Path control, handling and kinematics

Intuitively starting up robots

Path control

Multidimensional material transportation and material processing

In machine automation, handling the products is an important step in the process chain.
Loading and unloading directly contributes to the cycle time of the machine. Motion profiles must be fast, precise and, at the same time, gentle on the product and the mechanical system.

When the loading drive is positioning a product, it is moving in a single dimension. It is easy to optimize the positioning time and consequently the process. As soon as you start using two drives, the workpiece is moving in more than just one dimension. It is not always easy to know which motion profile is best to ensure that handling is as fast and coordinates often vary precise as possible while still ensuring process reliability. Different points in space often vary and can be reached using different paths. Typical uses include pick-and-place applications, palletizing, stacking, transportation and transfer applications, and secondary packaging.

Single column palletizer for moving drinks crates

Similar demands are posed by applications where products are given their finishing touches, for example when decorating food items, and by on-the-fly processing. The process is stable if material processing can be reproduced with a high level of accuracy.

We have developed intuitive software modules such as MOVIKIT® Robotics for areas of application such as these. From a hardware perspective, our parallel arm kinematics kit offers a solution for implementing complex motion sequences. Together, they form the ideal solutions platform if implementing path movements as simply and efficiently as when working with a single axis.

The MOVIKIT® software modules run on our MOVI-C® CONTROLLER or directly in our MOVIDRIVE® application inverters from our MOVI-C® modular automation system.

Robotic solutions – with innovative drive and automation solutions for all industries and applications

Our products and systems are used everywhere – worldwide. Whether in the packaging, automotive, building materials, metalworking, or food and beverage industry, the decision to use drive technology "made by SEW-EURODRIVE" means both functional reliability and security of investment.

No matter what kind of application you are planning and whether it features a SCARA, gantry, articulated arm, delta robot, or some other system, SEW-EURODRIVE has a standard portfolio that offers customized solutions for a wide range of robot kinematic models. What we call standard, others call customized.
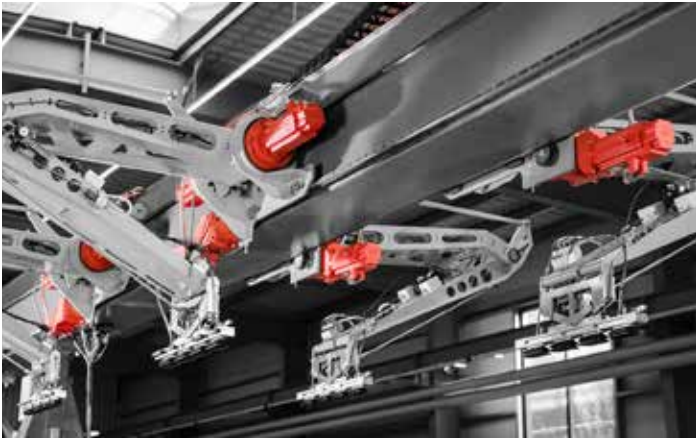

Fig. 1: Fully automated using drive and automation technology from SEW-EURODRIVE – a core element for SCARA robots is the MOVIKIT® Robotics software solution.

Fig. 2: Robotics-based end-of-line multipacker. The robot follows an optimized path curve to seal the carton. Perfect!

Fig. 3: Starting up handling machines or pickers such as these tripods is easy thanks to the intuitive MOVIKIT® Robotics software solution.

Fig. 4: Reliable and energy-efficient drive and automation components for gantry robots. SEW-EURODRIVE solutions make it possible to combine complete, intelligent software with reliable mechatronic systems to create fully integrated solution packages.

Robotic solutions

Quick and easy implementation

(1) MOVIKIT® software modules
Software modules executed by the controller. They operate the drives. Particularly easy startup, precise and reliable.

(2) Kinematic models and drives
For years, our motors and gear units have been famous for their high quality and fatigue strength. Our modular system also has something to offer when it comes to robots.

(3) MOVISUITE® RobotMonitor
The RobotMonitor is the interface between the robot and the operator. It puts you in control.

(4) Control technology
Comprehensive portfolio of control technology from motion controllers to high-performance controllers capable of complete automation.

(5) Displays and visualization
Displays with integrated controllers, WebVisu for use with external devices or keypads. Comprehensive templates are available.

(6) Drive electronics
in different designs. In a DC link network with optimum energy flow. Flexible in every respect. With
– MOVIDRIVE® modular
– Power and Energy Solutions

(7) Drives
The drive mechanics turn electrical power into dynamic movement. With the CM3C.. series synchronous servomotors and the PxG® planetary servo gear units, you have ideal components for doing just that.

(8) Service
Comprehensive services along the entire life cycle of a system complement the portfolio.

MOVIKIT®

Reach your goal faster

MOVI-C® software components
MOVI-C® software components are divided into three areas:

MOVIKIT® software modules

MOVIKIT® software modules are preconfigured software elements for implementing anything from simple drive functions such as speed control and positioning all the way to complex motion control functions such as electronic cam and robot control. The software modules can easily be started up by using paramterization. Graphical user interfaces offer simple diagnostics. They are divided into different categories and are available for the two MOVIRUN® software platforms. The software modules are run on various pieces of hardware, such as the real-time operating system of the MOVI-C® CONTROLLER portfolio, the MOVIDRIVE® application inverter or Windows devices.

MOVISUITE® engineering software

Engineering software for all MOVI-C® hardware and software components. MOVISUITE® standard is free of charge. Various MOVIKIT® software modules are available to expand the scope of functions.

MOVIRUN® software platform

Software platform for MOVI-C® CONTROLLER that determines the type of the runtime system. MOVIRUN® flexible makes it possible to implement everything from simple to complex motion control functions, and facilitates the efficient application of these functions via graphical user interfaces.

The MOVIKIT® software modules are divided into the following categories:

Communication
Software modules for various communication services

Drive
Software modules running directly on the inverter

Motion
Software modules for standardized motion control

MultiAxisController
Software modules for centrally controlling any number of mechanically coupled drives

MultiMotion
Software modules for universal motion control and control of interpolating axes

Robotics
Software modules for robot control

Power and Energy Solutions
Software modules for energy management

SingleAxis
Software modules for standardized single-axis functionalities

StackerCrane
Software modules for storage and retrieval systems

Visualization
Software modules for the graphical depiction of controller data

https://www.sew-eurodrive.de/en/movikit

MOVIKIT® Robotics

No complex programming language – directly at the machine – entirely intuitive.

