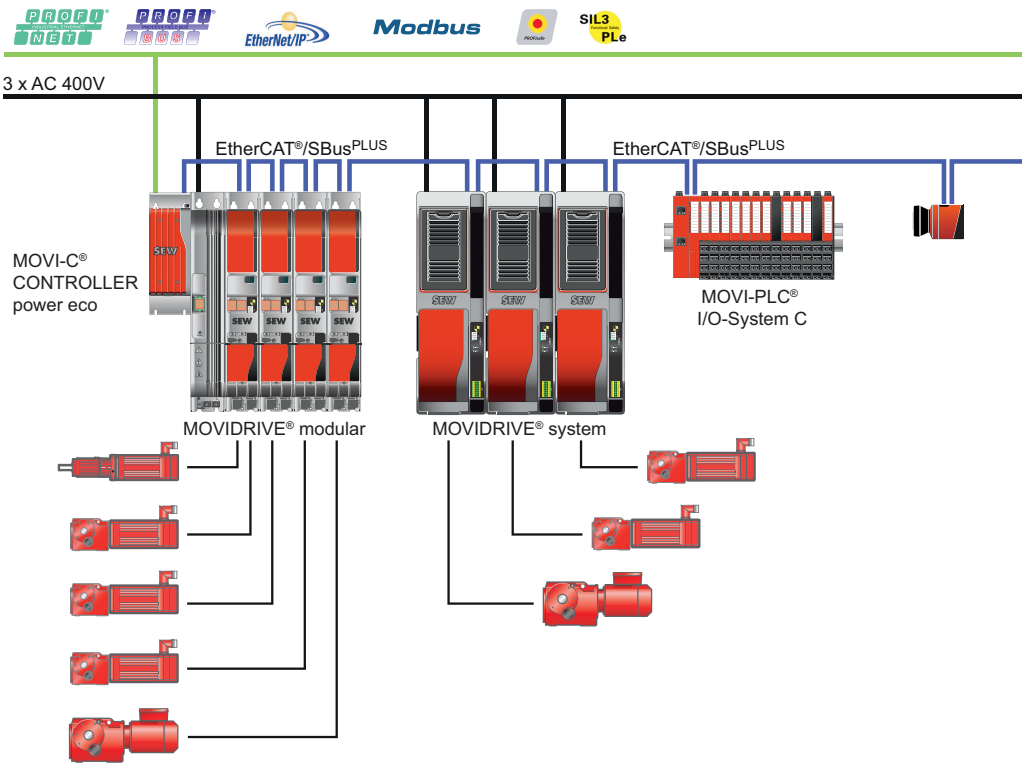
Variant	Connection	Maximum number of data words per controller
UHX84A	Without fieldbus - slave interface	
UHX84A-R	PROFINET-Slave, EtherNet/IP™-Slave or Modbus-Slave	<ul style="list-style-type: none"> <li>• 512 process data words</li> <li>• 248 process data words</li> <li>• 120 process data words</li> </ul>
UHX84A-P	PROFIBUS slave	120 process data words



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- |   |                     |
|---|---------------------|
| [1] SD removable data storage               | [4] LAN for control |
| [2] EtherCAT®-/SBus <sup>PLUS</sup> -Master | [5] DC 24 V supply  |
| [3] Fieldbus option                         |                     |

Topology example combined with MOVIDRIVE® modular, MOVIDRIVE® system and additional EtherCAT® components.



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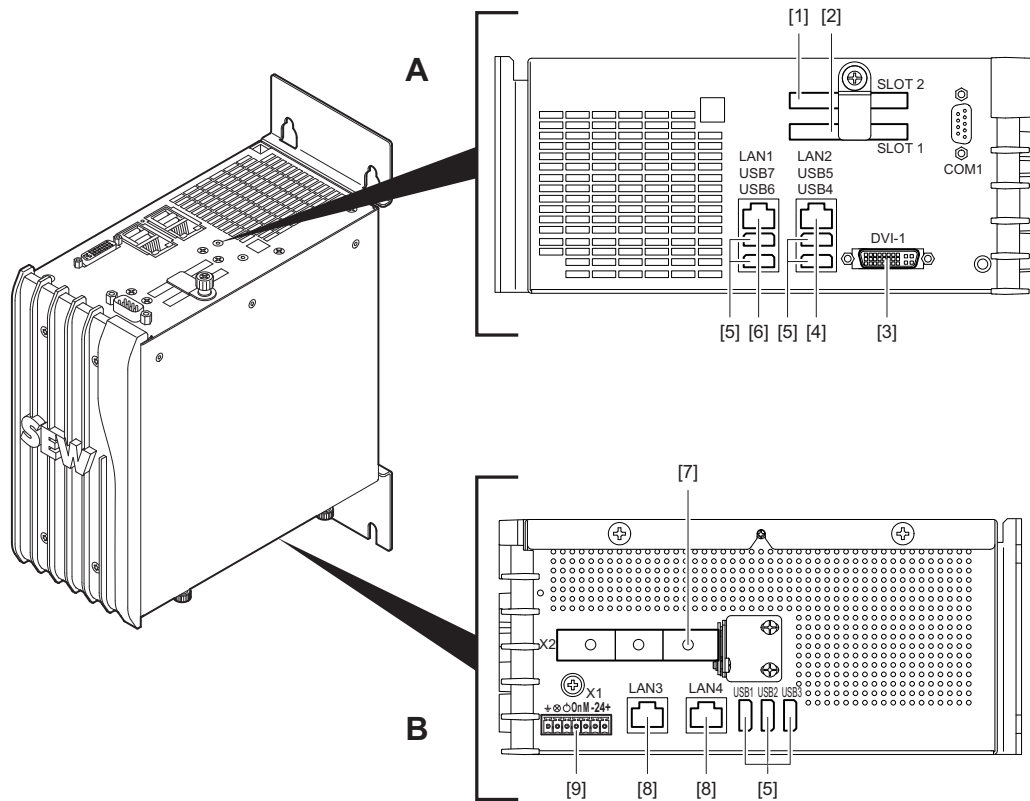
### 6.1.4 MOVI-C® CONTROLLER performance class power UHX85A

The MOVI-C® CONTROLLER power is available in 3 variants which differ in their fieldbus interface:

Variant	Connection	Maximum number of data words per controller
UHX85A	Without fieldbus - slave interface	
UHX85A-R	PROFINET-Slave, EtherNet/IP™-Slave or Modbus-Slave	<ul style="list-style-type: none"> <li>• 512 process data words</li> <li>• 248 process data words</li> <li>• 120 process data words</li> </ul>
UHX85A-P	PROFIBUS slave	120 process data words

The MOVI-C® CONTROLLER power offers the option of activating a second operating system, separately from the real time PLC via modern Hypervisor technology, e.g. for integrated visualization. Workload spikes in the real time PLC or the second Windows® Embedded Standard 7 operating system have no influence on the respective other side.

