

Motion Control and more without limits



SIMOTION

Answers for industry.

SIEMENS



The SIMOTION motion control system: Simply brings motion into your machine

State-of-the-art machines must continually fulfill even higher requirements. High product quality, the highest degree of productivity with ever-increasing cycle rates and maximum availability with minimum life cycle costs are just some of the challenges to be mastered. The consequence – electronic components are replacing mechanical ones. Not only this, a wider range of tasks has to be tackled, higher numbers of axes controlled and shorter innovation cycles must all be addressed along with keeping up with quickly changing market demands. Machine price? Operating costs? It goes without saying that these must be kept as low as possible.

The solution to all of these challenges has been packaged into one motion control system – SIMOTION. Your advantage: With conventional solutions, the individual modules and their interfaces have to be harmonized with one another – a time-consuming affair. With SIMOTION, this process has been significantly shortened and simplified.



One system. From a single source.

In order to realize the most complex machines, SIMOTION supports the machine development across the entire life cycle. This is achieved with tools that simplify planning in the development phase and support you in the commissioning phase with diagnostic functions. The overall concept has one objective: Achieve the highest possible degree of simplicity. This is because the more difficult the requirements, the simpler it must be to handle the solution. This shortens development and engineering times, as well as the time to market for your machines. But this isn't all – high cycle rates and the highest product quality are guaranteed.

Every degree of freedom for higher flexibility

The modular system design follows the trend towards modular machine concepts. Many different machine versions can be implemented and scaled with just a few modules – assuming that every module has its own intelligence. This is the reason that SIMOTION covers all of the functions and with PROFIBUS and PROFINET provides the matching interfaces for communication between modules. This means that you profit from our wide range of

powerful and innovative standard automation and drive components based on a common platform. Further, when implementing your application, you can select between several platforms and programming languages. The advantage: high-performance machines with a higher degree of flexibility, shorter mechanical design and commissioning times with lower machine costs!

SIMOTION has an almost unlimited degree of flexibility due to the perfectly harmonized hardware and software modules. This is just one of the reasons why the system has established itself across the widest range of sectors:

- Packaging industry
- Plastics industry
- Glass industry
- Woodworking
- Metal forming
- Textile industry
- Printing industry
- Converting
- General machinery construction

SIMOTION facilitates:

- powerful, flexible and innovative machine designs
- high cycle rates with a maximum product quality
- lower costs over the complete life cycle
- shorter time to market

Three strategies for your success: Hardware, software and engineering that are perfectly harmonized with one another

Motion control is becoming increasingly significant when designing machines that control complex, fast and precise motion. With SIMOTION, a new system philosophy was selected in order to keep the control of tasks as simple and flexible as possible: Motion control has been merged with PLC and technological functions. This concept allows axes and machines to be controlled using just one system. Technological functions provide support – for instance the closed-loop pressure control for hydraulic axes.

Problems relating to interfaces between individual components, often critical from a time perspective, are completely eliminated. This reduces the programming and diagnostics time for the complete machine. With SIMOTION, you can enjoy the same level of user-friendliness as you would with a PLC system.

Unified, integrated engineering with a complete system

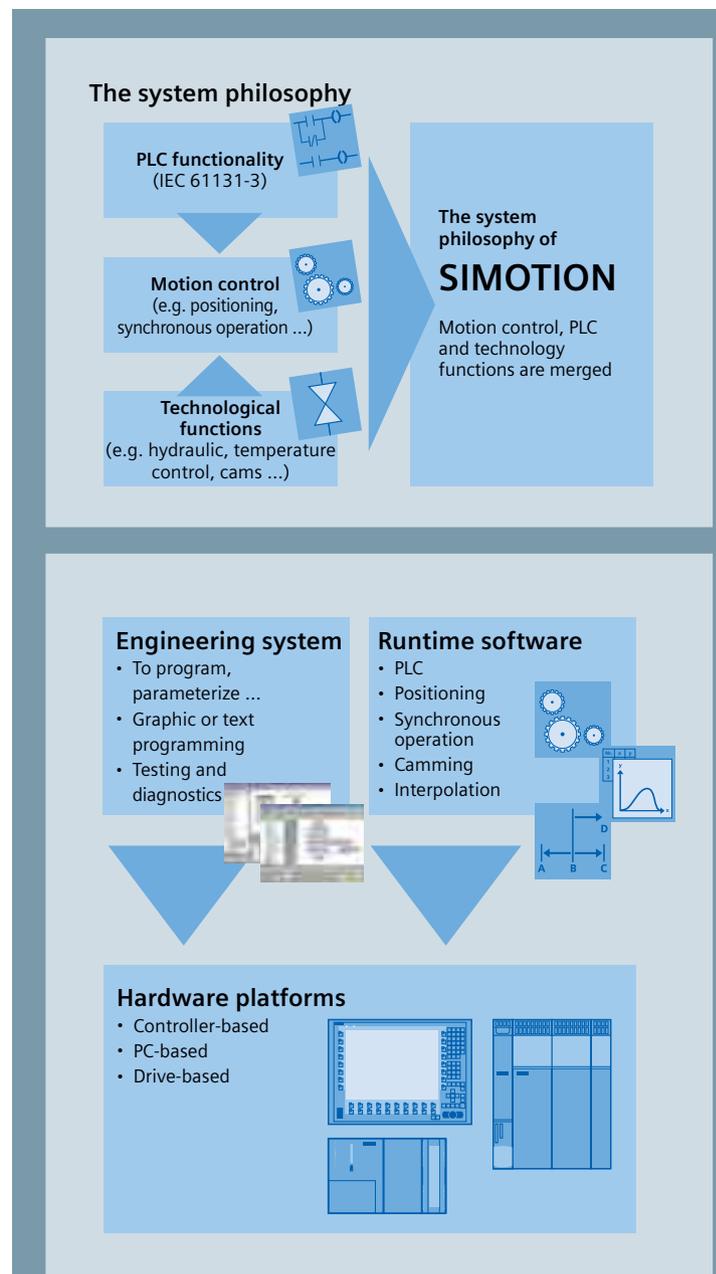
The SIMOTION system comprises three components: The engineering system, runtime software and hardware platforms. With SCOUT, SIMOTION not only offers an integrated, seamless engineering system, but it also provides all of the tools required for programming and parameterizing, testing and commissioning as well as diagnostics – all from a single source.