The standardized MOVIKIT® Robotics software module makes light work of controlling universal robot kinematic models simple and easy.

MOVIKIT® Robotics is the basic software for controlling a robot. It provides a wide range of kinematic models for parameterization (e.g. for specifying dimensions).

The comprehensive functionality included in the basic software can be expanded with numerous add-ons.

The benefits at a glance

- Operation via the MOVISUITE® RobotMonitor, the standardized or customizable process data interface, or from the IEC program

- Integrated, adaptive 3D simulation of the robot and its motion paths in MOVISUITE® RobotMonitor, for offline startup in the office or testing at the machine with simulated axes

- Predefined kinematic models in the basic software with two joint axes, including gantry robot, roller gantry, SCARA and delta robot types

- Manual operation (jog, program) and automatic operation (program)

- Jog mode: single-axis/joint axes/Cartesian

- Referencing and moving non-referenced axes directly via the robot's interfaces

- Override can be adjusted during motion

- Tool transformation

- Robot programming with the SEW Robot Language (SRL) and a teach-in function

- Control structures (IF, WHILE)

- Calling up of subprograms

- CallFunctions for the synchronized execution of IEC code

- Variables of the types BOOL, REAL and POSE can also be read and written in IEC

- Path events based on position, time, or both

- Storage of 20 programs with several hundred motion commands per program

- Additional programs without size limitation

- Step mode (set, movement)

- Linear and PTP interpolation with jerk limited blending

- Explicit coordinates or variable poses

- Can be combined with MOVIKIT® MultiAxisController and its add-ons (e.g. for applications in which several drives are moving one joint axis)

- Export of moment of forces and torques for drive project planning in the SEW-Workbench

MOVIKIT®
Robotics add-ons

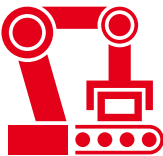## Expand functionality depending with your application

Add-ons are program modules that can be enabled via licensing. They complement the basic MOVIKIT® system by adding special functions.

MediumModels add-on

This module expands the functionality by adding kinematic models with three or four joint axes, e.g. the following types

– Gantry robots
– Roller gantries
– SCARA
– Delta robots
– Tripods
– Quadropods

LargeModels add-on

This module expands the functionality by adding kinematic models with five or six joint axes or at least two orientational degrees of freedom, including the following types

– Gantry robots
– Articulated arm robots
– Tripods
– Hexapods

In addition, the MediumModels and LargeModels expansion modules also include the corresponding 3D models of the kinematic models in RobotMonitor, along with convenient parameterization of the models in MOVISUITE®.

ConveyorTracking add-on

The ConveyorTracking add-on extends the scope of functions of MOVIKIT® Robotics by adding the option of interpolation in moving coordinate systems.

This makes it possible to pick up objects from a running conveyor belt, for example, and place them in a static environment or on another conveyor belt.

The robot first synchronizes itself with the belt in the Cartesian coordinate system. All other movements are then synchronized with the moving belt, making it possible for the picking sequence to be carried out.

The add-on also supports picking and placing objects from or onto a rotary table.

The rotary table can be externally controlled or synchronously controlled by the robot in such a way that the rotary table expands the robot's degrees of freedom. As a result, a robot with three degrees of freedom can carry out a four-dimensional palletizing task, for example.
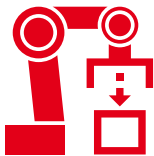
Touchprobe add-on

Makes it possible to carry out precise measurement of the current Cartesian position or true-to-path sensor-based positioning.

When a sensor is triggered or the state of a Boolean variable in the robot program changes, the actual position of the robot on its path is identified in terms of the Cartesian system. When this happens, a defined action can be carried out.

A possible action to be performed is, for example, sensor-based positioning. This involves traveling a specific remaining distance starting from the measured path point on the robot's programmed path.

Applications for the Touchprobe function include palletizing or depalletizing where the height of the parts is variable or unknown and the sensor-based execution of actions is needed.

Overview of functions:
– Touchprobe functions: Measuring and sensor-based positioning
– Registration and deregistration of the Touchprobe function at any point of the motion path
– Several registrations in one robot program
– Parameterization of the event source, edge, repetition of events (e.g. several measurements) and measurement direction
– Extensive diagnostics via registration, actuation of the trigger, and Touchprobe position in the robot program and the 3D simulation

Circle add-on*

The Circle add-on extends the range of functions of MOVIKIT® Robotics by adding the option of circular interpolation.

The circle segment can be parameterized in various ways.

– Circle center and angle
– Circle center and end-point of the circle segment
– Intermediate point on the circle segment and end-point of the circle segment
– Radius and angle
– Radius and end-point of the circle segment

CollisionDetection add-on*

Using the CollisionDetection add-on means you don't need expensive sensor technology on the tool and the arm joints, but can still reliably identify collisions on the tool and other mechanical parts of the robot.

To detect collisions with precision, the actual status of the robot is continuously compared with its target status as stipulated in a dynamic model.

Collision responses such as the true-to-path emergency stop can be configured in advance or integrated directly into the motion program using parameterizable commands.

* In preparation

Kinematic models

Similar, but never identical.

There are countless robotics applications that pose a huge range of different challenges regarding the movements required. You know which arrangement of axes is best to integrate into your machine for the application at hand. We make sure that you can configure and control your mechanical system with the greatest ease with a focus on parametrization.

With MOVIKIT® Robotics, SEW-EURODRIVE covers a large range of kinematic models of different types, and it is constantly expanding the portfolio. You tell us about the mechanical components involved, and we will offer tailored customer solutions using standardized SEW-EURODRIVE modules.

Gantry robots

Gantry robots provide a large work envelope and are widely used thanks to their linear construction. They are also capable of dynamically moving heavy loads.

Roller gantries

Roller gantries have the advantage that the drives are installed in stationary positions, making it possible to significantly reduce the masses being moved and the cabling.