For further information, refer to the chapter "Visualization" (→ 40).



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- |                                 |  |
|---------------------------------|--|
| [1] SD removable data storage   | [6] LAN for Windows® Embedded Standard 7 |
| [2] SD removable data storage   | [7] Fieldbus option                      |
| [3] DVI                         | [8] LAN for control                      |
| [4] SBus <sup>PLUS</sup> master | [9] DC 24 V supply                       |
| [5] USB interfaces              |  |



## 7 Visualization

Requirements in modern industrial environments are steadily increasing. At the same time, operator tasks at machines are becoming increasingly more complex and involve more responsibility. The operator must be able to obtain information regarding the machine status quickly and easily, and be able to modify settings directly and flexibly.

The range of functions in control systems is also increasing and becoming more advanced, enabling more complicated processes to be controlled efficiently. Operator terminals make human-machine communication simple and safe even for the most complex production processes.

Graphical operator panels have been developed to meet the requirements of a human-machine interface in connection with process controlling or monitoring in a wide variety of application areas in production technology. The terminal simplifies the operator's work since it can be readily adapted to the respective tasks at hand. This means operators can continue to use the terms and definitions they are familiar with.

### 7.1 HMI-Builder.PRO engineering software

With the HMI-Builder.PRO engineering software integrated in MOVISUITE®, the user can create professional and customized HMI solutions. The software has a variety of predefined library functions, such as:

- Symbol objects
- Alarm groups
- Alarms
- Password level
- Message library
- Macros
- Data logger
- Real-time clock

The operator panels are programmed using a PC with the HMI-Builder.PRO software. The operator panel is, to a large extent, object-oriented. This means that the programming is based on an object to which a function is assigned. All types of signals are defined on this principle. The programmed project is stored in the operator panel.

## 7.2 Visualization via DOP11C operator panel

The operator panels of the DOP11C family exist in 6 sizes:

- DOP11C-40 (4.3 inch touchscreen)
- DOP11C-51 (5 inch touchscreen)
- DOP11C-70 (7 inch touchscreen)
- DOP11C-100 (10.4 inch touchscreen)
- DOP11C-120 (12.1 inch touchscreen)
- DOP11C-150 (15.4 inch touchscreen)

7

The DOP11C operator panels all have the following characteristics:

- TFT/LCD touchscreen
- Front side with IP65 protection class
- UL508 approbation (except DOP11C-51)
- RS232 serial interface (except DOP11C-51)
- RS422/RS485 serial interface
- Ethernet
- Optional SD memory card (except DOP11C-51)

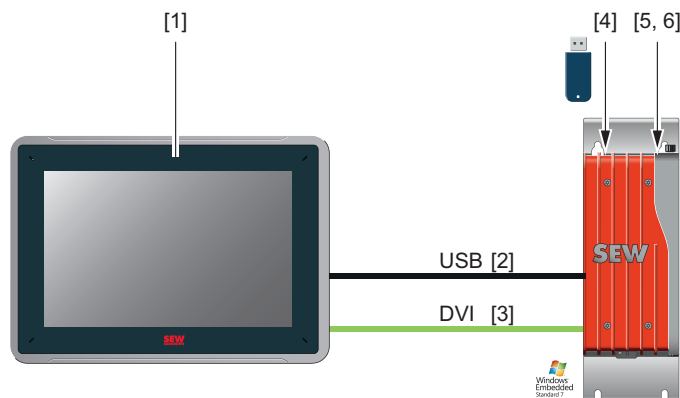
### 7.3 Integrated visualization with MOVI-C® CONTROLLER power

In addition to the real-time operating system for the control, the MOVI-C® CONTROLLER has an additional, optional Windows® Embedded Standard 7 operating system. This additional operating system is easily activated by plugging in the second removable data storage (CFast card). This allows additional, fully integrated functions running simultaneously to be implemented separately from the real time operating system, e.g. visualization.

- The runtimes of the two operating systems are separated by modern Hypervisor technology. Utilization peaks on one side thereby have no effect on the respective other side. The Windows® Embedded Standard 7 operating system can even be restarted without influencing the real time component of the controller. This contributes significantly to increased system availability with integrated visualization solutions.
- The 2 operating systems in one device result in wiring advantages and significant space savings. This results in a price advantage with increased functionality.

Criterion	DOP (Windows® CE)		Windows® Embedded Standard 7 (with runtime and OPT)	
	Comments	Assessment	Comments	Assessment
Additional possibilities	Remote maintenance possible	+	Remote maintenance <sup>1)</sup>	0
Cable length	Ethernet	+	Maximum 5 m due to DVI interface Compatible with conventional DVI extender	0
Wiring	Via switch			+
Price (including control units)	15" DOP	0	15" OPT monitor OVR dongle OMW CFast card 16 GB	+
Speed (page structure, tag polling, etc.)	1.1 GHz/1 GB RAM	0	2.27 GHz/2 GB RAM	+
Illustration		0	Suitable for 3D visualizations	+
Additional possibilities		0	Windows® applications included	+
OPC DA Server	Not available	0	Available	+
Programming (control elements)	.compact Framework	0	.net Framework	+

1) In preparation



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- |     |                |     |                                  |
|-----|----------------|-----|----------------------------------|
| [1] | OPT71C-Monitor | [4] | CFast card control OMH85A        |
| [2] | USB connection | [5] | CFast card Windows OMH7xB        |
| [3] | DVI connection | [6] | USB dongle visual runtime ORV71C |

Like the DOP panels, startup and programming of the visualization interface is performed with the HMI-Builder.PRO software, which is integrated in the MOVISUITE® engineering tool. This also results in software consistency between the two visualization solutions. Projects developed on the DOP panel solution can also be imported to the MOVI-C® CONTROLLER power control and vice-versa.

Device designation	Software/Hardware	Part number
OMW71B	Windows® CFast 16 GB	28208323
OMW72B	Windows® CFast 32 GB	28208331
ORV71C	Visual Runtime USB-Dongle	17974305
OPT71C-12	Monitor 12"	17974283
OPT71C-15	Monitor 15"	17974291

## 7.4 DOP11C, OPT71C

### DOP11C

The DOP11C series of operator panels offers high functionality for realistic, high-performance machine visualization.

The more complex the system or the machine is and the more complex the automation, the more important are the machine visualization and diagnostics and the possibility of storing extensive data packages and parameter sets.

The operator panels of the DOP11C (Drive Operator Panel) series are tailored for just these complex requirements with a high-resolution color display, fast processors and a large amount of RAM. The range of touch screens extends from 4.3" to 15.4" with resolutions up to 1280 x 800 pixels.

Durable monitors combined with the Windows®-based MOVI-C® CONTROLLER power control platform are available for particularly demanding visualization tasks.