Runtime software – simply program motion control

The runtime software has a modular structure and comprises a PLC, in compliance with IEC 61131-3, and optional functions such as positioning, synchronous operation, camming and interpolation. These functions are available as additional commands. This means that you can create a motion sequence just as simply and flexibly as a PLC program. As a result of the free programming in conjunction with the excellent motion control functions, SIMOTION is the ideal automation platform for all production machines requiring motion control.

The optimum platform for every machine type

You can select from three hardware platforms in order that you also have every degree of freedom in the application. You decide which platform suits your machine the best. Once applications and software modules have been created with the engineering system, they can be used on all three platforms. The various platforms can also be combined with one another. Once generated, a program can run in the drive, in the PC and in the controller without incurring any additional costs.



Three platforms – one objective: Maximum degree of flexibility



The compact solution: SIMOTION D directly in the drive

A perfect symbiosis: SIMOTION D is directly integrated in the SINAMICS S120 as control module. This not only saves valuable space, but also means that the system has an outstanding response speed. SIMOTION D is available in two mechanical designs – as single-axis system SIMOTION D410 and as multi-axis system SIMOTION D425/D435/D445 in various performance variants.

This guarantees the highest degree of scalability and flexibility. By integrating motion control and technological functions as well as PLC and closed-loop drive controls in just one compact module means that, in addition to the motion sequence, also the complete machine can be controlled.

Depending on the SIMOTION D version, SIMATIC HMI devices can be connected through PROFIBUS, PROFINET or Ethernet for visualization and operator control. PROFIBUS or PROFINET is used to connect the distributed I/O.

Optimally suited for:

- compact machines
- distributed automation concepts
- modular machines
- high-speed axis couplings



The modular solution: SIMOTION C for the widest range of applications

With four onboard interfaces for analog or stepping drives as well as several digital inputs and outputs, SIMOTION C is an especially flexible controller in an S7-300 mechanical design. Further, a SIMOTION C230-2/C240 can be expanded using I/O modules from the SIMATIC S7-300 range. Two PROFIBUS ports with PROFIdrive and an Industrial Ethernet connection ensure perfect communications with other parts of the machine.

With the distributed architecture, drives and I/O can be connected through PROFIBUS. Further, PROFIBUS can be used for communications with operator devices – for example, from the SIMATIC HMI range – or with higher-level controls such as SIMATIC S7. SIMATIC HMI panels as well as PCs with ProTool/Pro, WinCC flexible or OPC interfaces can be used as operator systems.

Optimally suited for:

- the highest degree of freedom when selecting drives
- a wide range of process signals
- retrofit applications using integrated analog interfaces



The open solution: SIMOTION P for PC-based tasks

Based on the latest Intel technology, SIMOTION P350 operates with the Windows XP operating system equipped with a real-time expansion for SIMOTION. This means that SIMOTION P350 can handle the highest performance requirements; for instance, high-speed control loops for hydraulic applications with closed-loop position and pressure control. In addition to SIMOTION applications, other PC applications can be processed at the same time.

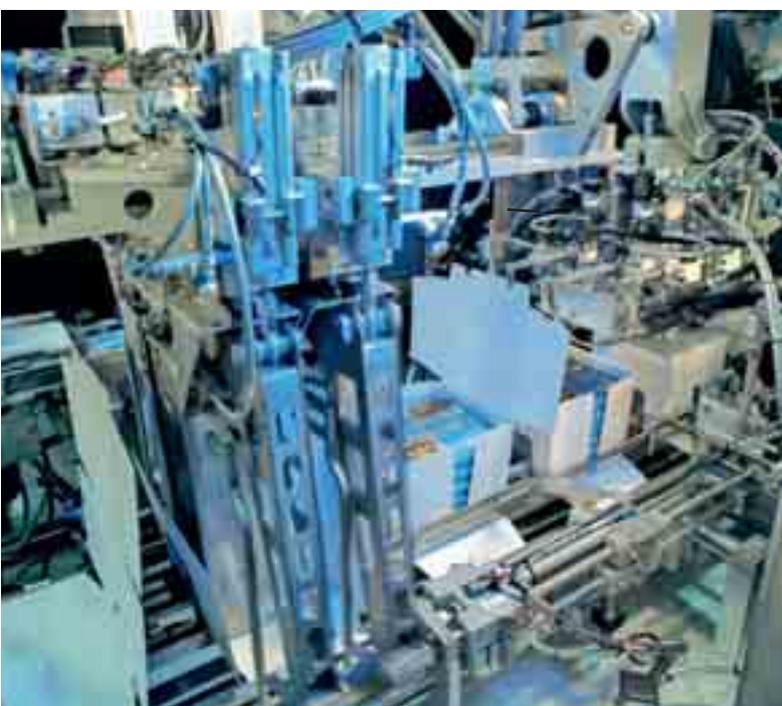
This industrial PC is offered with several panel versions with different screen sizes – controlled from a keypad, mouse or touch screen. The drives are decentrally connected through PROFIBUS DP/PROFINET with PROFIdrive.

Optimally suited for:

- applications that require an open PC environment
- applications with especially high performance requirements, e.g. hydraulic applications
- applications that require that the control and visualization run on a single hardware platform
- extensive data management, evaluation and logging