SCARA robots

SCARA robots are characterized by a mechanical design that is compact yet relatively straightforward compared to gantries.

Articulated arm robots

Articulated arm robots offer maximum flexibility combined with a relatively large work envelope.

Delta robots

Delta robots have the advantage that the drives are installed in a stationary position. They are widely used due to their robust design.

Tripods

Tripods are used when a high level of dynamics is required. Several tripods often share the handling at conveyor belts.

Quadropods

Quadropods are often used as cable robots in very large work envelopes.

Hexapods

Hexapods can move heavy loads with high precision in six dimensions.

Simulation of forces and torques

MOVIKIT® Robotics includes the option mapping motion in advance in the 3D visualization but also using the dimensions and masses provided and the known mass moments of inertia for the robot to create a simulation of the dynamics.

This makes it possible to determine how big the forces and required torques are for the individual joints and especially for the motors. This data can be used in the SEW-Workbench drive configuration tool to design the drive train perfectly to meet requirements. This saves you costs by avoiding oversizing or undersizing.
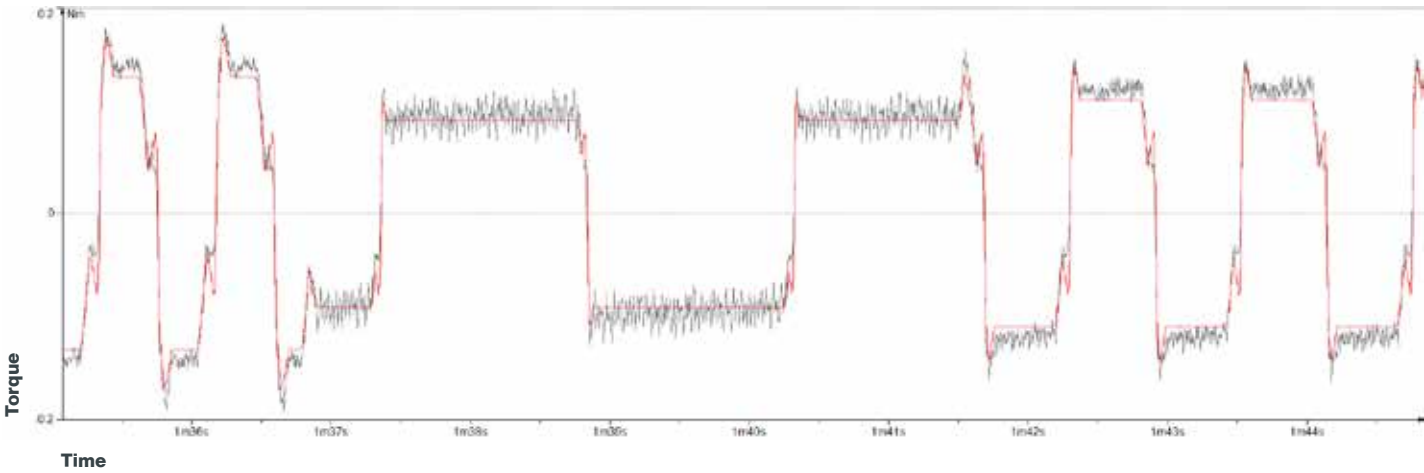
Realistic simulation of the motor torque: –– Simulated torque   –– Actual torque

Work envelope, achievable dynamics, load-bearing capacity and the complexity of the design are key parameters when selecting the suitable kinematic model. MOVIKIT® Robotics supports all kinematic models in numerous designs, along with other constructions that go beyond the basic models.

→ Have you developed a special kinematic model for your application? Feel free to contact us, and we'll be happy to help!

RobotMonitor

RobotMonitor is the user interface for MOVIKIT® Robotics and its add-ons.

It can be used to visualize the parameterized kinematic model and execute it axis-by-axis or using the Cartesian system in jog mode, or – in program mode – manually or automatically.

Furthermore, RobotMonitor contains an editor for the SEW Robot Language that makes it very easy to enter and parameterize the motion sequences by teach-in, using specific coordinates or pose variables.

Up to 20 programs, each containing several hundred commands, can be created. Additional programs without size limitation can be added.

During startup, the procedure can be monitored e.g. in step mode using the program pointer and motion pointer.


RobotMonitor can be run on PCs, or on handheld terminals and tablets using a Windows operating system. This provides users with the same interface, no matter which device they use.