The HMI-Builder.PRO software is available for programming the DOP11C operator panel. This software provides an interface between humans and machines (Human Machine Interface) and works according to the principle of "What you see is what you get".

### OPT71C

An OPT71C monitor can be connected to the MOVI-C® CONTROLLER via the DVI-I interface, which is assigned to the Windows® operating system.

## 7.5 HMI-Builder.PRO

HMI-Builder.PRO is visualization software for project planning, operation and diagnostics of products and applications from SEW-EURODRIVE.

The areas of application include machine-oriented configuration with a DOP11C operator panel and central, PC-based configuration with the optional Windows® operating system of the MOVI-C® CONTROLLER and an OPT71C.

Project planning and visualization development are carried out in a standardized interface. HMI-Builder.PRO includes essential functions that are tailored to customer-specific needs and specifications.

The component library includes a multitude of predefined graphical objects that can be used to create the process map. Additional actions are programmable in the script editor.

Additional functions such as trend-viewing, alarm management, language management, security management, data logging, time management and receipt management can also be used in HMI-Builder.PRO projects.

Simulation mode makes it possible to execute and test the application on a PC after completion.

## 8 Inverter

### 8.1 MOVIDRIVE® modular

MOVIDRIVE® modular consists of:

- Supply and regenerative modules.
- Single-axis and double-axis modules.
- Capacitor and buffer modules.
- 24 V switched-mode power supply modules.
- Assembly modules for integrating MOVI-C® CONTROLLERS into the axis system.
- Accessories for EMC-compliant installation.
- Option cards for connecting other I/O or multi-encoders.
- Option cards for functional safety in functionally different versions.
- Accessories for connecting and controlling motors and brakes as well as assembled motor and encoder cables.

MOVIDRIVE® modular can be supplemented by connecting MOVIDRIVE® system single-axis units. These possess functionalities comparable to those of axis modules, but have their own line connection.

Especially in the upper power range up to 588 A/315 kW, MOVIDRIVE® system supplements the modular application inverter. For additional information, refer to the MOVIDRIVE® system product manual.

The key features of MOVIDRIVE® modular are:

- A maximum of 15 axis modules at a power supply module, a maximum of 30 drives for double-axis modules.
- Control mode:
  - U/f: for simple applications with asynchronous motors.
  - VFC<sup>PLUS</sup>: for precise control of asynchronous motors.
  - CFC: for asynchronous and synchronous servomotors.
  - ELSM®: for synchronous motors without encoders.
- Multi-encoder input in basic device.
- Speed control, torque control, position control.
- Expansion slots for I/O, multi-encoder, functional safety.
- Very compact device size, reduced space requirements in the control cabinet.

MOVIDRIVE® modular and system are intended for operation on a MOVI-C® CONTROLLER.

They offer a powerful clock-synchronous connection via the integrated EtherCAT®/SBus<sup>PLUS</sup> communication interface. Other EtherCAT® clients from SEW-EURODRIVE or other manufacturers can be controlled and diagnosed by the MOVI-C® CONTROLLER.

## 8.2 MOVIDRIVE® system

MOVIDRIVE® system consists of:

- Basic device application inverter.
- Accessories for EMC-compliant installation.
- Option cards for connecting other I/O or distance encoders.
- Option cards for functional safety in functionally different versions.
- Accessories for connecting and controlling motors and brakes as well as assembled motor and encoder cables.

As an extension to the MOVIDRIVE® system, modules of the MOVIDRIVE® modular application inverter can be modularly connected. This inverter series has a comparable functionality, but is structured as a multi-axis system.

The key features of MOVIDRIVE® system are:

- Control mode:
  - U/f: for simple applications with asynchronous motors.
  - VFC<sup>PLUS</sup>: for precise control of asynchronous motors.
  - CFC: for asynchronous and synchronous servomotors.
  - ELSM®: for synchronous motors without encoders.
- Multi-encoder input in basic device.
- Speed control, torque control, position control.
- Expansion slots for I/O, synchronous encoder, functional safety.
- Very compact device size, reduced space requirements in the control cabinet.

MOVIDRIVE® modular and system are intended for operation on a MOVI-C® CONTROLLER.

They offer a powerful clock-synchronous connection via the integrated EtherCAT®/SBus<sup>PLUS</sup> communication interface. Other EtherCAT® clients from SEW-EURODRIVE or other manufacturers can be controlled and diagnosed by the MOVI-C® CONTROLLER.

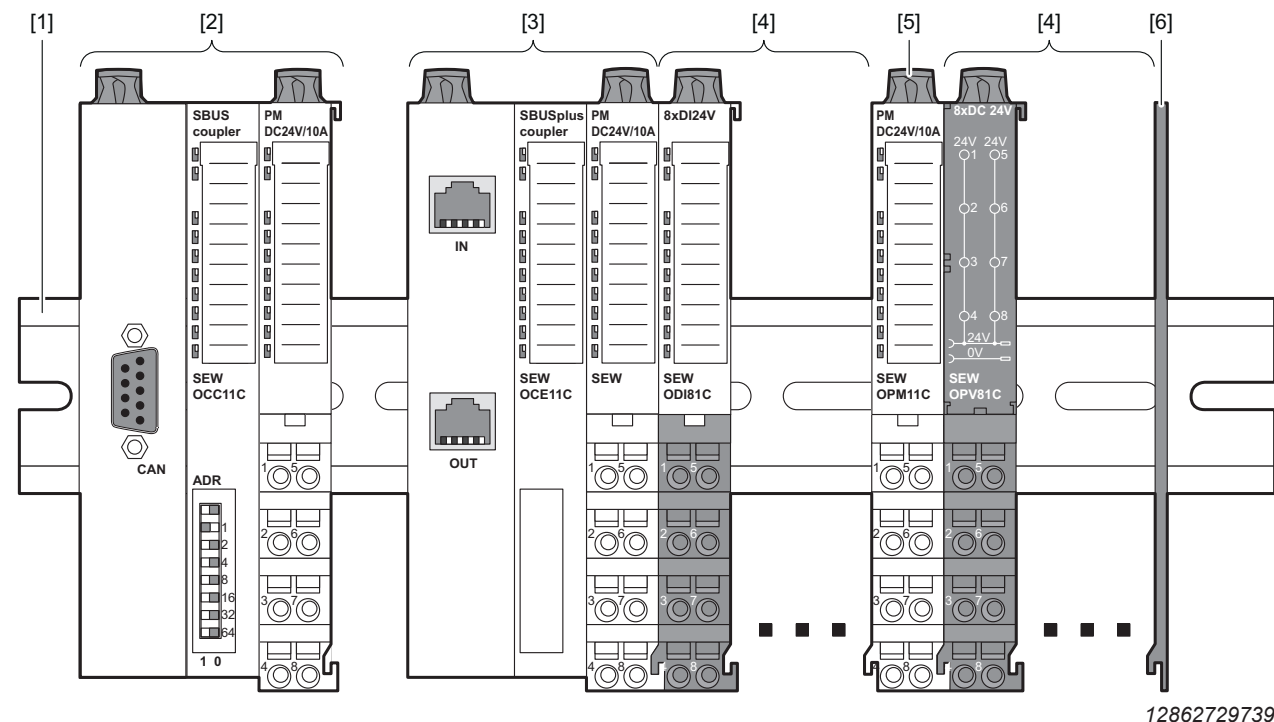
## 9 MOVI-PLC® I/O system C

The MOVI-PLC® I/O system C is an automation system with a modular structure for installation on a 35 mm mounting rail.

