SIEMENS

Solutions for handling applications

Controlled motion sequences – faster, simpler and more cost-effective

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Answers for industry.

Handling applications efficiently implemented

The degree of automation in the production environment is continually rising to address requirements relating to increasingly faster product changes and the highest degree of productivity. The challenge is to provide flexible solutions and modular systems. Also in the handling environment, maximum efficiency is becoming increasingly more important – in all sectors and applications.

Whether it involves simple feed axes, complex mechanical systems – such as delta pickers in the solar or packaging industry or automatically loading and unloading equipment for machine tools: With the SIMOTION® motion control system, the SINAMICS® drive family and the SINUMERIK® CNC system, we can offer you the optimum platform for first-class handling solutions – perfectly tailored to the specific handling tasks.

Machines and handling equipment must optimally interact with one another. Different than before, where handling robots were predominantly used in end-of-line applications, today, robots have also clearly established themselves in primary and secondary processes. And there is a good reason for this: Machines and handling equipment can be controlled with just one system.

We supply intelligent answers to changing software and hardware requirements based on our SIMOTION, SINAMICS and SINUMERIK systems. With our solutions, you can depend on first-class product quality and the highest productivity to achieve fast product changes. The result: more efficient and flexible production processes.

SIMOTION Handling Toolbox

With our SIMOTION Handling Toolbox, we can offer you modular solutions to optimally address almost any application. Any requirement can be simply and efficiently tackled with our standard, preconfigured application solutions.

Functions – such as path planning, protective zones, traversing program editor, teach-in and safety concepts – as well as managing products using a camera system – have already been implemented, and when required can be simply adapted and expanded.

All of the usual handling kinematics, such as cartesian gantry, roller kinematics, scara, articulated arm and delta, have also been integrated. A universal transformation module allows customized kinematics to be integrated, therefore offering a high degree of flexibility.

To shorten commissioning times, SIMOTION Kinematics Simulation Center includes a software tool to visualize mechanical handling systems.

SINUMERIK-based removal system

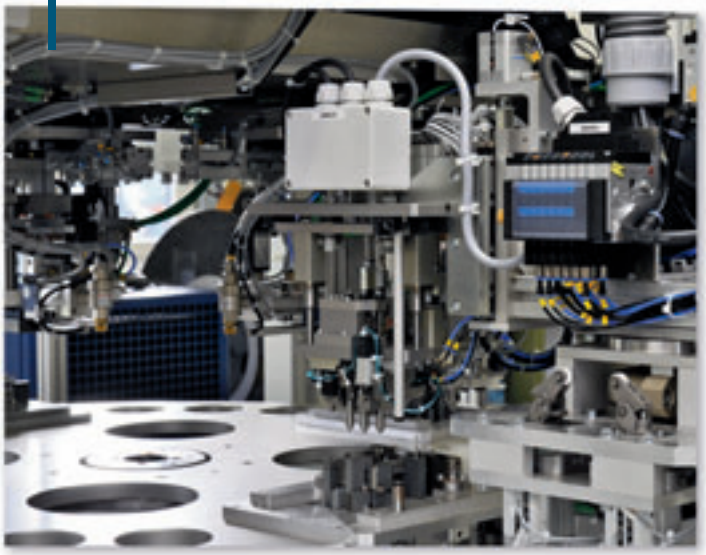
Using the handling option, removal systems can be operated in a dedicated channel, in parallel with processing on the machine. SINUMERIK Integrate supports you in implementing your ideas to achieve optimum operator control and production management. It goes without saying that all of the relevant standards are complied with – for instance, VDMA 34180 – which ensures that your customers can quickly implement the automation solution.

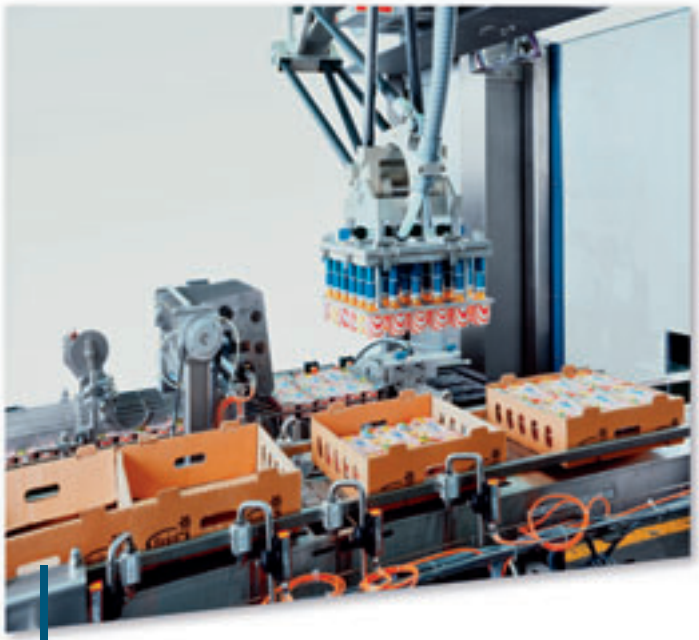
Our solutions are just as varied as your applications

From standard functions up to sector-specific requirements: We always supply the optimum solutions based on our comprehensive competence in the area of handling. The following examples will clearly convince you!

