Innovative system solution for a higher degree of flexibility

Multi-Carrier-System

siemens.com/mcs
At a glance: system components and their potential

**Highlights**
- Highly flexible: infeed and outfeed of the carriers without additional transfer couplings
- Freely customizable acceleration, speed and grouping
- Easily integrated into existing intralogistics
- Synchronous movement of multiple carriers
- Cam disk mode and movement synchronized
- 1 controller, even with additional machine modules
- Dynamic and fast, even with large loads

**Customizable configuration**
The basic mechanical system is modular, so that you can easily adapt it to the requirements of your machines and applications. You can incorporate it perfectly into your existing material handling and logistics solutions.

**Flexible transport**
The carriers can be used without any restrictions: options include free infeed and outfeed of the carriers and mixing different carriers and product configurations on a single system. The motion profile of every carriers in the Multi-Carrier-System can be set separately.

**High productivity**
The fast Multi-Carrier-System accelerates smoothly without jerks – and positions the carriers with extreme precision. Shorter retooling times, virtually seamless format changeover and reduced maintenance costs increase the utilization of your system.

**High-performance controller**
The Siemens controller integrates motion control tasks for the entire system. In addition to controlling the motion of the transport system, it can coordinate motion with other servo-driven machine modules, considerably reducing the number of interfaces.

**Basic profile**
- Standardized mounting interfaces for motors
- Holds the roller track and the optional external displacement encoder

**Roller track**
- Is glued seamlessly onto the preassembled conveyor structure for smooth rolling
- Stainless steel track for low wear, good resistance to corrosion and easy cleaning

**Carriers**
- Directly transport the product
- No motor, no cables, no active electronics
- With magnet for position sensing
- Mechanical interface for application-specific holders and adapters
- Plastic-sheathed track rollers and their bearings ensure jerk-free and low-vibration movement

**SINAMICS drive system**
- Modular drive system for machinery and plant construction
- Suitable for single-axis or multiaxis applications
- Facilitates modular and flexible machine concepts
At a glance: system components and their potential

Motors
- Powerful motor available in several versions for optimum machine design
- Standardized mounting interfaces
- IP65 protection or higher on request, easy to clean

Closed-loop and open-loop control sections
- Sections with closed-loop control or open-loop control can be combined as required
- This option can be adapted or expanded at any time

Infeed and outfeed of the carriers without additional transfer couplings
- The carriers stop at the transfer point to the traditional material handling system or existing intralogistics
- Free transfer without having to mechanically couple systems

Integration into existing intralogistics
- Simple connection to and use of the existing material handling systems
- Inexpensive linking to other system and production modules
- Optional carriers sensing via RFID for optimized logistics design

SIMOTION motion control system
- Scalable, modular motion control system for applications requiring a high dynamic response
- SIMOTION easyProject project generator for creating a loadable and executable project in just a few mouse clicks
- SIMOTION SCOUT for integrated and seamless engineering across the entire system
- Application-oriented hardware platforms: PC-based or drive-based

Circulating system
- Fixed carriers are conveyed via the internal transport system from one side of the installation to the other
- Transport using the circulating system underneath the Multi-Carrier-System
- Carriers can be conveyed empty or fitted with a specific product fixture
Basic types of motion in the Multi-Carrier-System

Unrestricted possibilities: the movement of a carrier

Every carrier can be moved freely and with its own feed force on the Multi-Carrier-System. It can be freely positioned, accelerated, braked, and synchronized with individual process steps in the application. In addition to this absolute positioning of an individual carrier, it is also possible to move and position multiple carriers relative to one another without the risk of collision.

Simple and limitless: synchronous movement of multiple carriers

In the Multi-Carrier-System, you can group an unlimited number of carriers and move them synchronously. You can bring together any number of carriers with different speeds while the process is running and can create a motion profile, can be customized just the same as for individual carriers. All carriers in the group are moved at the same time with fixed distances between them – with the same motion profile for position, acceleration and speed. When the task is finished, the group can be split up and separated or regrouped.