The modular MOVI-PLC® I/O system C extends the interfaces of the MOVI-PLC® controller.

A MOVI-PLC® I/O system C contains a bus coupler (CAN bus coupler or EtherCAT® bus coupler) to which up to 64 I/O modules can be connected via the backplane bus. The bus couplers communicate with the MOVI-PLC® controller via system buses. Up to 64 MOVI-PLC® I/O systems can be connected depending on the controller type. This means the MOVI-PLC® controller can automatically access a large number of inputs and outputs.

You can adapt this system precisely to your automation tasks using the 2, 4 and 8-channel peripheral modules. The DC 24 V voltage supply is integrated in the backplane bus. This means that you can exchange defective electronics modules when the wiring is upright. You can define further potential areas inside the system for the DC 24 V voltage supply using the differently colored power supply modules.



12862729739

- |     |                              |     |                            |
|-----|------------------------------|-----|----------------------------|
| [1] | 35 mm mounting rail          | [4] | Peripheral modules         |
| [2] | CAN bus coupler OCC11C       | [5] | Power supply module OPM11C |
| [3] | EtherCAT® bus coupler OCE11C | [6] | Bus cover                  |

## 9.1 Part numbers

Type	Designation	Part number
OPV81C	8 × DC-24-V terminals	28211847
OPV82C	8 × DC-0-V terminals	28211855
OPV41C	4 × DC-24-V and 4 × DC-0-V terminals	28211863
OPM11C	Power module DC-24-V, 10 A	28211871
ODI24C	Digital inputs DI 2 × DC 24 V ETS	28211898
ODI42C	Digital inputs DI 4 × DC 24 V, 2 µs – 4 ms	28211901
ODI43C	Digital inputs DI 4 × DC 24 V, 3-conductor	28211928
ODI81C	Digital inputs DI 8 × DC 24 V	28211936
ODO81C	Digital outputs DO 8 × DC 24 V, 0.5 A	28211944
OAI42C	Analog inputs AI 4 × 16 bit 0(4) – 20 mA	28211952
OAI41C	Analog inputs AI 4 × 16 Bit ±10 V	28211960
OAI44C	Analog inputs AI 2 × 16 bit TC	28211979
OAI45C	Analog inputs AI 4 × 16 bit R/RTD	28211987
OA042C	Analog outputs AO 4 × 12 bit 0(4) – 20 mA	28211995
OA041C	Analog outputs AO 4 × 16 Bit ±10 V	28212002
ORS11C	RS422/485 interface	28212010
OCC11C	CAN bus coupler (SBus)	28212029
OCE11C	EtherCAT® (SBus <sup>PLUS</sup> ) bus coupler	28212037
OZB11C	Bus cover	28212045
OZS11C	Shield bus carrier	28212053
OKC11B	OCC11C – MOVI-PLC® connection cable	18104827

## **10 SBus<sup>PLUS</sup> system bus**

### **10.1 Basics**

The SBus<sup>PLUS</sup> is the EtherCAT<sup>®</sup>-compatible system bus in MOVI-C<sup>®</sup> automation.

The communication protocol is standardized in accordance with international IEC standards and meets all of the requirements necessary with respect to plant and machine automation. These include a topology-free network, synchronization of system components, and extensive service and diagnostics options.

The EtherCAT<sup>®</sup>/SBus<sup>PLUS</sup> Master enables the MOVI-C<sup>®</sup> CONTROLLER controls to integrate system components such as the MOVIDRIVE<sup>®</sup> and MOVI-PLC<sup>®</sup> I/O-System C application inverters. For complete system solutions, the open EtherCAT<sup>®</sup> protocol provides the opportunity to integrate third-party components such as IP67 I/O systems, linear measurement systems, RFID systems or valve blocks.

SBus<sup>PLUS</sup> master in the MOVI-C<sup>®</sup> system meets the following requirements:

- Startup functions, parameterization and engineering of system components with the MOVISUITE<sup>®</sup> engineering software.
- Clock-synchronous process data exchange between the SEW-EURODRIVE control and the EtherCAT<sup>®</sup> clients in the network.
- Automatic addressing of EtherCAT<sup>®</sup> components during the startup phase and system expansion..
- High-precision synchronization through Distributed Clocks for interpolated axes.
- Simplified and fast startup with a configuration state of the system components.
- Secure data transmission for safety protocols.
- Services for saving and restoring the data sets of system components.
- Services for parameterization of additional automation components.
- Advanced diagnostics functions of network components.
- Identification and localization of errors in the network.

## 10.2 Connection cable

### 10.2.1 Prefabricated cables from SEW-EURODRIVE

#### System bus and module bus cable

The RJ45 connectors of the system bus and module bus cables, the connectors that can be preassembled in the field, and the sockets in the application inverters have been checked for mechanical stability and contact reliability by SEW-EURODRIVE. SEW-EURODRIVE recommends to use the system bus and module bus cables listed below, and the connectors that can be preassembled in the field. If other cables and connectors are used, SEW-EURODRIVE does not make any statements regarding the quality of the plug-in connection.

#### NOTICE

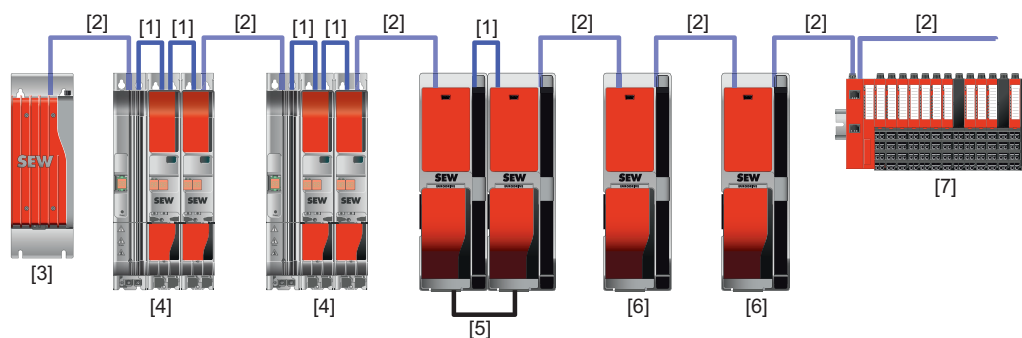
Use of wrong cables.