Machine tools

Assembly



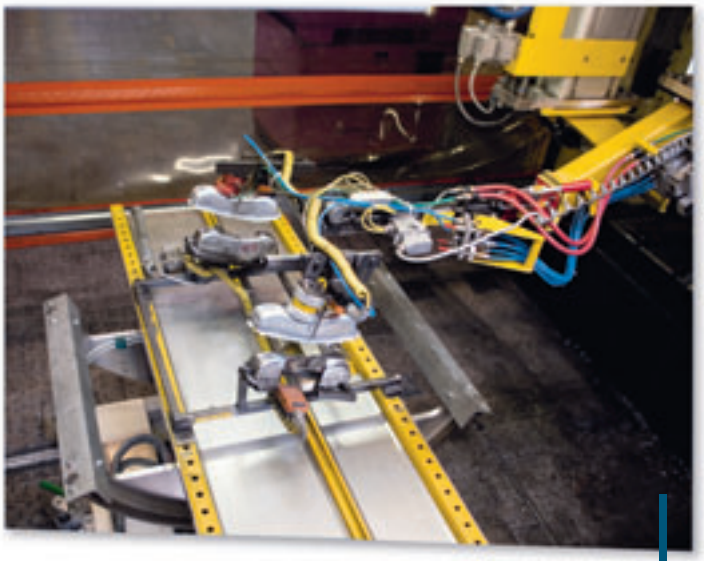


Packaging

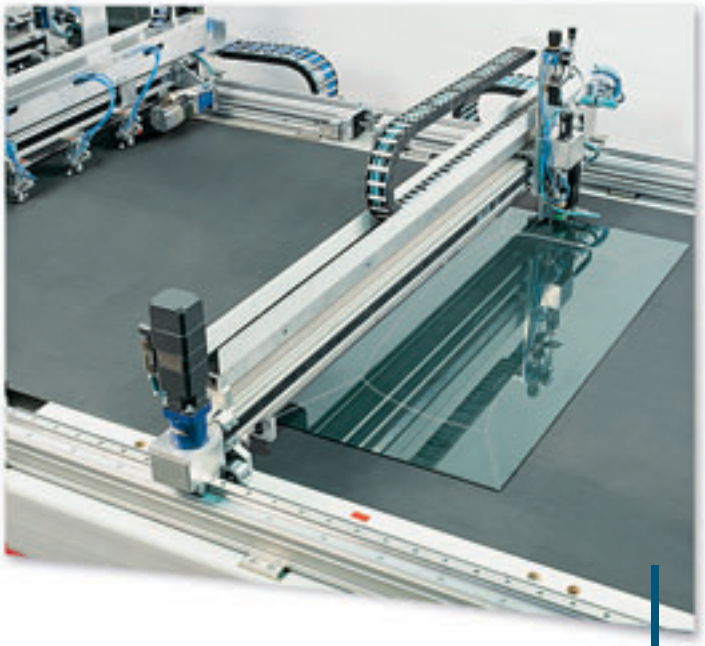
Plastics

Food processing

Solar / semiconductor



Metal forming technology



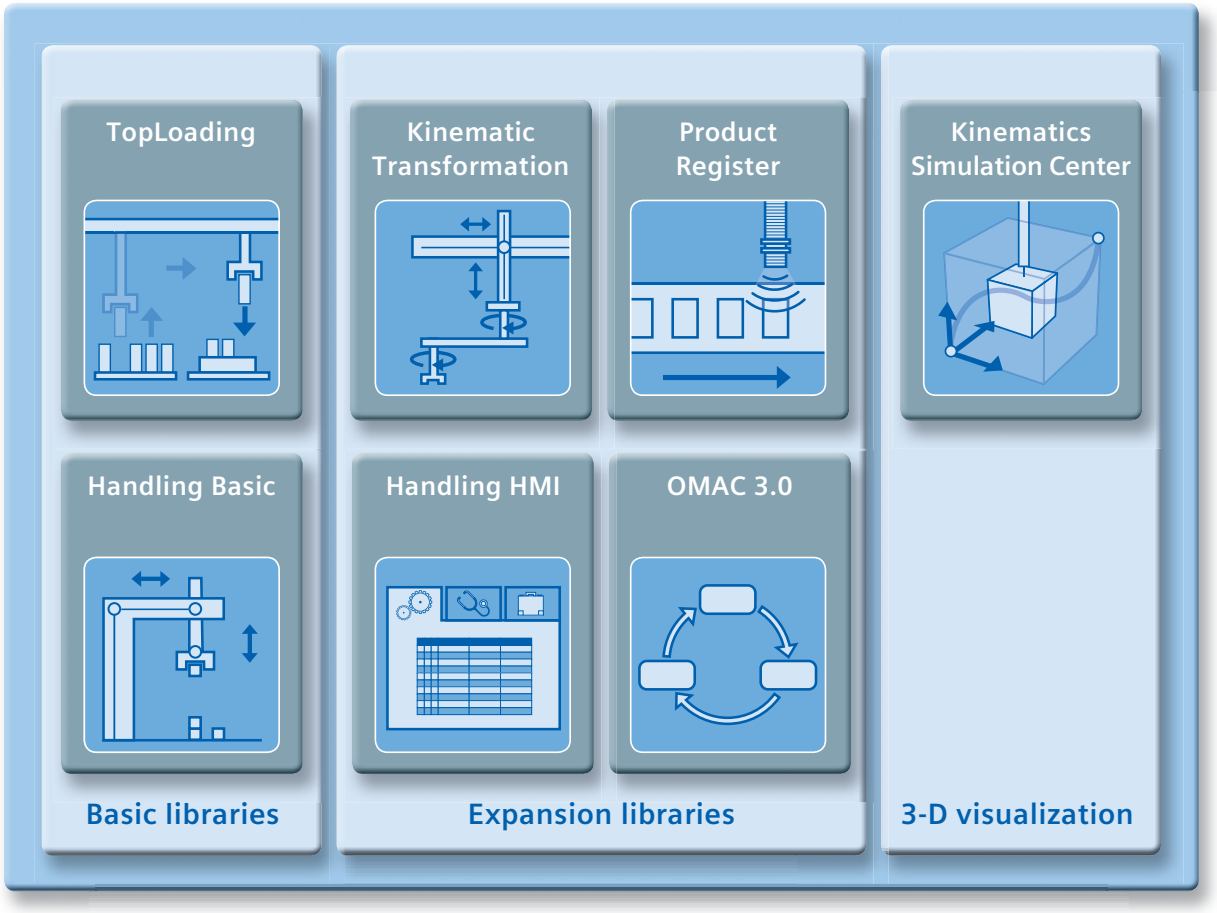
Wood / glass / ceramics / stone

For production machine applications: SIMOTION Handling Toolbox

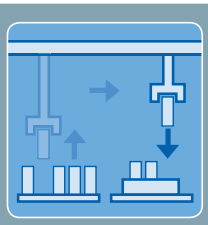
Automation systems must be designed, so that customer-specific functions can be quickly and cost-effectively implemented. With our range of products and solutions, we can offer you the ideal basis to achieve this: a modular system for each and every handling application, which can be integrated into the line automation.

The modular SIMOTION Handling Toolbox ensures maximum efficiency when developing the application, as the individual modules can be simply combined. Beyond this, you profit from a high degree of flexibility and reusability. A 3-D visualization tool also helps to make the engineering process efficient.

SIMOTION Handling Toolbox

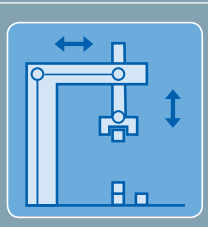


Basic libraries



SIMOTION TopLoading
SIMOTION TopLoading is a universal library for almost every handling task – from palletizing tasks up to high-speed pick&place applications.

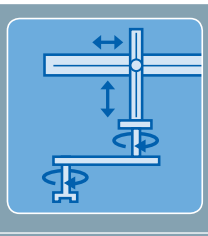
A whole raft of functions is available for this, such as:
- Interpolation point-based, velocity-optimized motion planning
- Zone management, for example to monitor working areas
- Pick&place applications on moving belts can be programmed very easily



SIMOTION Handling Basic
With SIMOTION Handling Basic, you have basic handling functionality in just one block. Typical applications include palletizing and transfer motion with cartesian gantries.

- Interpolating 4-D motion (x, y, z and gripper orientation)
- Automatic online path planning based on consecutive target positions
- Simple interface for entering interpolation points from a master unit (SIMATIC)