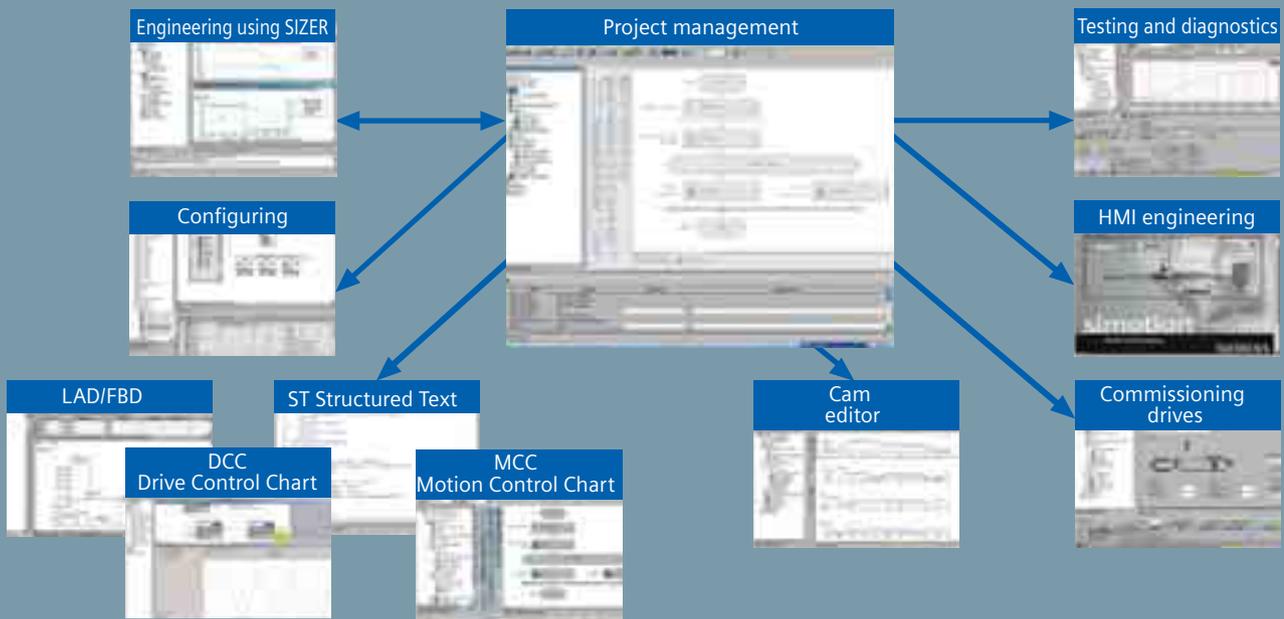
SIMOTION offers:

- simple and fast engineering
- application-orientated hardware platforms
- a flexible, scalable system and therefore the highest security for your investment



One tool – all tasks: Engineering tasks are efficiently and quickly executed

In order to fully utilize the system performance of SCOUT – the engineering system for SIMOTION –, we placed the greatest emphasis on user-friendliness. Just one system is used to engineer the motion control, PLC, technological functions and the drives. Configuring, programming, testing, and commissioning – everything can be graphically handled from one workbench. With the intelligent user navigation, a context-sensitive help function and the automatic consistency check, SIMOTION significantly simplifies motion control programming – especially for entry-level personnel. Further, all of the tools associated with SCOUT are completely integrated into the user interface to make engineering even more efficient. SCOUT can be used as a stand-alone tool or in conjunction with SIMATIC STEP 7.



Components are perfectly selected – from the drive to the control

Not only can the drives and the motors be selected and dimensioned using the easy-to-use software-based SIZER engineering tool, but also all of the supplementary components required for the entire drive solution – all the way down to the appropriate cables. The software was designed from the solution-orientated view of the user – and using intelligent functions and other help functions makes it easy to generate a drive solution with the specified features and characteristics.

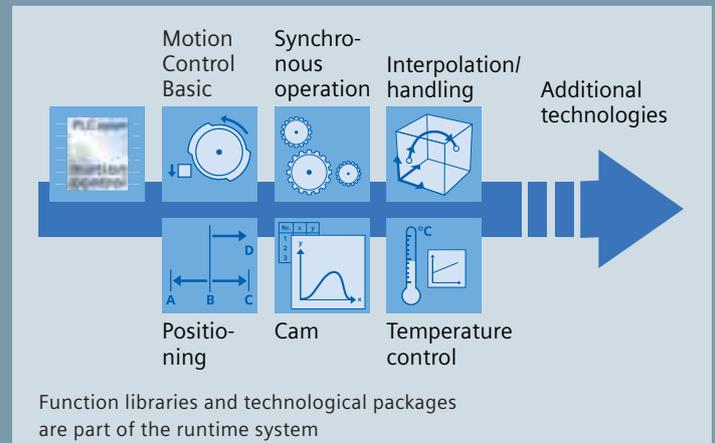
SIZER navigates the user step by step as he dimensions the drive solution. The status is graphically displayed in the drive engineering workflow. Every engineering step is prompted using the appropriate screen forms. All drive applications are to be addressed and as a consequence it is possible to enter simple load characteristics as well as complex load and travel curves. But this is not all – with the added functionality of the CAD Creator, you quickly have all of the motor-specific 2-D/3-D dimension data at your fingertips.

SIMOTION SCOUT stands for extremely simple handling and offers:

- all of the engineering functions in one system
- all of the components are quickly configured
- powerful commissioning and diagnostic functions

Simply practical: Programming

SIMOTION provides you with every degree of freedom when it comes to programming. This is because the system can speak several “languages” at the same time. In addition to the ladder diagram (LAD), function block diagram (FBD) and the text-based high-level language ST (Structured Text according to IEC 61131), motion sequences can also be programmed using Motion Control Chart (MCC). Expanded control tasks can be easily implemented in a structured fashion using Drive Control Chart (DCC).



Everything is simply there: the runtime system

In order to be able to simply handle the wide range of motion tasks of different machines, a special runtime system architecture was developed for SIMOTION. Basis functions – such as the PLC functionality – are already integrated in each SIMOTION device. The performance range can be extended as required using technological packages and function libraries. Technological packages provide the complete functionality – for instance, for motion control or closed-loop temperature control. On the other hand, the function libraries include standard functions for tasks that are frequently required. It goes without saying that you can create your own libraries with functions that you have generated yourself. The unique functionality of SIMOTION is obtained by combining the technological packages, function libraries and runtime system: scalability, flexibility and expandability – from commissioning through operation up to maintenance.