Damage to the application inverter.

The system bus cables [2] must only be 4-pin cables. If an 8-pin cable is used, malfunctions or failures may occur at the connected devices.

#### System bus and module bus cabling

Example of a system bus and module bus cabling



18016992651

- [1] Module bus cable, 8-pin, color: anthracite gray.
- [2] System bus cable, 4-pin, color: light gray.
- [3] MOVI-C<sup>®</sup> CONTROLLER power UHX8x
- [4] MOVIDRIVE<sup>®</sup> modular
- [5] MOVIDRIVE<sup>®</sup> system with DC link connection
- [6] MOVIDRIVE<sup>®</sup> system
- [7] Other EtherCAT<sup>®</sup> stations at the EtherCAT<sup>®</sup>/SBus<sup>PLUS</sup>

## System bus cable

### Figure of the cable



[1] Connector red

[2] Connector red

The 4-pole system bus cable [2] is used between automation components, see figure (→ 50). Some of these components are listed here as examples:

- MOVI-C<sup>®</sup> CONTROLLER
- MOVIDRIVE<sup>®</sup> modular application inverter
- PC with MOVISUITE<sup>®</sup> engineering software
- MOVI-PLC<sup>®</sup> I/O system
- Other EtherCAT<sup>®</sup> stations at the EtherCAT<sup>®</sup>/SBus<sup>PLUS</sup>

The following lengths of the system bus cable are available for fixed installation.

Cable length	Part number
0.29 m	18179959
0.75 m	18167039
1.5 m	18179975
3 m	18167047
5 m	18179983
10 m	18179991

## Data cable

If the assembled system bus cable cannot be used, the option exists of field assembly. The reasons for this can be different cable lengths or different raw cable qualities.

If other data cables are used, the following requirements must be complied with:

- Data cable according to transmission category Cat. 5, Class D.
- Outside diameter 6.1 – 6.9 mm.
- Core cross section depending on connector variants.
- 2-paired (only 2 pairs are used in 4-paired cables).
- UL approval if the system is used in a UL-relevant manner.

*RJ45 connector*

Part number of RJ45 connector	Description	Core cross section
19174594	RJ45 connector to IEC 60603-7, 4-pin	<ul style="list-style-type: none"> <li>• Litz wire: AWG 22 – AWG 24</li> <li>• Wire: AWG 22 – AWG 23</li> <li>• Cable jacket: Ø 6.1 – 6.9 mm</li> </ul>
19174586 <sup>1)</sup>		<ul style="list-style-type: none"> <li>• Litz wire: AWG 26</li> <li>• Wire: AWG 24</li> <li>• Cable jacket: Ø 6.1 – 6.9 mm</li> </ul>

1) Use this connector for the operation at a data cable of SEW-EURODRIVE or when the preassembled system cable is shortened

Plug connector characteristics:

- Can be preassembled in the field without tools.
- Transmission category Cat. 5.
- Suitable for connecting litz wires and wires.
- UL approval.

*Pin assignment*

The prefabricated system bus cables are assigned according to EIA/TIA-568A. Also use this assignment for prefabrication in the field.

Pin	Color coding
1	White/green
2	Green
3	White/orange
4	Reserved
5	Reserved
6	Orange
7	Reserved
8	Reserved

## Module bus cable

Figure



18027071371

[1] Connector black

[2] Connector red

For MOVIDRIVE<sup>®</sup> modular, the 8-core module bus cable [1] connects the power supply module to the first axis module and the axis modules to each other, see figure (→ 50).

For MOVIDRIVE<sup>®</sup> system the module bus cable is used when 2 MOVIDRIVE<sup>®</sup> system devices are connected in the DC link.

For MOVIDRIVE<sup>®</sup> modular, in addition to the system bus communication, the module bus is routed in the cable for information inside the unit. The module bus cable is delivered in the length required as part of the accessories for the axis modules.

A module bus cable for MOVIDRIVE<sup>®</sup> system in the required length must be ordered separately.

If the module bus cable for MOVIDRIVE<sup>®</sup> modular is needed as a spare part, it can be ordered with the following part numbers.

Cable length	Part number	Replacement cable for MOVIDRIVE <sup>®</sup> modular	Cable assignment for MOVIDRIVE <sup>®</sup> system
0.23 m	18166989	MDA90A-0020 – 0120-.. MDD90A-0020 – 0040-..	-
0.26 m	18166997	MDA90A-0160 – 0240-.. MDD90A-0020 – 0080-..	-
0.29 m	18167004	MDP90A-0100-...-C00 MDA90A-0320 – 0480-..	MDX90A-0020 – 0160-.. to install the devices directly next to each other
0.35 m	18167012	MDP90A-0500 – 0750-.. MDA90A-0640 – 1000-..	-
0.44 m	18167020	MDA90A-1400-..	MDX90A-0460 – 1130-.. to install the devices directly next to each other
1.6 m	18174205	-	MDX90A-.. with devices not directly next to each other