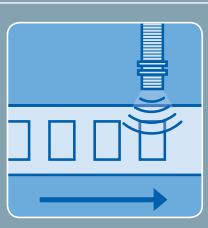
Expansion libraries



SIMOTION Kinematic Transformation
The "SIMOTION Kinematic Transformation" library allows customized handling equipment to be integrated using transformation equations.

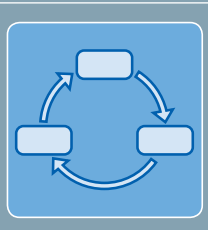
SIMOTION Handling HMI
An HMI solution tailored to handling applications, which in addition to service and diagnostic functions, has the following features:

- Path editor for defining interpolation points, including teach-in function
- Program editor for changing or generating a traversing program
- User-friendly parameterization and/or calibration of zone and coordinate systems



SIMOTION Product Register
Data management for vision systems to manage products regarding position, orientation and minimum distances.

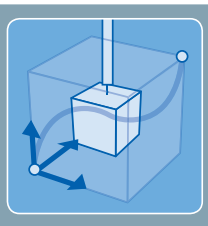
- Sorting products according to a defined picking strategy
- Defining product pickup areas
- Checking that minimum distances are maintained, to avoid collisions when gripping products



OMAC 3.0
Standard operating mode management is available in the form of the OMAC block:

- Predefined states for handling tasks (e.g. path stop, restart after an Emergency Off, ...)
- Can be expanded using user-defined states
- Possibility of connecting to higher-level line concepts (for instance, Siemens Optimized Packaging Line)

3-D visualization



SIMOTION Kinematics Simulation Center
The Kinematics Simulation Center Windows-based tool is a software tool for 3-D visualization of mechanical handling systems and conveyor belts.

- Supports all of the kinematics integrated in SIMOTION
- 3-D trace track for motion tracking
- Connection to SIMOTION for engineering without having a real mechanical system

Customized kinematics

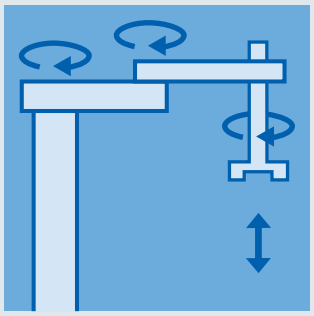
Almost all kinematics can be seamlessly integrated into the application using the SIMOTION Handling Toolbox.