Force can be defined: motion with constant force

Every carrier can be moved with a defined constant force, independent of the motion profile. This allows a “clamping force” to be built up between a series of two carriers, which remains constant regardless of speed or acceleration.

A further feature is motion where the force is limited.

How propulsion works in the Multi-Carrier-System

When energized, the electric windings of the motor (stator) generate a moving magnetic field. The carriers (the motor’s rotor) with its permanent magnets is pulled along with the linear movement of the magnetic field. In this process, there is a direct relationship between current intensity, magnetic field and the feed force generated.

Closed-loop and open-loop operation

- Closed-loop and open-loop sections can be combined as required:
  - Closed-loop sections provide greater dynamic response, force and precision
  - Open-loop sections do not need an additional measuring system, thereby reducing costs, especially for long sections
System components in detail

Sturdy standard carrier for to directly transport the product

The permanent magnets in the carrier together with the motors generate the propulsive forces. The carrier is designed so that it can be placed on the system or taken off it at any point. This feature allows additional carriers to be added easily at any time and unused carriers to be removed from the system – without the need for tools or reconfiguring the system. The magnet on the side for position sensing and the external absolute displacement encoder make closed-loop operation possible.

The mechanism of the transport system ...

... comprises a motor, a basic profile and a roller track. The powerful motors together with the permanent magnets in the carrier provide the feed force. Different motor versions in a range of lengths are available for optimized machine layout and customized motor distribution. They are mounted directly on the guide strips in the machine frame, making replacement very easy when required, as there is no need to dismantle the entire section. Seamless assembly of the motors means the carriers move completely jerk-free.

1. Track rollers with ball bearings for low-vibration movement, replaceable
2. Permanently glued, wearresistant permanent magnets
3. Mechanical interface for application-specific holders and adapters

• Resilient plastic sheathing for high wear resistance
• These generate the feed force together with the motor
• Customer-specific or application-specific fixture possible as an option
• Continuously high travel speeds even with large payloads
• Can be used for fixing on traditional transport systems
• Material: aluminium

1 Motor length 306 mm in 2 versions
2 Motor length 102 mm in 2 versions
3 Motor length 102 mm

• Version 1: 2 motors each 51 mm long together in 1 plate – for the lowest resolution of the travel distances and the highest component density in the Multi-Carrier-System
• Version 2: 1 motor 306 mm long – for long transport sections and costefficient design
• Version 2: 1 motor, 102 mm long
Overview of controllers for motion control

SIMOTION – the scalable motion control system for any requirements

With SIMOTION even the most complex machines can be automated highly efficiently. This motion control system offers an abundance of tools to support the machine over its entire lifecycle. They simplify planning from the development phase onwards, and provide valuable diagnostic functions during commissioning.

The modular structure of this motion control system is in keeping with the trend towards modular machine concepts: with just a few modules, many different machine versions can be implemented and expanded. The SIMOTION software covers the full range of functions.

It is all based on an innovative system approach, which ensures maximum flexibility. Motion control, PLC and technology functions are merged in a single system.

• One engineering system for configuring, programming and commissioning
• Motion control, PLC and technology in a single system
• Flexible, dynamic machine solutions
• Short development and commissioning times

SINAMICS S120 – the flexible drive system for advanced motion control applications

The modular SINAMICS S120 servo drive is the modular system for high-performance motion control applications in industrial plant and machinery construction. Highly dynamic single-axis and multi-axis drives, with their extensive range of functions and scalable number of axes, can handle virtually any drive application.

SINAMICS S120 permits the implementation of flexible and modular machine concepts, allowing customer-specific requirements to be swiftly met. Tailored solutions are made possible by a host of compatible components and functions, for example high-performance individual drives and coordinated drives (multi-axis applications) with vector or servo functionality.

With the SINAMICS S120 drive system, users are investing in greater performance, productivity and flexibility.