## 11 Motors and gear units

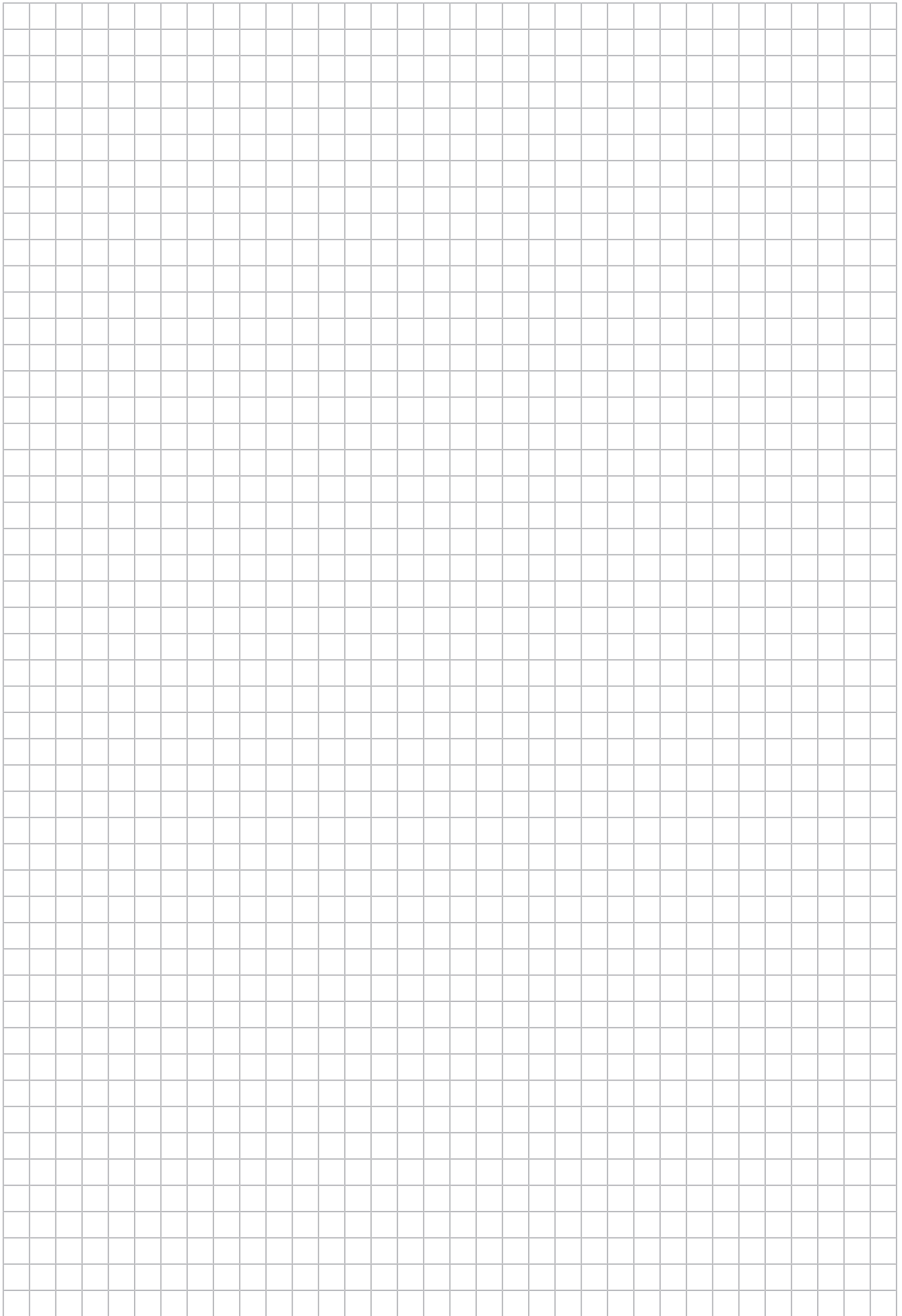
The modular system from SEW-EURODRIVE allows for combining asynchronous motors up to the energy efficiency class IE4 and synchronous motors with a very wide variety of gear unit designs. The gear units are also available with reduced backlash for servo applications.

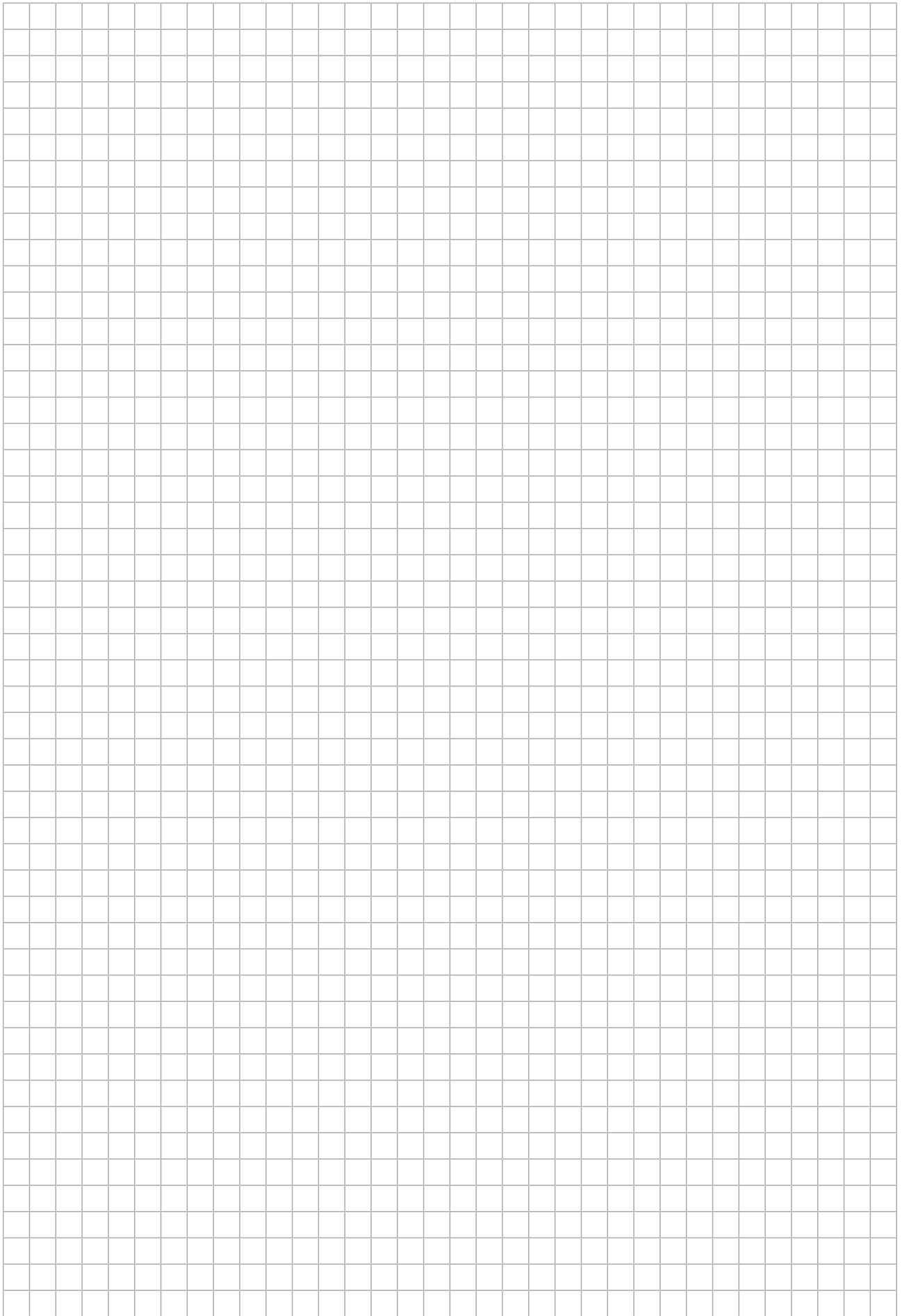
In addition to the rotating motors, linear motors and electric cylinders are also available.