Kinematics integrated in the system

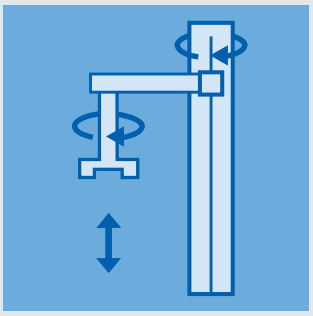
All of the usual handling kinematics – such as cartesian gantry, roller kinematics, scara, articulated arm or delta – are already implemented on the system side, and can be freely parameterized using preconfigured transformation modules.

Customized kinematics

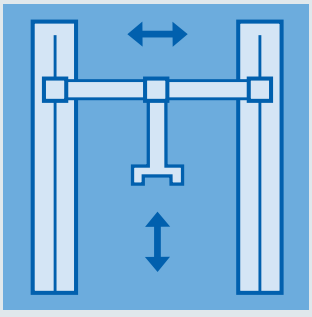
To ensure full flexibility, with SIMOTION Kinematic Transformation, you have a universal module to integrate your own kinematics.



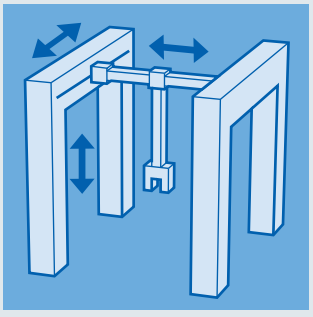
Scara



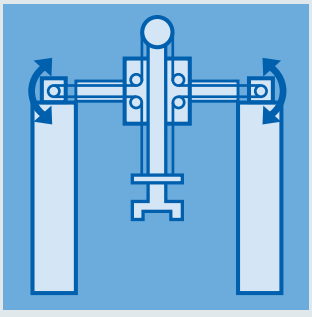
Swiveling arm



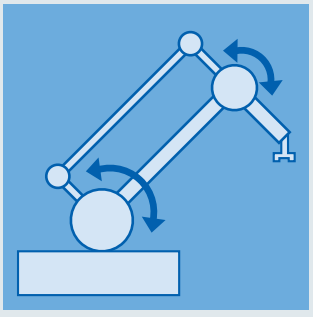
Cartesian gantry 2D



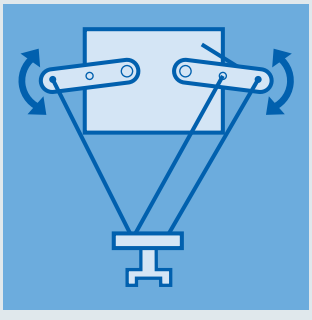
Cartesian gantry 3D



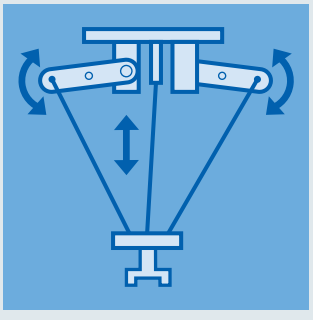
Roller kinematics



Articulated arm

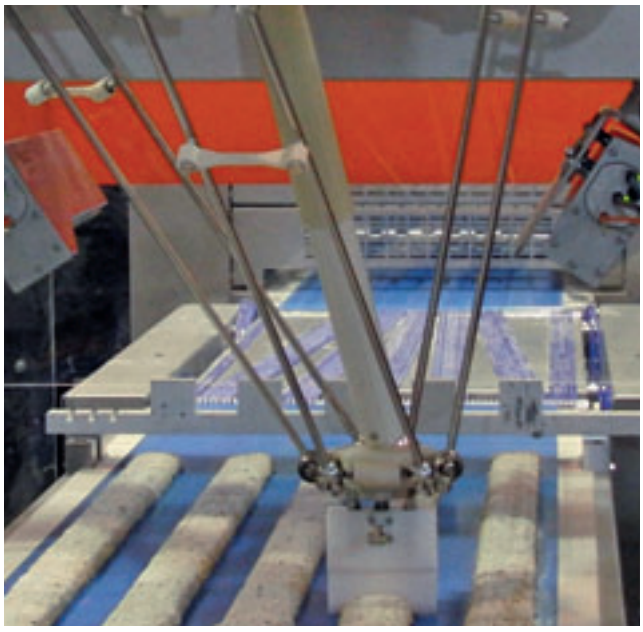


Delta 2



Delta 3

Sample application with SIMOTION



Handling task in the food industry using SIMOTION D445

The challenge

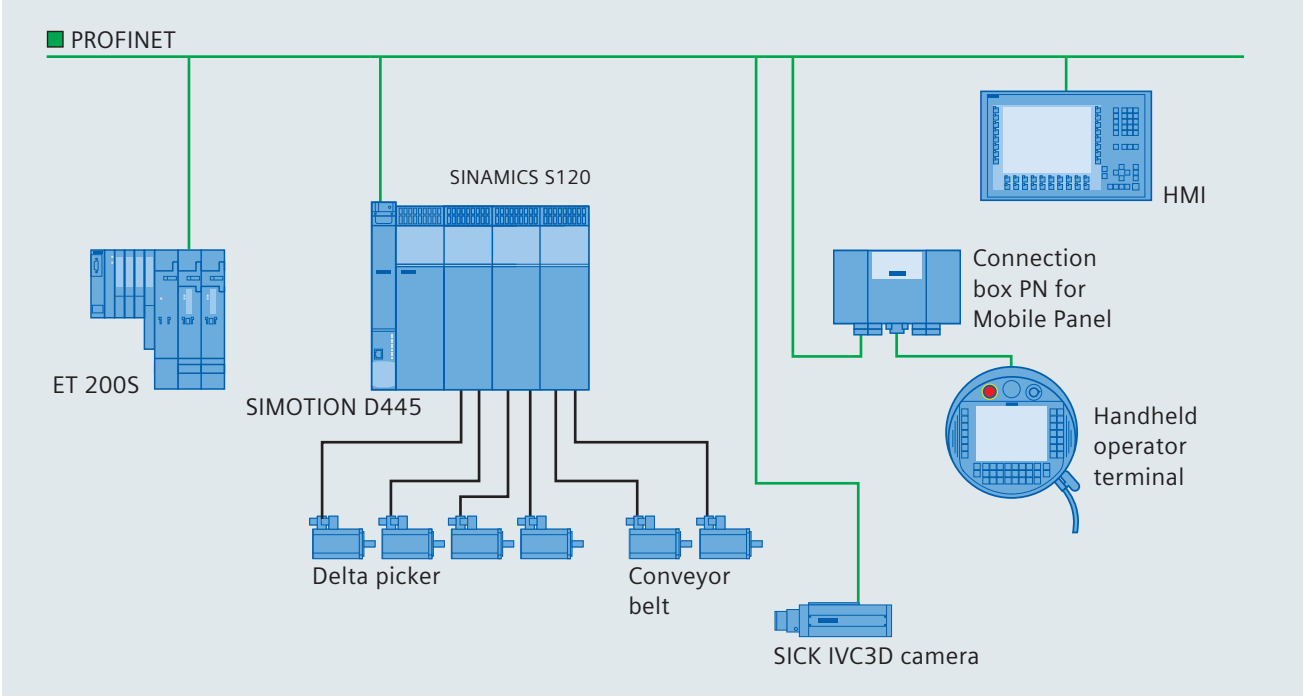
- Synchronizing to conveyor belts
- Integrating a camera system
- Managing products regarding position, orientation and distance

Solution

- SIMOTION TopLoading
- SIMOTION product register
- SIMOTION D445 for motion control and PLC

Customer benefits

- Delta3 kinematics integrated in the system
- Lower engineering costs using standard software modules and a preconfigured HMI solution
- Working area monitoring using blocked, alarm and product zones



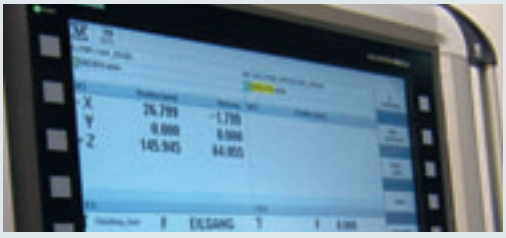
SIMOTION sample configuration – components used

For machine tool applications: SINUMERIK handling option