IEC Editor

Configuration and creation of IEC programs
The IEC program that matches the MOVISUITE® configuration is generated automatically, meaning the robot can be operated directly, without its own IEC code. Moreover, complete integration opens up a wide variety of extension and combination options.
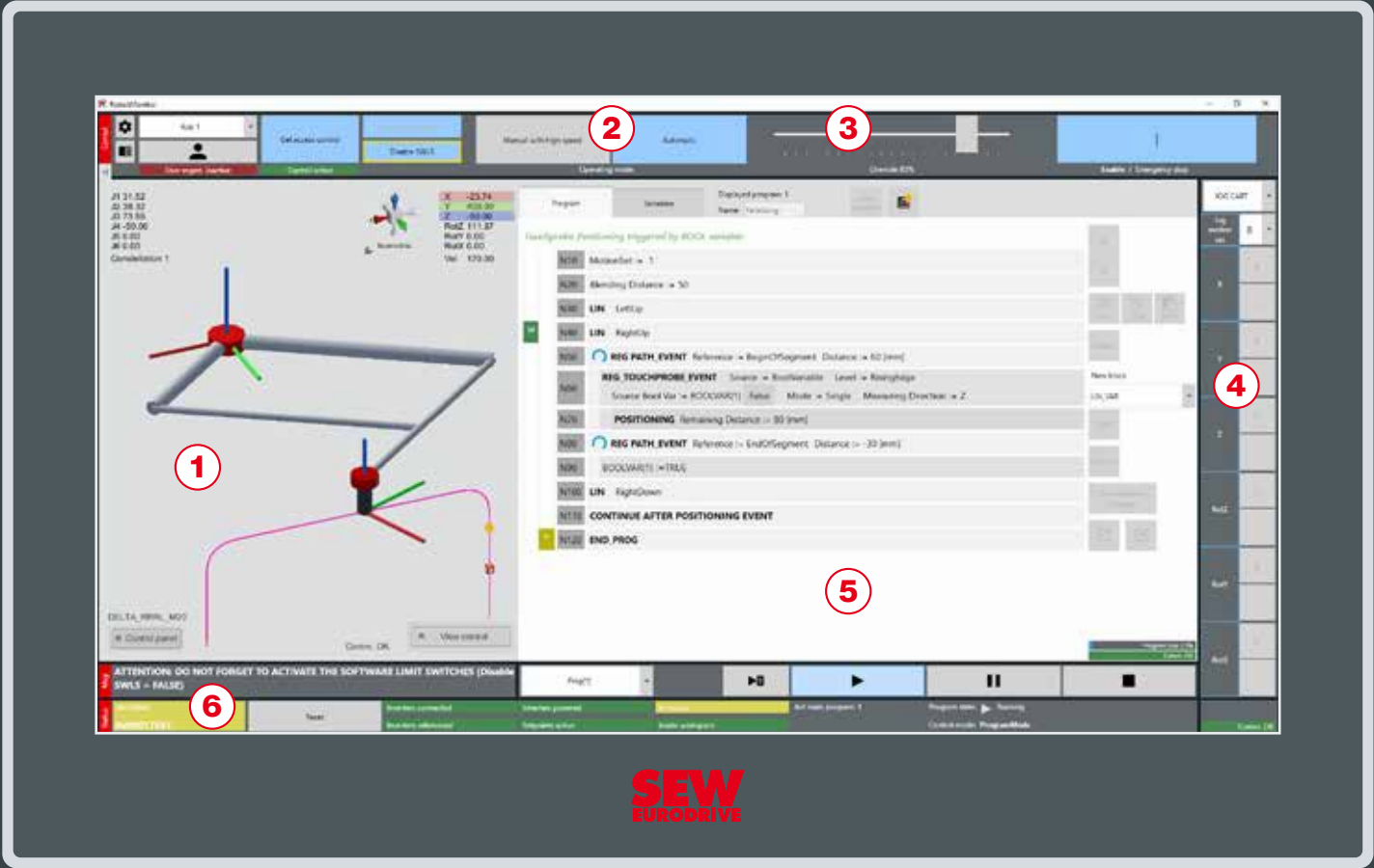
1
3D simulation of the kinematic model
This makes it possible to examine the movement from any angle, including when working without a drive in the office or e.g. in the case of simulated drives, on the machine.

2
Manual mode and automatic mode
The program can be executed manually and optionally in step mode, or automatically.

3
Speed override
Especially during startup, it makes sense to operate at a reduced speed.

4
Buttons for jog mode
In manual mode, and for the teach-in, the robot can be moved to the desired position.

5
Editor for the SEW Robot Language
Makes it easy to create the robot program or adjust standard programs using intuitive, understandable instructions and graphically supported diagnostics.

6
Information and error display
Provides a clear, convenient display of the current error status and other helpful notifications in plain text.

# SEW Robot Language

The SEW Robot Language integrated into RobotMonitor offers a complete set of functions that can be entered and parameterized simply and conveniently.

Working with the sequential function chart is intuitive and can therefore be learned fast. As a result, the individual commands can be combined – without any additional programming knowledge – to create a sequence that defines the motion sequence of the kinematic model.

Loops, branching and calling up subroutines are all possible, as is the setting of variables. The robot language can, in turn, interact with the lower-level IEC program, which means special functions can be carried out there.

N10	MotionSet := 1
N20	Blending Distance := 50 [mm]
N30	**LIN** LeftUp
N40	Coordinate System := User
N50	**LIN** RightUp
N60	**LIN** RightDown
N70	**WAIT** MotionDone
N80	**LIN** RightUp
N90	Coordinate System := Base
N100	**LIN** LeftUp
N110	**LIN** LeftDown
N120	**END_PROG**
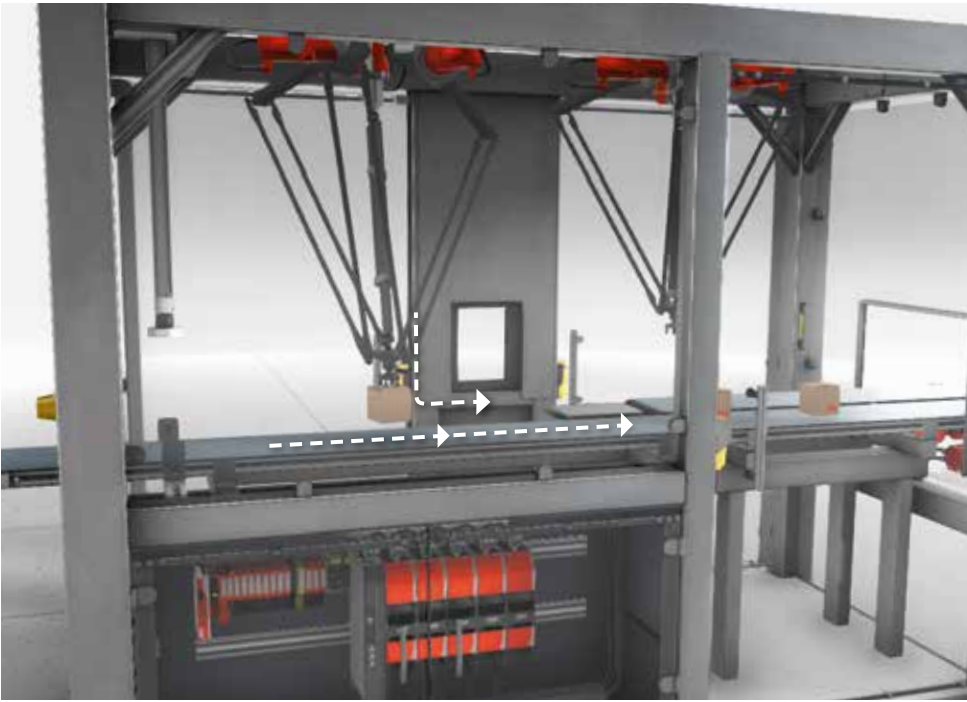
You define the motion sequence using simple commands such as LIN and WAIT, and by setting the coordinate system.