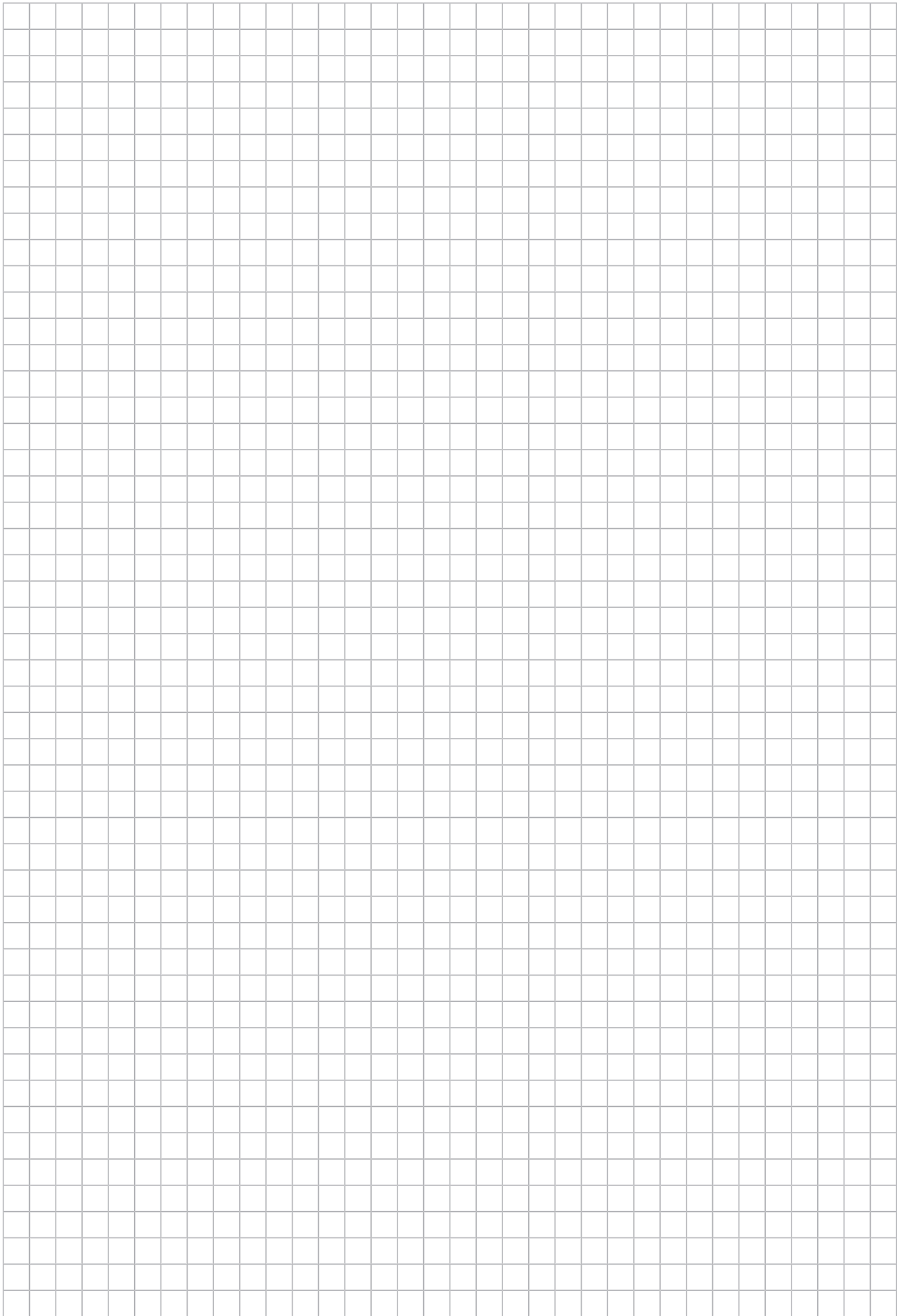
For more detailed information on SEW-EURODRIVE motors and gear units, refer to the following documents:

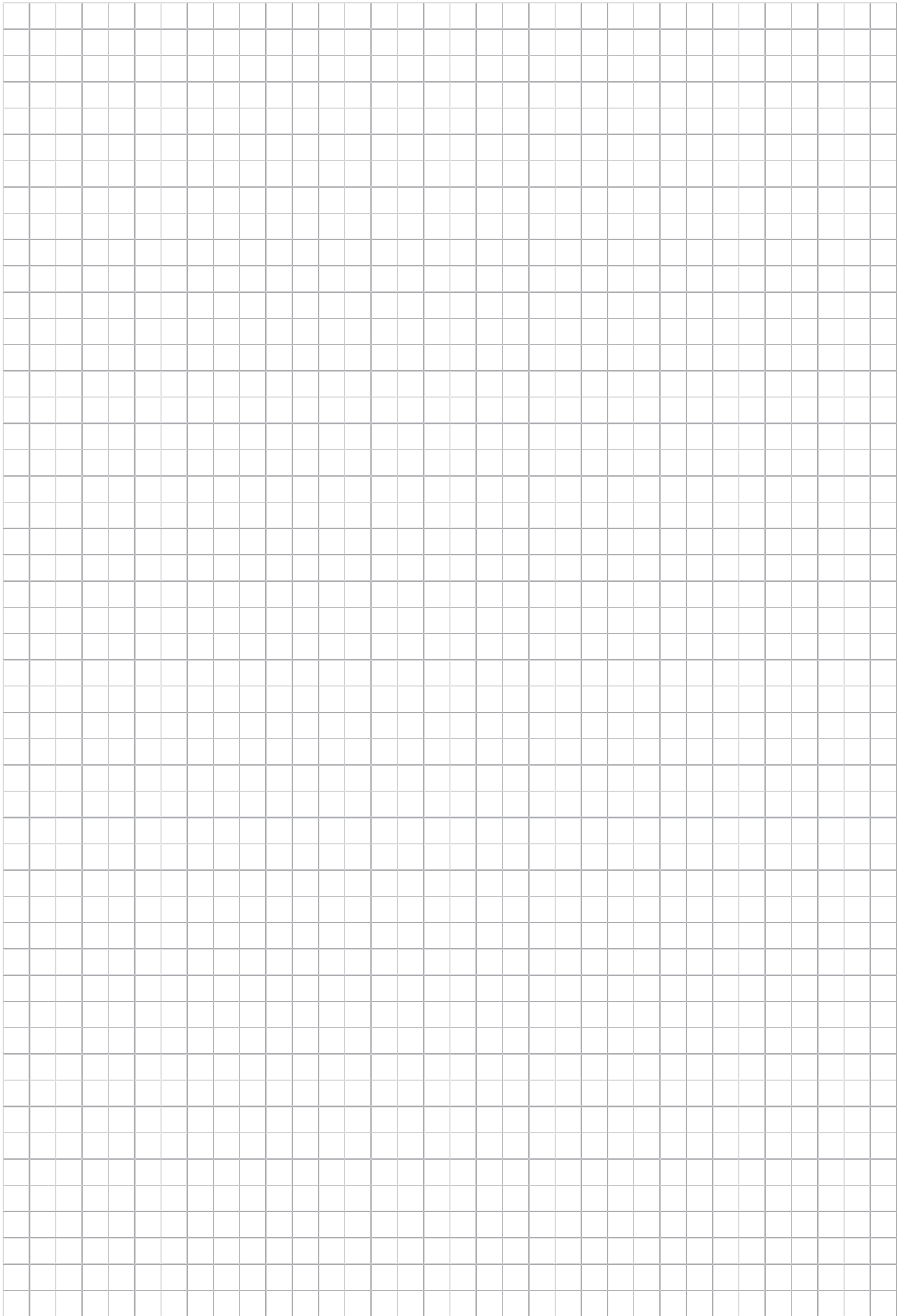
- DRN80 – 315 AC Motors Catalog
- DR.71 – 315, DT56, DR63 AC Motors Catalog
- CMP.. Synchronous Servomotors Catalog.
- Gear Units Catalog
- Servo Gear Units Catalog
- SL2 Synchronous Linear Motors Catalog
- CMS.. Electric Cylinder Catalog.