Today, in the production environment, short product cycles and flexible batch sizes represent some of the biggest challenges. The high spindle runtimes required to achieve a high degree of productivity were not able to be achieved up until now. Here, it makes sense to use a removal system as cost-effective solution. A robot represents the most flexible solution for the automation task. SINUMERIK offers the perfect CNC equipment for workpiece handling. The control system has integrated operating control of the handling cell. No special knowledge is required when programming the robot. Further, high machine runtimes can be achieved as a result of the easy-to-operate automation. Finally, a standard link to an MES (Manufacturing Execution System) corresponding to VDMA 34180 can be easily implemented.

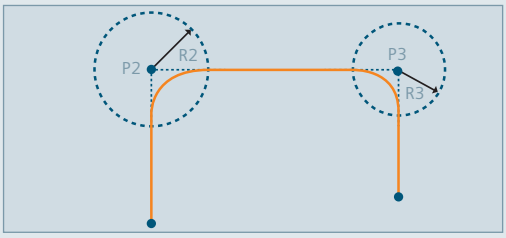
Multi-channel and simple

The SINUMERIK handling option provides everything that is important for a handling solution. Further, a multi-channel option is available for fast integration into a plant or system – to facilitate optimum synchronization with the machines.



Path planning made easy

The path is simply programmed in G code. Cycles can be used for demanding and sophisticated solutions. Interpolating motion control with smoothing rounds off handling solutions.



User-friendly machine operation

The mobile HT8 handheld terminal is used for user-friendly operation and monitoring. It goes without saying that the user interface and operation correspond with those at the machine operator panel. For safety reasons, the device has a three-stage enabling switch and an Emergency Off button.

Robot cells can be easily set up

Previously, robot cells were an additional component with their own operating control. Now, they can be set up using SINUMERIK from the machine tool user interface. As a consequence, robot programs can be just as simply run-in as NC programs, and only knowledge regarding the machine control is required.