Scalable

- using various function levels as well as software models and technological packages
- from simple open-loop control functions up to complete mechatronic sequences

Flexible

- using the integrated, freely programmable PLC in compliance with IEC 61131-3
- using technological packages that can be freely instantiated with a comprehensive range of commands
- by being able to operate servo, vector, stepping and hydraulic drives

Can be expanded

- using standard functions of the function libraries

Simple graphic programming – with MCC

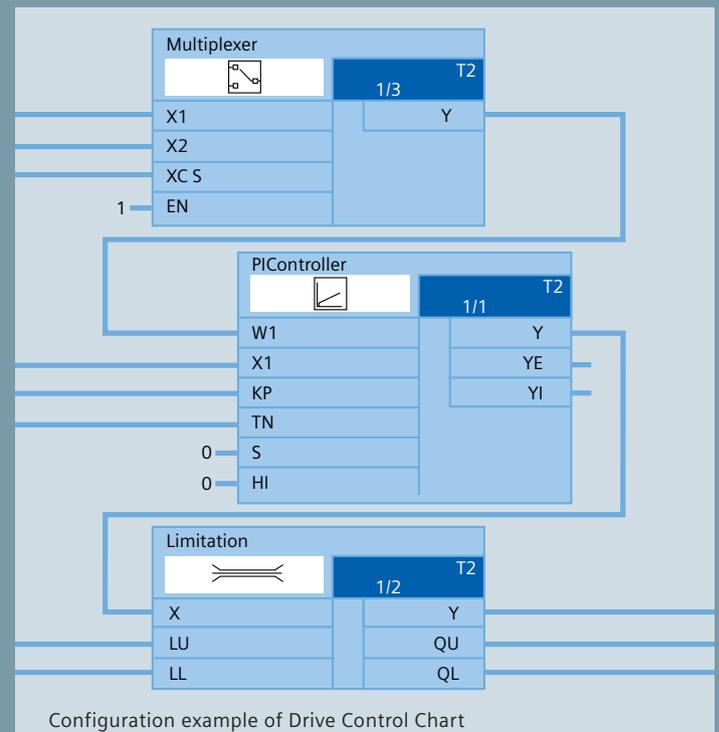
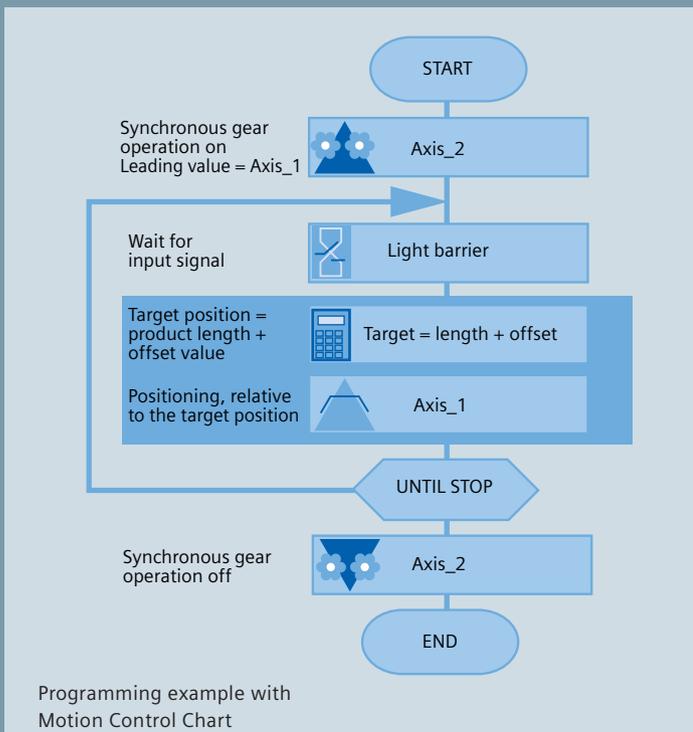
The intuitive user prompting of MCC – Motion Control Chart – makes it easier to program even the most complex motion functions. The machine sequence is clearly and transparently shown using a flow diagram. In addition to motion control commands, there are also commands to access I/O, logic and arithmetic operations, sub-routine calls and even commands to control the program flow.

The well-known standard from the PLC environment: LAD and FBD

A high-performance editor is available both for programming in LAD as well as in FBD. In addition to standard logic functions, all of the motion control and technological functions can be used in LAD/FBD. Blocks programmed in other SIMOTION languages can be simply called. Further, when programming with LAD or FBD, users can profit from user-friendly functions such as declaring variables “on the fly” and the automatic syntax check. Further, programs can be toggled between LAD and FBD displays at any time.

One standard – also for motion control: PLCopen

The PLCopen blocks for motion control, integrated in the system, are especially suitable for programming in a PLC-type view. They are saved in the command library and can be used in all of the languages. LAD or FBD is most suitable – especially for entry-level personnel. In addition to certified single- and multi-axis blocks, extended functions are also available.



Highest efficiency when structuring the program: Structured Text ST

Using Structured Text ST, the complete functionality and flexibility of the SIMOTION system can be used in an environment that is suitable for high-level languages. This results in extremely efficient programming.

Blocks, generated in ST, can be called in all of the other SIMOTION languages at any time.

Easy-to-configure technological functions: Drive Control Chart DCC

It is extremely simple to configure open-loop and closed-loop control functions using the DCC Editor. Multi-instance-capable function blocks are selected from a predefined library and are graphically interlinked with one another by dragging and dropping them. With DCC, there are no restrictions regarding the number of functions that can be used. The block library includes a wide selection of closed-loop control, arithmetic and logic blocks – as well as ex-

tensive open-loop and closed-loop control functions. Open-loop and closed-loop control structures configured using DCC are transparently shown. Charts once generated can be simply called, reused and combined with other program sections in order to form a complete program.

Cam editor for more user-friendliness: CamTool

Editors are included in the basic scope of SCOUT, which enable cams to be created in a tabular or polynomial form. A VDI Wizard simplifies configuring even more by using graphic symbols.

Complex motion interrelationships can also be simply and graphically programmed using the CamTool editor.

Simply integrated: Central management with all the tools



The trace function integrated into SCOUT simplifies commissioning and faultfinding

One system – one data management:

All of the information relating to the machine – such as configuration data, programs, motion profiles and drive data – is saved in one project. Once a drive is commissioned, all of the required data can be simply called up from the central project management.

Simply harmonized: Configuring the axes

Axis handling is also significantly easier than with conventional systems as a result of wizards that navigate the user through the process. Intelligent axis objects can be set up in the software. They include all of the relevant information – such as the axis name, the connection of the associated drive, encoder type with resolution, closed-loop position control parameters and even the mechanical axis system data – which can be saved and visualized. Any type of axis can be addressed and information about its operating state can be called using the user program.

Everything at a glance with the axis control panel

SCOUT also has an integrated axis control panel that can be used to simply commission the various axes. This can be used to traverse, test and optimize any axis using the commissioning PC – also without a user program.