The example shows the procedure for synchronizing a robot with a conveyor belt.

MOVIKIT® AutomationFramework

Automating a complete machine faster

The MOVIKIT® AutomationFramework provides a standardized state and mode manager for implementation on all MOVI-C® CONTROLLER.

It is compatible with PackML, offers defined interfaces such as PackTags, and uses defined modes and states. A master and Slave are included in the basic program.

More machine modules can easily be added to the program from a basic project. MOVIKIT® AutomationFramework also offers a range of additional functions on top of this. These include, for example, troubleshooting, recipe management and a simulation environment for all incoming machine modules and prepared HMI modules.

→ **OMAC-defined industrial standard** thanks to PackML (Packaging Machine Language) compatibility

→ **Time-saving pre-engineering** thanks to 2D/3D simulation of the application

→ **Added value** through additional features such as preprogrammed robot tracking with load balancing

→ **Reduced programming outlay** by using prefabricated software modules

MOVI-C®
CONTROLLER

Every aspect of MOVI-C® CONTROLLER is specially designed for motion control and machine automation. It doesn't matter whether you are creating a single-axis or multi-axis application based on standards or implementing customized, particularly complex motion control applications.

Depending on the design, the high performance of the MOVI-C® CONTROLLER enables you to control several robots with a single controller.
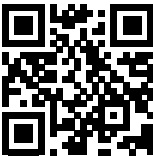
Special functionalities of the MOVI-C® CONTROLLER

– Various fieldbus variants available
– Safety routing for integrating an external safety controller into the overall system
– Fast, open real-time EtherCAT® bus for controlling drive components and other sensors and actuators
– Rapid replacement of hardware thanks to removable memory cards
– Windows + real-time operating system on a controller with hypervisor concept

– Further peripheral connections to integrate external devices, e.g. via Ethernet, USB or DisplayPort
– Fast engineering via Ethernet, even over long distances
– Explicit coordination or variable poses
– Can be combined with MOVIKIT® MultiAxisController and its add-ons (e.g. for applications in which several drives are moving one joint axis)
– Export of moment of forces and torques for drive project planning can be provided

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Especially in the case of the **UHX65A** with four cores, an experienced programmer can use the IEC Editor seamlessly integrated into MOVISUITE® to group tasks and explicitly assign them to the individual cores. As a result, data exchange can be fine-tuned and challenging operations that require a great deal of computing power can be achieved. As an optional extra, an additional operating system such as Windows 10 IoT can be set up on the UHX65A.

This operating system enables customers to run machine-oriented algorithms and applications in higher-level languages. The UHX65A's Hypervisor RTS-based architecture automatically ensures that the additional operating system does not influence the function of the real-time system. In addition to the operating system available as standard, it is also possible to adapt the Windows operating system for the customer, and thus meet IT requirements without having to take any further steps.

https://www.sew-eurodrive.de/
movi-c-control-technology

EtherCAT® Technology Group

PROFI NET INDUSTRIAL ETHERNET

EtherNet/IP™

Modbus

Power class	UHX25A **Standard**	UHX45A **Advanced**	UHX65A **Progressive**	UHX85A **Power**
Memory	512 MB SD card	512 MB SD card	2 GB CFast memory card	2 GB CFast memory card
CPU	DualCore ARM Cortex-A7, 1 GHz	DualCore ARM Cortex-A7, 1 GHz	Intel Atom® E3815 1.46 GHz, Intel Atom® E3825, 2 × 1.366 GHz, Intel Atom® E3845, 4 × 1.91 GHz	Intel Core2Duo 2.2 GHz
Number of axes Interpolated	Up to 2	Up to 8	Up to 16	Up to 32
Number of axes non-interpolated	Up to 6	Up to 8	Up to 16	Up to 32

Displays and visualization

It's important to keep track of sophisticated drive tasks involving a large number of axes. The more extensive the functionality of systems and drive technology becomes, the more the requirements for operation, visualization and diagnostics increase.

The SEW-EURODRIVE visualization hardware has been specifically developed for use in harsh industrial environments immediately next to the machine.

Capacitive touch displays enable the operation with gloves. Safety functions such as key switches, emergency stop systems and immobility alarms are already integrated.

It goes without saying that SEW-EURODRIVE delivers the appropriate accessories, such as prefabricated cables, assembly parts and power supply, in addition to its comprehensive portfolio of visualization solutions – all from a single source.

SEW-EURODRIVE offers a comprehensive portfolio of visualization solutions for various applications.

Based on the UHX45A and UHX65 MOVI-C® CONTROLLER, users first select an industrial display unit (e.g. a web operator panel, an operator terminal or a handheld terminal) to suit the application at hand. The MOVIKIT® Visualization software module (Web Visualization, Visualization basic, Visualization flexible or Visualization multi) then offers the possibility to create a graphical interface. This interface can be freely designed or users can take advantage of simple (free-of-charge) and complex (subject-to-charge) ready-made templates (frameworks).

One example is the ParameterMonitor add-on for the MOVIKIT® Visualization software module.

For this, the visualization is created in the CODESYS, the same location as the IEC program (machine logic). This creates a seamless transition between the two worlds. Depending on the visualization task, visualization can be conducted on the controller or on a separate Windows PC.

Features and advantages

- End-to-end hardware portfolio, ranging from mobile display units and operating panels to monitors and web panels
- Visualization editor added to the engineering tool used (IEC Editor) to create specific graphical interfaces (HMI)
- MOVIKIT® Visualization makes it possible to create any number of complex user interfaces based on available visualization elements and can be depicted as a target or web visualization.
  Target visualization for connecting with an external monitor, e.g. via a DisplayPort, and web-based visualization based on open standards such as HTML5.
- In addition, the solution enables direct access to the controller variables. This eliminates the need to configure the data exchange.