Application sample with SINUMERIK

Handling gantry with SINUMERIK 840D sl

The challenge

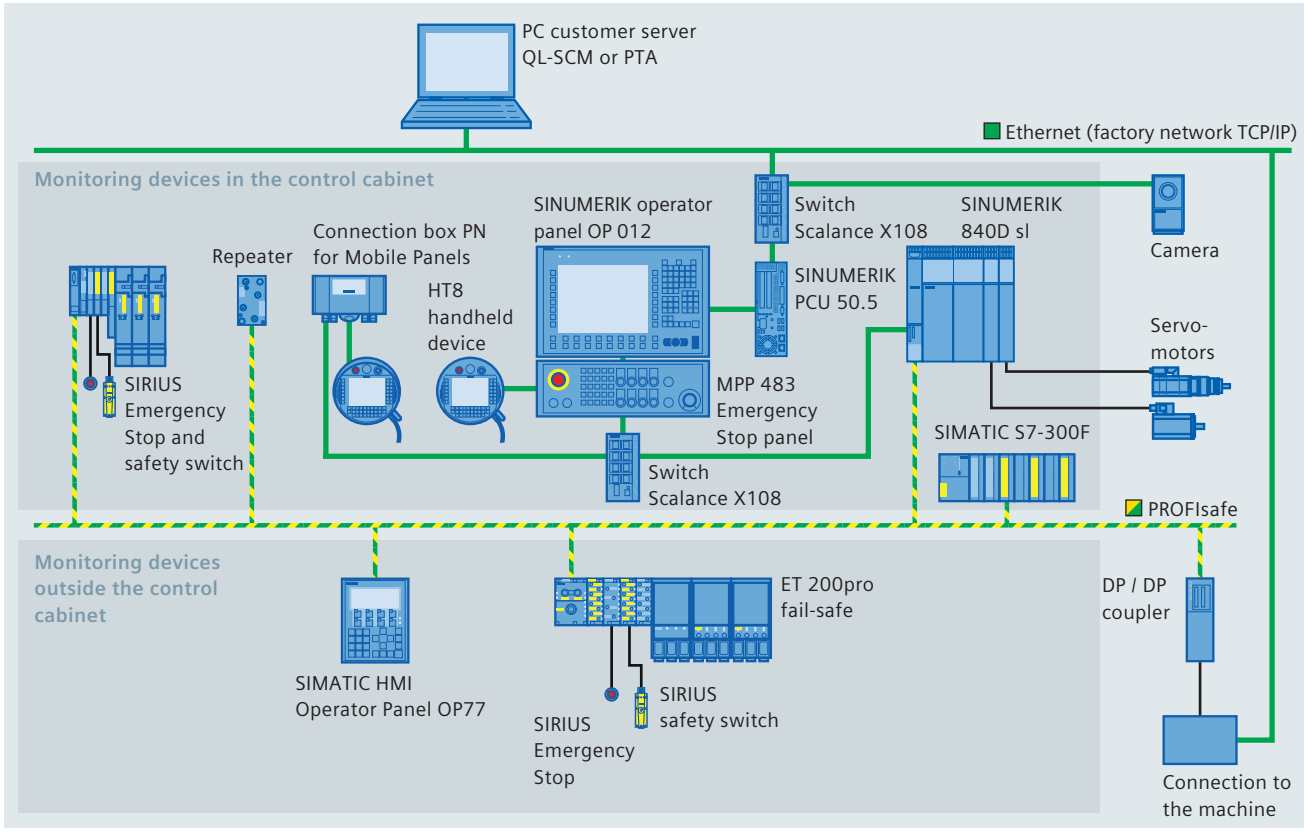
- Integrating a camera system
- Machine networking using Ethernet and PROFIBUS
- Safe position identification
- Safe communication

Solution

- SINUMERIK 840D sl
- HMI-Pro operator support
- Handheld HT8
- PROFIsafe

Customer benefits

- Standardization
- Simple system layouts that can be cost-effectively adapted – using standard hardware and software
- Use of standard operating control
- Simple expansion of the operating control
- Good networking options via PROFINET / PROFIBUS
- Lower wiring costs



SINUMERIK configuration sample – components used

Flexible and scalable: the modular motion control system

Whether it involves open-loop and closed-control, commanding and signaling or evaluating and responding: We address all handling applications with our portfolio. Our products, systems and solutions support you when automating even the most complex machines – and more specifically, over their complete lifecycle. This simplifies planning in the development phase as well as commissioning – as a result of efficient diagnostic functions. With all of these features, we have a very clear objective: minimum complexity with minimum development times.

SIMOTION: all degrees of freedom for more flexibility

The modular SIMOTION design addresses the trend for modular machine concepts: Many different machine versions can be implemented and scaled using just a few modules. Here, the SIMOTION software covers all functions and with PROFINET provides the optimum interface for inter-module communication.

When implementing your solution, you can choose between several programming languages and platforms. The significant advantage: higher degree of flexibility, high-performance machines, shorter commissioning times and lower machine costs.

SINUMERIK: one system, many possibilities

SINUMERIK represents an integrated and seamless system platform for automating machine tools – for different sectors and technologies. Our CNC system is simple to operate, offers a whole raft of innovative functions and technology cycles for even more cost-effective production. Further, the programming methods always precisely fit your requirements: no matter whether producing small or large series, simple or complex parts.