Simple commissioning: Testing and diagnostics

SCOUT offers testing and diagnostic functions – the same as are used for PLCs – to commission the user program. For example, the states of blocks and variables are displayed, break points are set and variables traced. In addition to these testing and diagnostic functions, the trace function integrated into SCOUT significantly simplifies commissioning and troubleshooting. This means for example that program variables, the position actual value and the following error can be simultaneously recorded in millisecond intervals. Data that is recorded can also be saved and compared with new traced data. Further, commissioning and machine optimization procedures are also simplified with features such as automatic controller settings, measuring functions, function generators, FFT analysis and Bode diagram to display the frequency response.

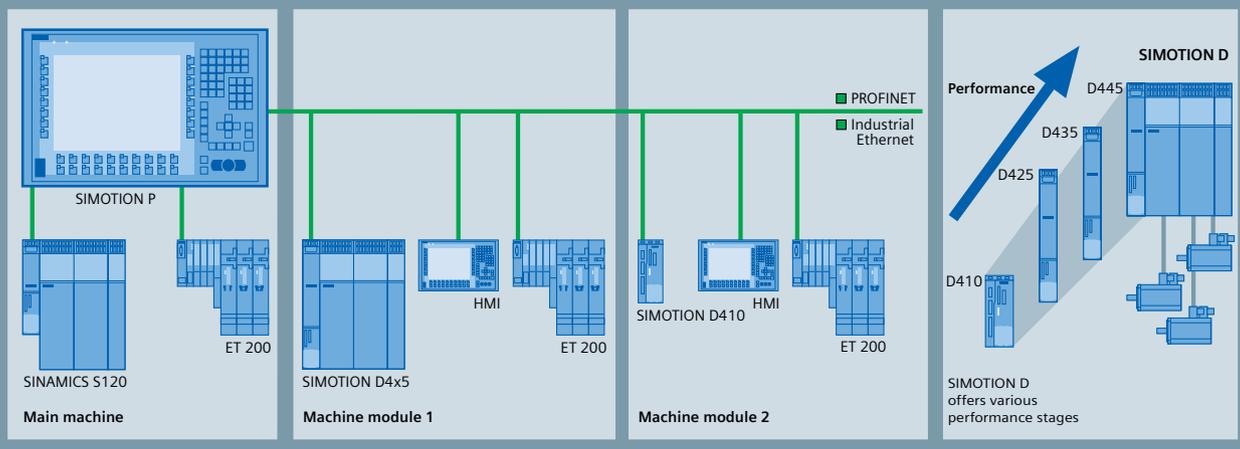
Everything under control with IT Diag

SIMOTION IT Diag is especially suitable for first-level diagnostics even once production has started. Using SIMOTION IT Diag – when connected via Ethernet –, machine and control information can be read out using a standard web browser. The Ethernet connection can also be used to update the project and firmware. In addition to system-specific standard diagnostic screens, machine- and customer-specific diagnostic screens can also be created and saved in the SIMOTION devices. SIMOTION IT Diag can be used to eliminate time-consuming and costly service calls and reduce machine downtimes.

SIMOTION permits:

- fast entry into programming through MCC
- simple programming of PLC tasks using LAD or FBD
- fast commissioning and reduced downtime through extensive diagnostic functions

SIMOTION and the SINAMICS S120 drive system – a perfect team



SINAMICS S120 is a modular system of drives for high-performance applications in the machine and plant construction sectors. It has numerous components and functions that are harmonized and coordinated with one another. This means that you can optimally adapt the drive to your particular requirements. SINAMICS S120 offers high-performance single-motor drives and coordinated drives (multi-axis applications) with vector functionality for the highest torque accuracy – or servo functionality for the highest dynamic performance. The range of motors extends from induction and synchronous motors up to linear and torque motors. SINAMICS S120 is available in different types of construction and covers the power range from 0.25 to 4,500 kW with supply voltages 1-ph. 230 V AC, 3-ph. 380–480 V AC and 3-ph. 660–690 V AC.

SIMOTION P and SIMOTION C with SINAMICS S120

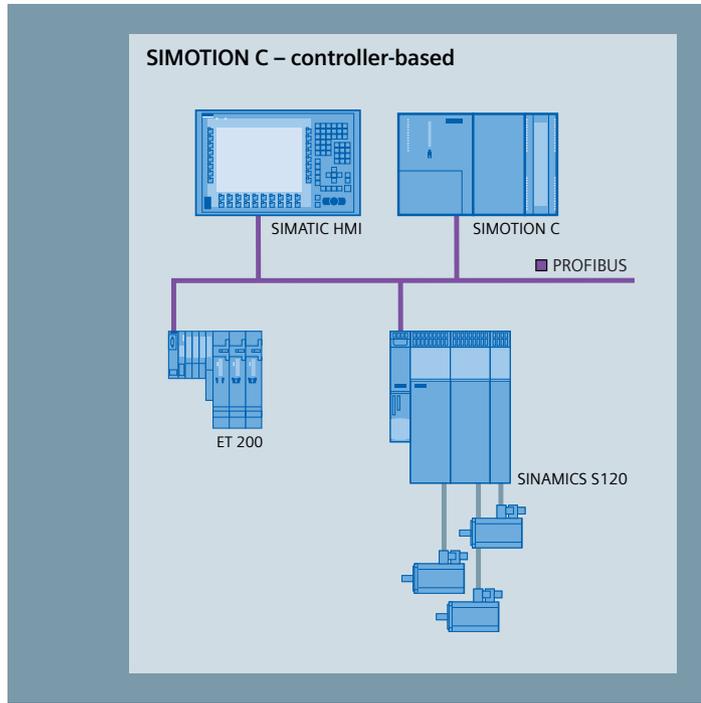
SIMOTION P and SIMOTION C handle the automation of the complete machine or individual machine modules. The drive control is implemented in the SINAMICS S120, which communicates with SIMOTION via PROFIBUS DP or PROFINET.

SIMOTION D and SINAMICS S120

Motion control tasks are becoming increasingly more complex – and the requirements placed on precision and speed are increasing as well. SIMOTION D was created by integrating SIMOTION into the high-performance SINAMICS S120 drive system. This means that SIMOTION D is the response to the challenge of having to control many coordinated axes with high cycle rates.