- Integration of ready-made frameworks (templates) in SEW Design saves time
- Option to create straightforward diagnostics pages (e.g. mapping of application's parameter or status information)
- Visualization displayed more than once on the system or via remote access
- Distributed visualization on multiple end devices
- CODESYS web server positioned locally on the controller
- Remote access using a standard browser
- Based on HTML5 – also runs on smartphones and tablets
- Scalable and adaptable – any device with a web browser can be used as the HMI client without the need for additional software
- Web visualization supports several displays on a single system

Web Operator Terminal WOP11D-150-0, WOP11D-100-0 and WOP11D-70-0

- Chromium-based HTML5-web browser
- i.MX8 Quad Core CPU
- 7" monitor with WSVGA resolution (1024 × 600)
- 10.1" monitor with WXGA resolution (1280 × 800)
- 15.6" monitor with FHD resolution (1920 × 1080)
- Luminance: 450 cd/m²
- Capacitive touchscreen (PCAP)

Operator Terminal OPT11D

- 15.6" monitor
- Resolution: FHD (1920 × 1080)
- Anti-reflective glass cover
- Luminance: 450 cd/m²
- Capacitive touchscreen (PCAP)
- Interfaces: 1 × DVI, 1 × DP, 1 × USB 2.0

Handheld Terminal DOP21C-T70

- 7" TFT WSVGA Display, WSVGA 600 × 1024 pixels
- Analog resistive touch
- Intel Celeron N2807 2 × 1.58 GHz
- 32 GB SSD Flash, 4 GB DDR3 RAM
- 21 buttons and 4 status LEDs
- Key switch
- Two-channel emergency stop or two-circuit stop button
- Windows 10 IoT Enterprise operating system

Compatible software
- SEW RobotMonitor
- MOVIKIT® Visualization flexible
- HMI-Builder PRO with USB dongle

MOVIKIT® Visualization

MOVIKIT® Visualization makes it possible to create simple of complex user interfaces based on available visualization elements using the visualization editor integrated in the IEC Editor. In this way, MOVIKIT® Visualization reduces development time. The generated visualization runs on the entire MOVI-C® control portfolio, and also on Windows 10-based systems.

– Direct access to all controller variables (additional data exchange projects are not necessary)
– The MOVIKIT® Visualization addon ParameterMonitor software module includes prepared user interfaces.
– Reduced development time
– Reuse of visualization frameworks and preset objects
– Visualization of all functions and elements available in CODESYS (e.g. alarm management, trace and trend visualization, user management, recipe management, visualization styles)

MOVIKIT® Web Visualization

Visualization runs on a MOVI-C® CONTROLLER without Windows 10 IoT operating system directly in the IEC part
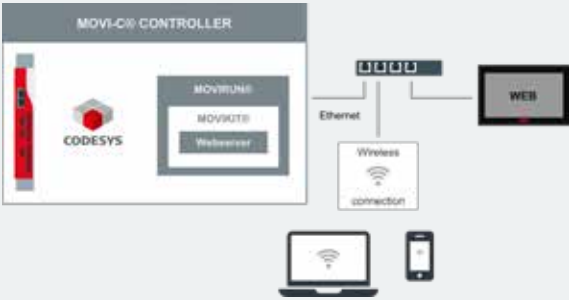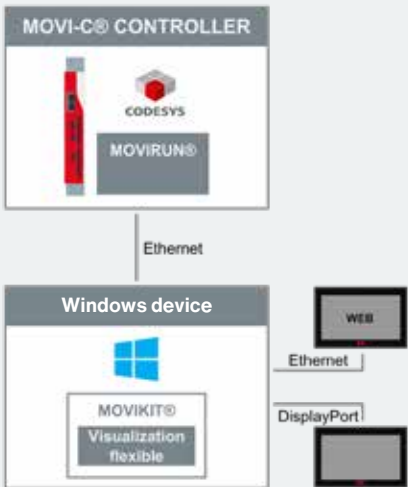

MOVIKIT® Visualization basic

Visualization runs on a MOVI-C® CONTROLLER with Windows 10 IoT operating system and is connected to the IEC part via the internal network.
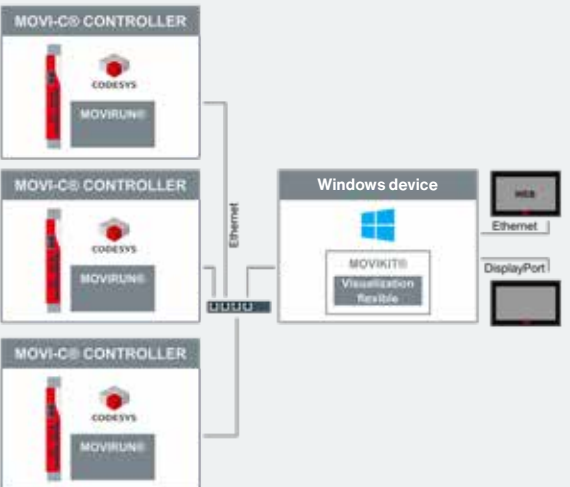

MOVIKIT® Visualization flexible

Visualization runs on an external Windows 10 IoT system and is connected to a MOVI-C® CONTROLLER via an Ethernet network.

MOVIKIT® Visualization multi

Visualization runs on an external Windows 10 IoT system and can be connected to several CODESYS controllers via an Ethernet network.

MOVI-C®: Inverter technology

Central, decentralized, single-axis, or multi-axis systems, the inverters from the MOVI-C® modular automation system ensure precise implementation of control commands. Simple and intuitive, the inverters can be operated end-to-end with user-friendly MOVISUITE® software. The Power and Energy Solutions can be used to expand handling applications easily and energy-efficiently.