SINAMICS S120 for demanding drive applications

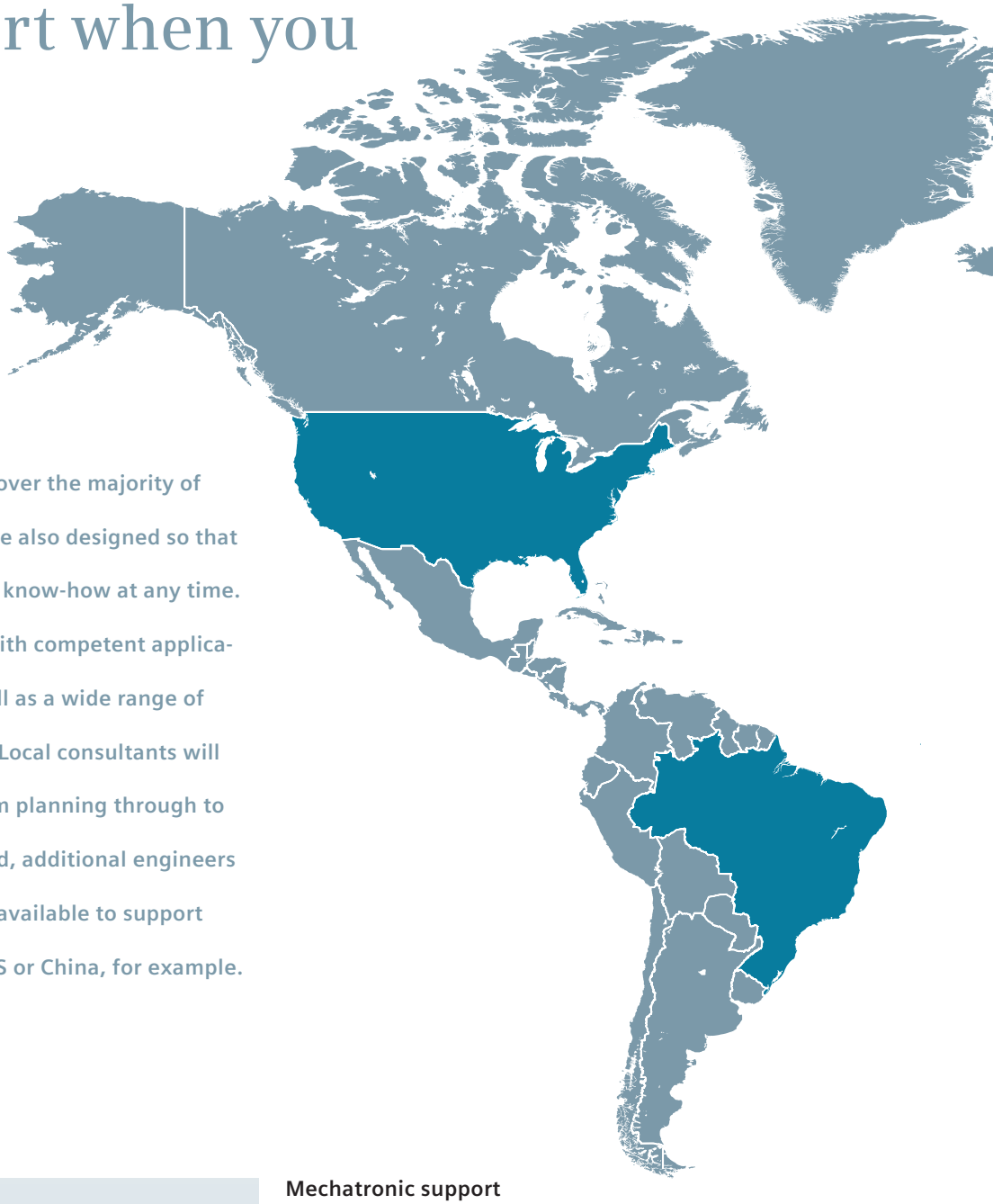
The modular SINAMICS S120 drive system with servo and vector control is especially predestined for addressing demanding drive applications in machine and plant construction. Versions are available for single- as well as multi-axis applications. The modular SINAMICS S120 system addresses a power range extending from 0.12 kW up to 4500 kW, and includes different control modules graduated according to their functionality. As a consequence, a precisely tailored drive configuration can be designed quickly and simply – for each and every drive application.

Drive-based safety functions facilitate added safety within the SINAMICS family. Safety concepts – as are required in practice – can be implemented using this integrated safety technology. All safety functions are certified according to international standards (IEC 61508, EN 954-1).

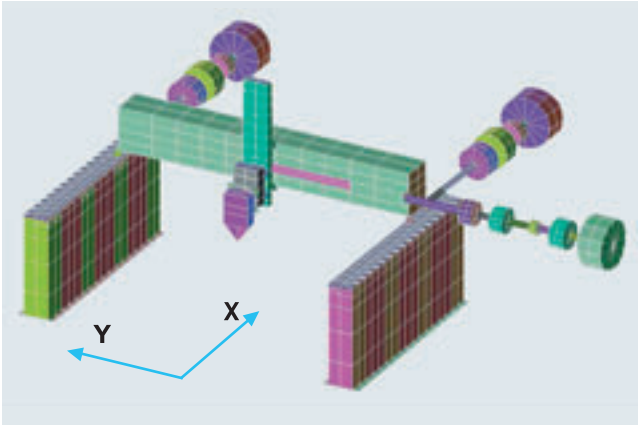
The ideal motor for every task

Clear trends can be identified for motion control drives: Motors are becoming increasingly more compact with a higher dynamic performance, in the widest range of power ratings and versions – as well as mechanically integrated solutions. We supply an intelligent response to these trends as we have the world's largest range of servomotors (SIMOTICS S) and direct drives (SIMOTICS M). We can provide the optimum motor for each and every application, no matter what your requirements.