This allows a distributed automation structure where the machine is split up into various axis groups – each with its own SIMOTION system. An additional benefit is a compact machine design. With SIMOTION D, various performance versions can be selected. Whether as SIMOTION D410 single-axis system, which can be directly snapped onto the SINAMICS S120 Power Modules PM340 in the Blocksize format – or as scalable SIMOTION D4x5 multi-axis system in three different performance variants in the Booksize format. The highest degree of scalability and flexibility makes it easier for you to precisely align the automation to the requirements of your machine.

SIMOTION – full flexibility when it comes to the machine concept



The three SIMOTION hardware platforms provide you with a high degree of flexibility so that you can optimally adapt the motion control system to your machine.

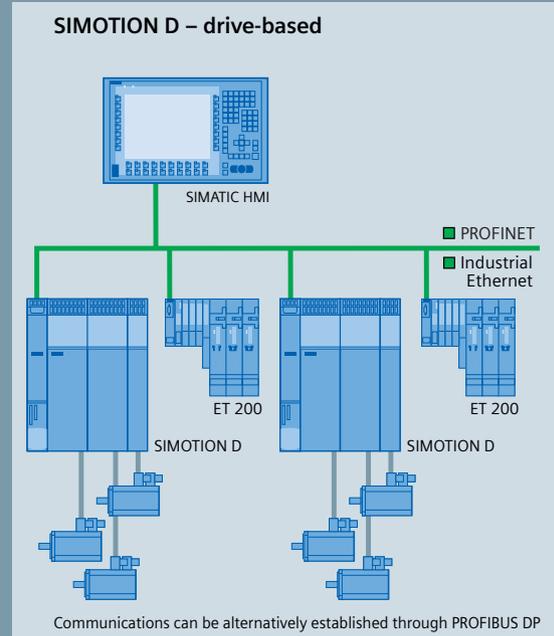
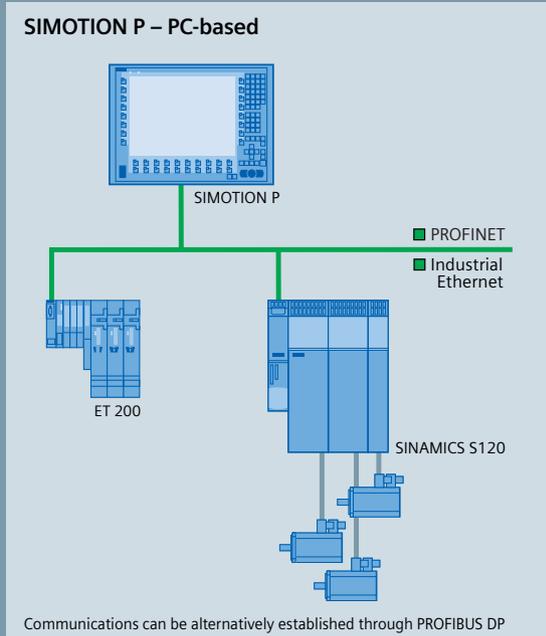
Machines with servo drives ...

... are completely controlled via SIMOTION, e.g. using a SIMOTION C240. This device processes all I/O signals and coordinates the motion of the servo drives. The process signals are connected to the controller through central I/O – or to PROFIBUS DP through distributed I/O stations.

For instance, the system is optimally supplemented by the SINAMICS S120 servo drives. A SIMATIC Operator Panel – that is connected to the controller via PROFIBUS DP or Ethernet – is used for operator control and visualization.

For modular machines ...

... SIMOTION can fully utilize its tremendous flexibility. This is because different machine segments can each be controlled from one SIMOTION system – or even from different SIMOTION platforms. For instance, one segment with a servo drive and distributed I/O can be controlled from the industrial PC SIMOTION P. Another segment and an autonomous module, that also has several servo drives and distributed I/O, can then be controlled from a SIMOTION C controller.



Solutions can also be implemented with SIMOTION D directly embedded in the drive. SIMOTION systems and servo drives are synchronized via PROFIBUS DP or PROFINET with PROFIdrive.

The operator interface on SIMOTION P can be very easily configured using ProTool/Pro and WinCC flexible. The HMI application can also be configured using other tools. In this case, the system and variables are coupled through OPC.

Hydraulic applications ...

... with their high-speed control loops for position and pressure control can be implemented using the fast, distributed ET 200S I/O; these are preferably connected to SIMOTION via PROFINET, therefore permitting the shortest control cycles. In addition to electric drives, this also allows hydraulic drives to be synchronized with one another – the ideal basis for seamless and integrated automation solutions such as e.g. conveyor belts and press lines.

Machines with many axes ...

... are a challenge for any motion control system. The reason for this is that each axis increases the load on the system as well as on the bus. SIMOTION tackles these challenges using a distributed automation structure. The machine is subdivided into various modules, each controlled by its own SIMOTION system.

The individual systems are then connected to one another via PROFIBUS DP or PROFINET and PROFIdrive. The bus load is now significantly lower – and, as a consequence, machines equipped with a high number of axes, executing complex functions and with high requirements on the performance can be automated.

The drive-based version SIMOTION D is especially suited for this type of application thanks to its compact design and fast communication within an axis group.

SIMOTION – the system with a link to the future



Part of Totally Integrated Automation

SIMOTION is an integral part of Totally Integrated Automation (TIA). With TIA, Siemens is the only manufacturer that offers a seamless, integrated platform to implement customer-specific automation solutions – in all sectors, from goods in to goods out. Totally Integrated Automation distinguishes itself with its integrated data management, engineering and communications. As well as reducing engineering costs, it ensures the highest degree of transparency across all levels – from the field level through the production control level up to the company's enterprise level.

This unique level of integration is a requirement for every new product or system we develop. It reduces the complexity of automation solutions and ensures the best level of interoperability as well as a high degree of investment security.