Power and Energy Solutions – the intelligent power supply and energy management system

– Reduction of power peaks from the supply system
– Reuse energy and minimize energy costs
– Bridge system operation in the event of a grid outage or supply fluctuations

MOVIDRIVE® modular – multi-axis system in a compact format

– Compact single-axis and double-axis module
– Integrated digital interfaces with the motor
– Safety technology included
– Expandable to up to 30 drives on one power supply module

MOVIDRIVE® system – perfect for high power ratings

– Single-axis system that can be extended easily
– Up to 1200 m motor cables for long distances
– Also available as a variant with EtherCAT® CiA402 profile

www.sew-eurodrive.de/
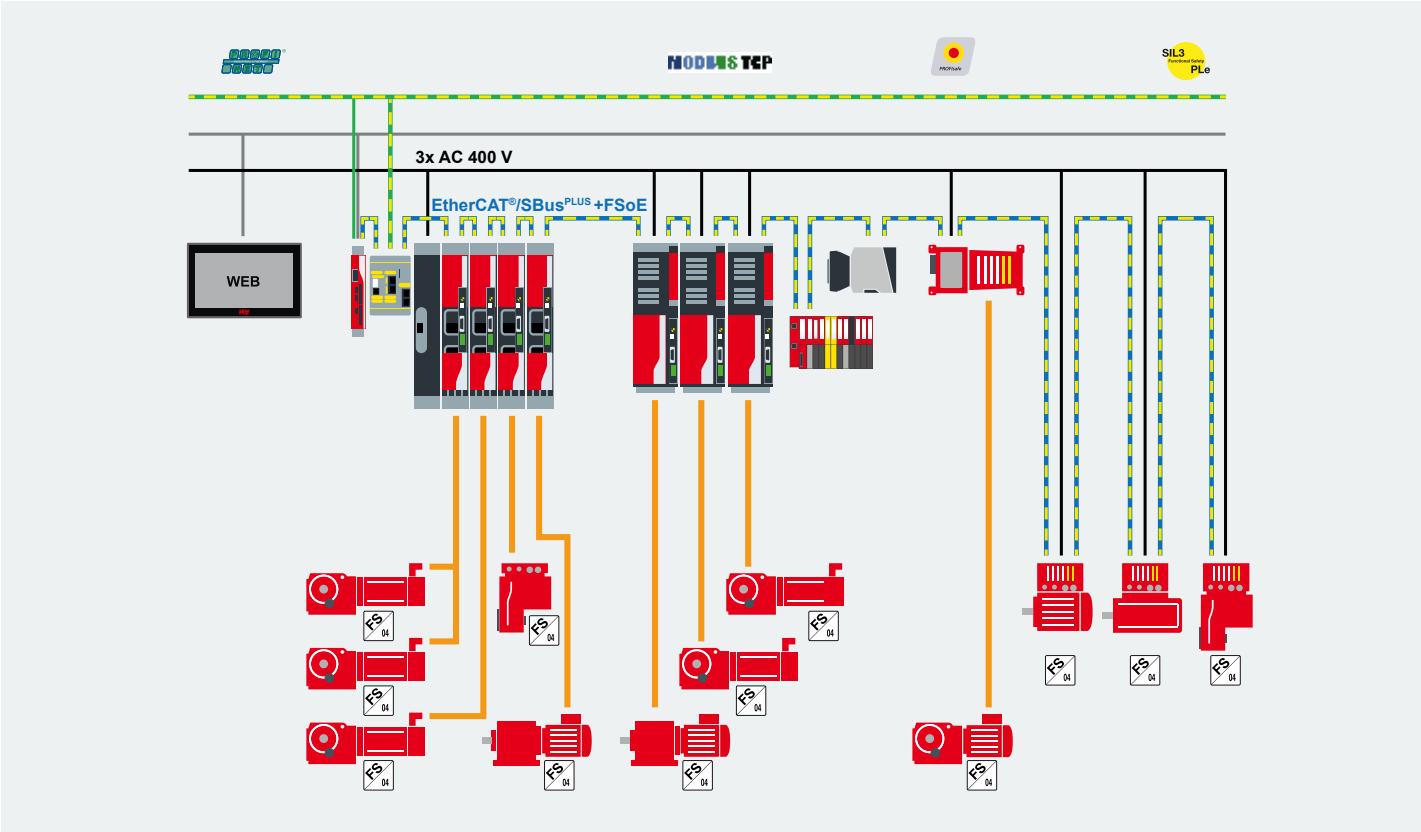movi-c-modular-automation-system

Safety

Functional safety technology does more than ensure personal safety and the safe operation of machines and plants.

It can also boost efficiency, reduce safety zones and thus measurably reduce overall costs.

Alongside the integrated STO in PL e, the modular design of the MOVIDRIVE® system, modular and technology inverters means users can plug in safety option cards. This makes it possible to expand safety functions as required.

All devices of the MOVI-C® controller platform enable safety routing. This makes it possible to integrate an external safety controller into the axis system. As a result, the controller communicates directly with the axis modules.

Consequently, it is also possible to use safety functions from third-party manufacturers that permit kinematic safety functions. **We would be happy to recommend appropriate products.**

It is easy to implement autonomous machines and autonomous system modules with Motion Control and Safety. Simple connection to higher-level PROFIsafe systems is possible where required. Safe kinematics functions such as TCP velocity can be programmed locally as an optional extra.

End-to-end topology for control cabinets and decentralized devices. Machine builders can generate added value for themselves with the standard machine and safety program. Furthermore, creating individual system modules within the overall system is less complex.

The new MOVISAFE® CSA31A safety card represents a significant boost in functionality and therefore flexibility for the MOVI-C® safety portfolio. It makes it possible to achieve more complex functions, such as safe speed and safe position from all kinds of encoder combinations (e.g. motor and distance encoders), while maintaining the same level of user-friendliness.

Based on the SEW principle of parameterization instead of programming, even the most complex safety function can be started up quickly and easily, thanks to straightforward parameterization in MOVISUITE®. Safe communication

profiles such as PROFIsafe or FSoE can be used to easily activate/implement safety functions, including STO, SS1, SLS and SLP up to PL e. Even in the case of systems subject to slip, machine builders will find fast and simple solutions to challenging safety problems and be able to ensure rapid on-site startup for the end customer.

The CSA31A complements the existing SEW safety card portfolio for inverters from the MOVI-C® modular automation system. SEW-EURODRIVE has a customized solution for every application, whether the safety technology involved is straightforward or highly complex.