• Its innovative system architecture and digital communication options make it a perfect basis for modular system and machine designs
• Wide range of control types and drive-related technology functions
• Integrated safety functions

The network structure of the Multi-Carrier-System

PROFINET
Industrial Ethernet

SIMOTION P

DRIVE CLiQ

SINAMICS S120
Booksize Compact

Multi-Carrier-System

SIMOTICS
Simple implementation of the transport system through efficient engineering

SIMOTION SCOUT – one engineering system for all tasks

The SCOUT engineering system provides support every step of the way, making engineering simple and efficient. SCOUT is the common framework for all the tools in the engineering system.

Just one system is used to engineer the motion control functions, PLC and technology functions and the drives. Configuring, programming, testing, and commissioning – everything can be done with a graphic interface from one workbench.

With its intelligent user navigation, context-sensitive help function and automatic consistency check, SIMOTION significantly simplifies motion control programming.

Further, all of the tools associated with SCOUT are completely integrated into the user interface to make engineering even more efficient.

SIMOTION easyProject project generator – for efficient automation

The Simotion easyProject project generator makes engineering even complex motion control projects even simpler and more efficient. Its largely automated process guides the user to a smoothly running application, ideally without any programming. That enables machine builders to cut their production costs and time to market significantly, making them more competitive on the world stage.

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**SIMOTION SCOUT**

- **Project Management**
- **Programming**
- **Configuration / Parameterization**
- **Testing and Commissioning**
- **Optional SCOUT packages**
  - GIS Radar
  - Graphics-based creation and optimization of zone

**Simotion easyProject project generator**

- **Hardware and Network Configuration**
- **Creation of Technology Objects**
- **Configuration / Parameterization**
- **Programming**
- **Testing and Commissioning**
- **Creating Cams**

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**SIMOTION quickStart**

- **Motion Control Chart (MCC)**
- **STARTER Drives and Commissioning Tool**
- **Diagnostics for Testing and Commissioning (Trace)**
  - Axis control panel
  - Ladder logic (LAD) / function block diagram (FBD)
  - Structured Text (ST)

**SIMOTION SIMOTION**

- **Project Management Workbench**

**Optional SCOUT packages**

- Graphics-based configuration with Drive Control Chart (DCC)
- DCC-Editor
- Graphics-Based Cam Editor (CamTool)

**Graphics-based creation and optimization of cams**

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**Simotion EasyProject project generator**

- **Diagnostics for Testing and Commissioning (Trace)**
- **Axis control panel**
- **Ladder logic (LAD) / function block diagram (FBD)**
- **Structured Text (ST)**

**Hardware and Network Configuration**

- **Creation of Technology Objects**

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**SIMOTION Project generator**

- **Modular software...**
  - **Line control**
  - **Base program Multi-Carrier-System**
  - **Drive-integrated transition control (“Open Architecture”)**

**...with optimum hardware**

- User-specific program section
- Simplification with a standard application for the Multi-Carrier-System with “zone concept”
- Freely programmable by the user
- Base program as “background service” for the Multi-Carrier-System
- Representation of a carrier on a virtual axis
- Collision monitoring
- Following-area monitoring based on the actual position value
- Versions as library with know-how protection

**SIMOTION INAMICS**

- Implementation of all segment transitions – also cross-controller
- Switching of the closed/open-loop control modes
- Basic safety functions (STO, SS1) can already be used
- Minimum collision monitoring
Designed for maximum flexibility: the Multi-Carrier-System

The Multi-Carrier-System gives machine builders a whole new kind of flexibility. This innovative system solution makes production processes more flexible inside the machine, as well as synchronized with the overall process. The flexible transport system can be adapted very simply and quickly to different formats, sizes and types of products, and also to seasonal demand. At the same time, it is an important, forward-looking step toward the possible modularization of machines and complete production plants.

Simple implementation, optimum combination

• Existing intralogistics are retained
• Seamless integration
• Efficient engineering
• Proven control platform
• Complete synchronization of transport and motion control for continuous production processes