PROFIBUS: the No. 1 fieldbus worldwide

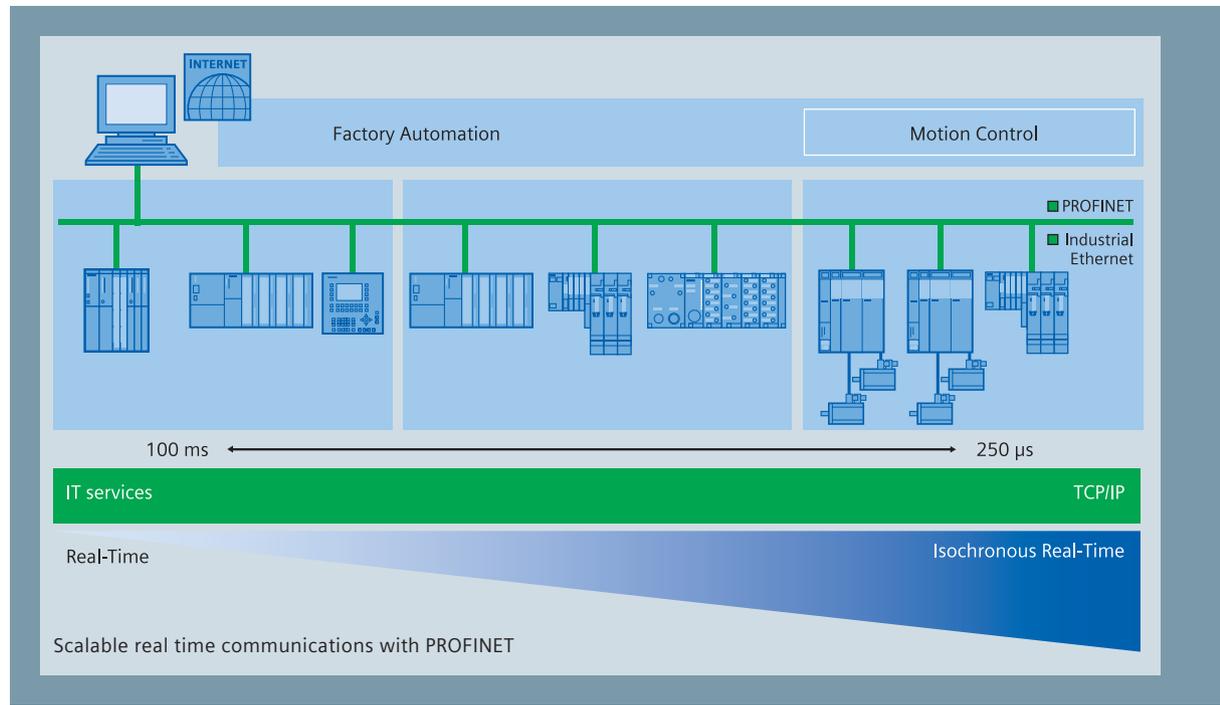
Today, with over 10 million installed nodes, PROFIBUS is the No. 1 fieldbus. With PROFIBUS, several SIMOTION devices can be quickly and reliably linked at the process level for motion control applications.

PROFINET: company-wide automation – seamless connectivity

The unique level of integration and seamlessness of TIA can be implemented with PROFINET, the open and non-proprietary Industrial Ethernet standard. PROFINET can be used to simply implement extremely fast isochronous drive controls – and TCP/IP communications can be used at the same time without any restrictions.

SIMOTION permits simpler handling and:

- perfect integration into every automation solution through TIA
- optimal compatibility with all of the usual standards



Motion control via PROFINET: if your machine needs even higher performance

PROFINET is the open and innovative Industrial Ethernet standard that meets all requirements of the automation environment. Based on PROFINET, extremely fast isochronous drive controls can be implemented for high-performance motion control applications using isochronous real time. The standardized PROFIdrive profile allows non-proprietary communications between motion controllers and drives, independent of the bus system – Industrial Ethernet or PROFINET.

Isochronous real time communication and standard IT communication can run simultaneously on the same cable without mutually influencing one another. PROFINET uses standard TCP/IP for parameterizing, configuring and diagnostics.

Using PROFINET IO, process data is transferred in real time along the same bus cable. SIMOTION integrates PROFINET IO with RT as well as also PROFINET IO with IRT for motion control tasks. This allows machines to be realized with a significantly higher performance regarding cycle times, data quantities and

the numbers of axes that can be controlled. Diagnostic and maintenance functions can be simultaneously executed to increase the machine availability and your level of competitiveness. Not only this, if necessary, existing PROFIBUS networks can be easily integrated into a PROFINET architecture to provide an even higher degree of flexibility.

PROFIdrive – the well-proven drive interface

For PROFINET and PROFIBUS, the functional interface between controls and drives is clearly defined by the PROFIdrive drive profile of the PROFIBUS User Organization (PNO). PROFIBUS users who are already operating drives on PROFIBUS benefit because the user program does not have to be changed when changing over from PROFIBUS to PROFINET.

SIMOTION: The basis for integrated high-performance sector solutions

Modern machines place the highest demands on automation and drive technology. Innovative technologies are demanded in order to continually increase and optimize the productivity. Further, there is a clear trend towards flexible, modular concepts as well as state-of-the-art solutions for service, maintenance and connection to supervisory control systems. The demand for low engineering and operating costs makes it imperative to have seamless and integrated automation concepts – from the field up to the company supervisory level. With its PROFINET, SIMOTION and the SINAMICS S120 drive system, Siemens offers the perfect basis to reliably fulfill all of these requirements.

Well-conceived down to the finest detail: modular machine concepts

SIMOTION and PROFINET create the prerequisites for modular and scalable machine concepts that simultaneously allow the implementation of high-speed control loops.

For instance, these are absolutely necessary for hydraulic applications in metal-forming machines. The design of modular machines is based on standard hardware and software components. The modules can be easily handled, simply adapted to specific requirements and separately tested. Finally, they can be easily interlinked with one another to create individual machine versions.

This innovative approach has already proven itself in numerous industries such as in the printing-machine industry. This approach allows a flexible and quick response to changing market and customer requirements. Deterministic real time and short cycle times ensure optimized machine cycles – and in turn, constant high product quality and productivity. Not only this, the integrated, seamless networking using just one single bus system reduces the operating costs. Redundant concepts secure a high machine and plant availability.

Preconfigured solutions: ready-to-apply and ready-to-run

Automation systems must be designed so that customer-specific functions can be quickly implemented at a favorable price. The Converting Toolbox – for instance, for winders, flying saws and rotating knives – is an example of standard software applications. Siemens offers preconfigured solutions for central technological machine functions:

Ready-to-apply – packages with standardized software for similar motion tasks that are repeatedly required. For instance, in the plastic, textile and metal-forming industries.

Ready-to-run – i. e. complete packages that are ready to be powered up including all of the required hardware and software.