The application and then what? Our support when you need it!

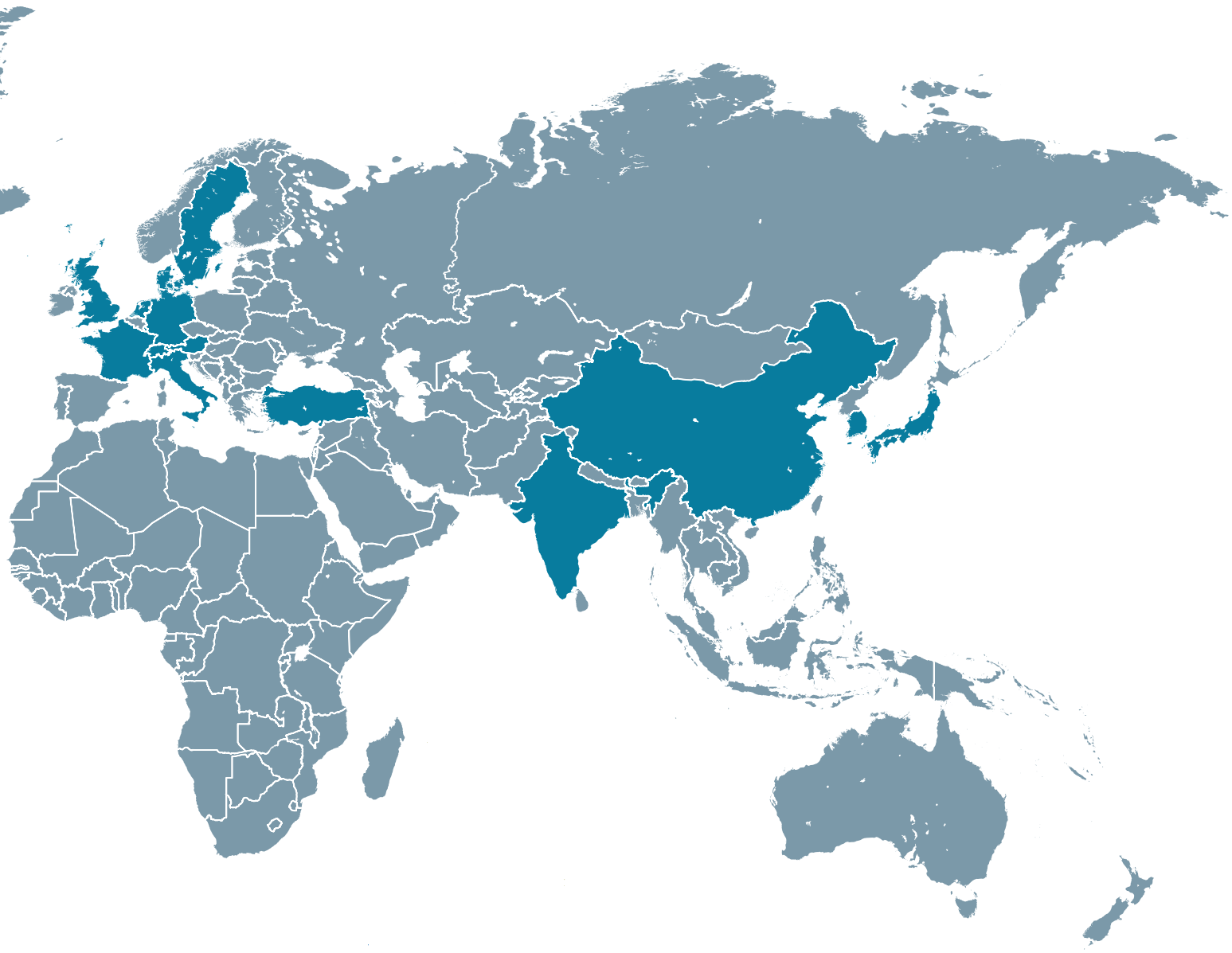


Our preconfigured solutions cover the majority of handling applications. They are also designed so that you can incorporate your own know-how at any time. In so doing we can help you with competent application consulting services as well as a wide range of general services and support. Local consultants will accompany your project – from planning through to commissioning. When required, additional engineers in our application centers are available to support you – in Germany, Italy, the US or China, for example.



Mechatronic support

Mechatronic machine concepts (e.g. handling equipment) are based on mechanical elements, electric drive technology and motion control software. The more perfect the components are coordinated with one another, the higher the efficiency of the complete system. Here, our Mechatronic Support team can help you when optimizing the precision and productivity of your machines. The results that are obtained are secured through simulation.



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You can obtain brochures on special topics all about motion control from your regional contact person. Of course, he will be more than willing to respond to all of your questions regarding our portfolio.

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