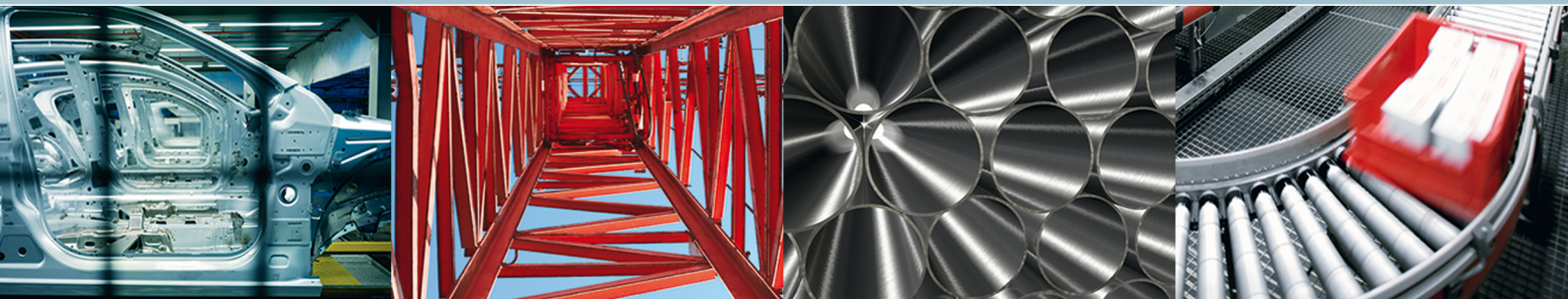
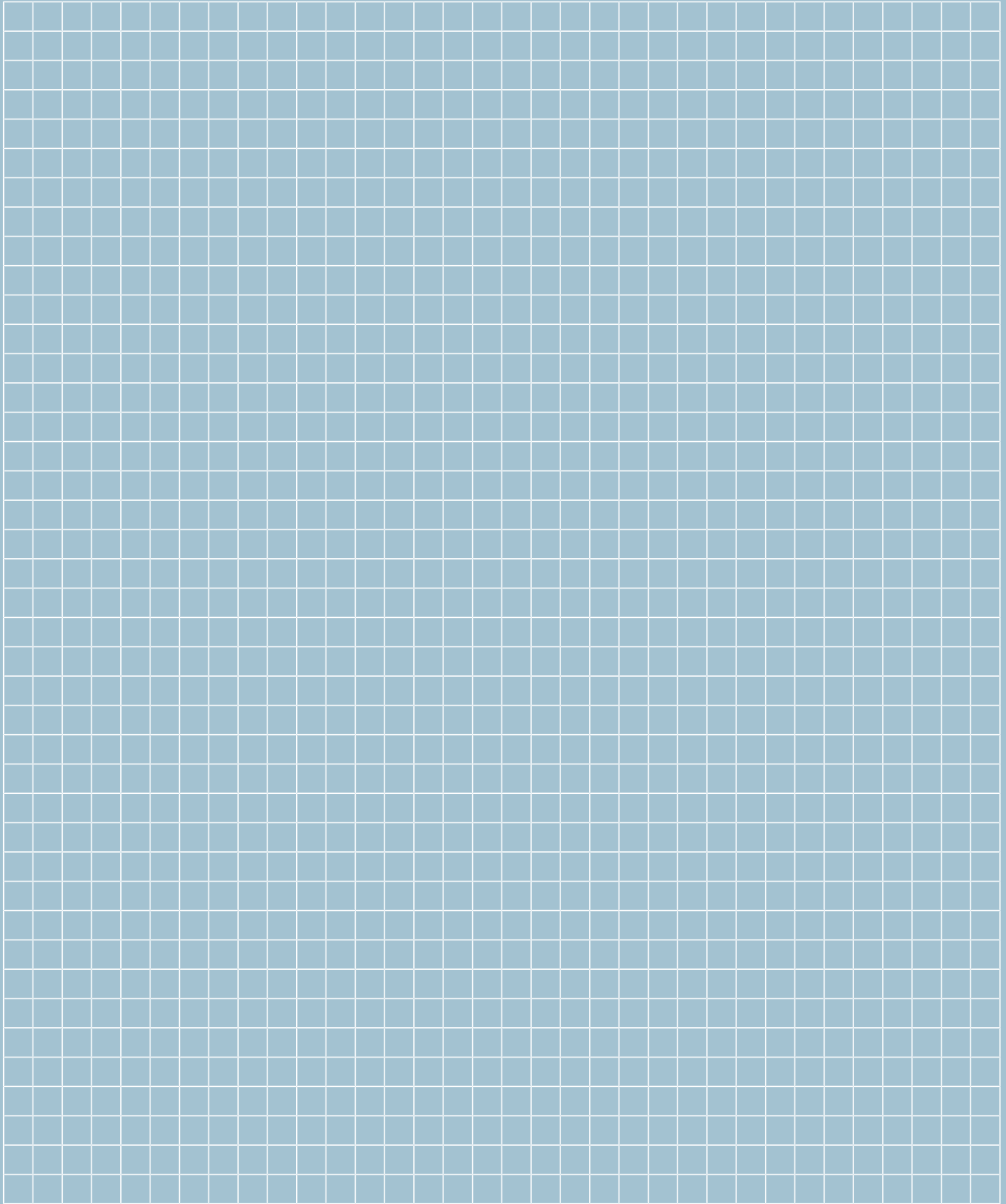
You can obtain these catalogs from SEW-EURODRIVE. These documents and a variety of other documents, information and services can be found on our homepage [www.sew-eurodrive.com](http://www.sew-eurodrive.com).

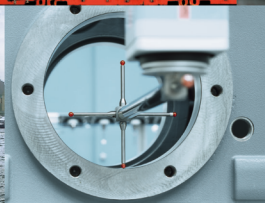












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