Hardware	CSB21A	CSB31A	CSS21A	CSS31A	CSA31A
Safe inputs	4	4	4	4	4
Safe outputs	–	2	2	2	2
Safe stop functions	STO, SS1-t	STO, SS1-t, SBC	STO, SS1-t, SBC	STO, SS1-t, SBC	STO, SS1-t, SBC
Safe movement functions	–	–	SOS, SS1-r, SS2, SLS, SSR, SLA, SSM, SDI	SOS, SS1-r, SS2, SLS, SSR, SLA, SSM, SDI	SOS, SS1-r, SS2, SLS, SSR, SLA, SSM, SDI
Safe positioning functions	–	–	SLI	SLI	SLI, SLP, SCA
Safe communication	PROFIsafe, FSoE	PROFIsafe, FSoE	PROFIsafe, FSoE	PROFIsafe, FSoE	PROFIsafe, FSoE
Process value via secure communication	–	–	Speed	Speed	Speed, position, SCA status
Additional multi-encoder input	–	Yes/non-safe	–	Yes/non-safe	For safety
Encoder for functional safety	–	–	FS motor encoder	FS motor encoder	Motor encoder sin/cos, SSI

CM3C.. series synchronous servomotors

Highly dynamic, high-precision and high-performance drives are essential wherever heavy external loads need to be moved quickly and positioned accurately. CM3C.. synchronous servomotors combine precisely these features and are therefore ideal for robotics applications.

– Space-saving installation
– High torque density
– Fast, reliable startup
– Reduced installation efforts
– Suitable for foodstuff applications
– High inertia

| Size	63*	71*	80*	100*
MO in Nm	2.7 – 6.4	6.5 – 14	10.5 – 22.8	19 – 40
Mpk in Nm	8.1 – 19.2	19.5 – 42	31.5 – 68.4	57 – 120
Edge dimension in mm	88	116	138	163
Speed in min^{-1}	3 k / 4.5 k / 6 k	2 k / 3 k / 4.5 k / 6 k	2 k / 3 k / 4.5 k / 6 k	2 k / 3 k / 4.5 k

* Each size available in 3 lengths – S, M and L.

The **lowest possible ratio of load moment of inertia to motor moment of inertia** is key for transporting heavy loads from A to B at high speed and with great precision. That is why CM3C.. series servomotors exhibit **increased inertia**. These servomotors are therefore suitable for all automation and handling applications with a correspondingly high load moment of inertia. With their four sizes – 63, 71, 80 and 100 – they can cover **standstill torques from 2.7 to 40 Nm**.

The term "pick and place" describes high-speed handling with robotic functionality for free movement within a defined work envelope exhibiting precision and impressive dynamics of more than 200 picks per minute. CM3C.. servomotors, combined with the outstanding features of the PxG® planetary gear units, offer the perfect solution.

https://www.sew-eurodrive.de/en/cm3c
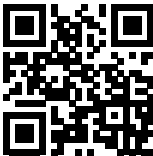
PxG® planetary servo gear units

Thanks to their scalable modular concept, the PxG® planetary servo gear units offer considerable added value for every application. The units can be customized configured in terms of service life, precision and performance, thereby closing the gap between servomotor and application.

– Maximum precision for the highest possible positioning accuracy
– Highest torque density for compact designs
– High overload capacity for quick acceleration and short cycle times

Planetary servo gear units		P5.G..	P6.G..	P7.G..
Sizes		21, 22, 31, 32, 33, 41, 42, 43, 51, 52, 53, 61, 62, 62, 71, 72, 73		
Gear ratio	1-stage	3 – 10		4 – 5.5
	2-stage	12 – 100		16 – 55
	3-stage	64 – 1000	On request	64 – 550
Acceleration torque		66 – 4200 Nm	40 – 2000 Nm	80 – 6150 Nm
Rotational clearance		3 – 4 arcmin		1 arcmin
Service life		20 000 hrs (DC 60%)	30 000 hrs (DC 100%)	20 000 hrs (DC 60%)
Output variants		Solid shaft (smooth, key or splining), flange block shaft with or without index bore		Flange block shaft without index bore
Lubrication for life		GearOil Poly E1 by SEW-EURODRIVE or Grease HL 2 E1 by SEW-EURODRIVE, also in H1 (food grade)		
Seal		Premium Sine Seal or labyrinth seal (in the case of grease lubrication)		

https://www.sew-eurodrive.de/pxg-planetary-servo-gear-unit
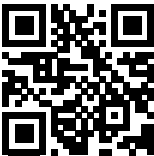
I/O modules

The MOVI-PLC® I/O system C combines high performance and the latest functions with a sophisticated mechanical concept in a compact design that can be precisely adapted to the requirements of the relevant application – module by module.

The MOVI-PLC® I/O system C portfolio enables the **integration of external field units**, offering users a high degree of flexibility. The modules can be integrated into the controller's EtherCAT® bus using the bus coupler.

In addition to reading binary and analog signals, function modules for reading SSI encoder signals, energy measurement modules, counter modules and modules for connecting strain gauges are also available.

To meet the requirements for machinery and applications in the field of functional safety, the SEW portfolio includes **two FSoE I/O modules, each with four secure inputs and outputs**.

The modules can be connected to a **safety controller** via the bus coupler for analysis and logical connection.

Device functions

– 100% compatible with all MOVI-C® CONTROLLER
– Up to 64 electronics modules on the backplane bus
– Easy installation/servicing
– Status and diagnostic display using LEDs
– Safe and non-safe I/O modules
– Upright wiring
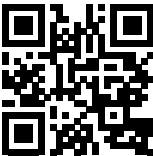
Life Cycle Services

We provide support in the form of services and tools along the entire system life cycle. Benefit from our excellent service.

Project planning and design

Selecting components is often hard work – especially for complex kinematic applications. We would be happy to offer advice on configuring and selecting the perfect motion solution for your needs.

Training

Choose from our wide range of training courses, covering everything from project planning and programming the controller through visualization and startup to defining the motion sequence and even bespoke course content.

24h Service Hotline

The technical hotline is available to you 24 hours a day, seven days a week. Our service specialists provide skillful, straightforward assistance.

Close to you

With 33 sites in Germany alone, we are always close to you. Rapid assistance is available at any time. You will find us to be a reliable partner, especially when it comes to spare parts and replacing parts quickly in the event of a failure.

Driving the world

Automation and drive technology from SEW-EURODRIVE

Other topics
that might interest you
Software
Functional safety
Digital motor integration
Energy management

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