Examples from the packaging industry:

- Automation package for tubular bagging machines – SIMOTION Baggers and Wrappers
- Standard applications for product infeed – SIMOTION Intelligent Infeed
- Standard applications for handling tasks – SIMOTION Top Loading

Faster to the individual packaging line: Optimized Packaging Line

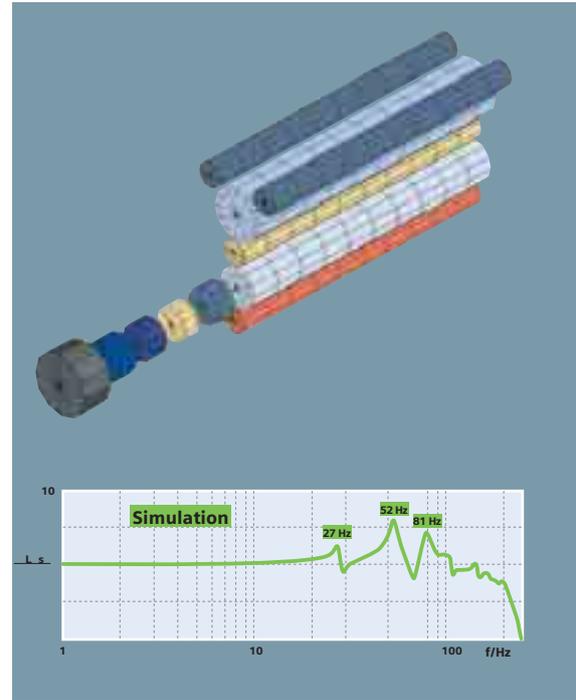
Optimized Packaging Line is a standard automation architecture that is optimally tailored to the specific requirements of the packaging industry. It precisely addresses the issues that are relevant in this industry: Lower life cycle costs, increase productivity and achieve shorter time to market.

These types of solutions are based on international standards such as OMAC and PROFINET. Engineering costs are significantly reduced – e.g. for line integration, as well as risks in the ramp-up phase. The standardization of components also provides advantages when it comes to service and support as in this case spare parts stocking as well as special know-how can be minimized.

Comprehensive information ...

... on our skill sets in the various sectors within the framework of SIMOTION is available under www.siemens.com/simotion-branches

Our support services – the team at your side



Our support team is there to support you in every area so that the automation of your machine runs as efficiently and smoothly as possible.

Competent application support for your sector

The Siemens portfolio encompasses the complete automation environment – from drive technology through machine control systems, including software systems.

Our specialists know and understand the various industry sector requirements from a large number of successful projects. They apply this experience to develop innovative ideas and user-specific machine concepts hand in hand with the machinery OEMs. Our specialists and application support personnel accompany your projects, on-site, from the initial planning through commissioning – from the original idea up to the operational machine. In turn, they are supported from a series of Application Centers in Germany, Italy, the US and China.

Application support includes the following range of services:

- Selecting the optimum solution packages from our product portfolio
- Developing and providing customer-specific add-ons
- Providing support during testing and commissioning

Mechatronic support – for a harmonized system

Mechatronic machine concepts are based on mechanical elements, electric drive systems and motion control software. The more perfect these three components are harmonized with one another, the higher the efficiency of the complete system. We have many years of experience in these three areas and we can support you with the ability to simulate your entire machine. With our mechatronic support, we can optimize the precision and productivity of your machines – both for existing as well as new machines. Machine concepts can first be compared, changed and optimized – also with new mechatronic components. The results obtained are secured and proven through simulation as this precisely emulates the real machine.

Service from Siemens – something you can depend on

Siemens offers dependable service worldwide. From the hotline to personal service 24 hours a day. Customers receive precisely the help and support that they require. This support ranges from quick information on a simple problem up to having a qualified technician on-site for competent service.

Finite Element Methods
and Simulation

An overview of data, functions, features

SCOUT engineering system	
Workbench concept	All of the tools have been integrated, uniform look & feel, predominantly graphics-based tools, wizards, consistency checks, central data management
Programming PLC, motion control and technological functions	All using the same languages, even in the same program
Programming languages	IEC 61131 languages: Structured Text, ladder diagram and function block diagram as well as Motion Control Chart and Drive Control Chart. Motion control functions for all languages as system functions as well as certified PLCopen blocks are available.
Variables	Elementary data types (bit, time, string, numerical data type) as well as user-defined data types (arrays, structures, enumerations, etc.)
Cam configuration	Table or polynomial in accordance with VDI 2134 to 5th Order graphic cam editor (optionally, using CamTool) import/export (e.g. Excel)
Know-how protection for user blocks	Possible, with password
Libraries	System and user libraries
Downloading the application	Via PROFINET, PROFIBUS or Industrial Ethernet (all platforms) or using a card reader, directly to a memory card (D4xx, C2xx), hard disk (P350)
Commissioning the drive	Integrated in SCOUT
Commissioning the axis	Axis wizards for simple parameterization, axis control panel, automatic controller setting, trace (oscilloscope function), measuring functions, etc.
Program test and diagnostics	System states, program status, variable status and control, cross-reference list, trace (drive variables, PLC variables), graphical program tracking in MCC, break points in ST

SIMOTION runtime system	
Output cams	High-precision individual output cams and cam tracks, switching cams, distance-distance cams, distance-time cams with max. switch-on length, dynamic cams, counting cams
Axes	Virtual axes, speed axis, positioning axis, synchronous axis, path axis, cam axis, electric and hydraulic drives, stepping drives, pressure control/pressure monitoring
Measuring inputs (probe)	High-precision measuring probe – e.g. for print-mark control, flying measurement, etc.
Cams	Cams can be scaled, offset and changed over during the runtime; cams can be calculated and changed from the user program, number and size only depend on the available system resources
Interpolation	Linear, circular and polynomial interpolation in 2-D and 3-D, including transformations for various handling kinematics

SIMOTION hardware platforms			
	SIMOTION C	SIMOTION P	SIMOTION D
Memory medium for user data	Micro Memory Card	Hard disk	Compact Flash Card
Retain data (Kbyte)	12 (C230-2)/100 (C240)	15 with UPS: 256	D410: 7; D4x5: 320
Minimum clock cycle time for a user task (ms)	1.5 (C230-2) 1 (C240)	1 0.25 with PROFINET	2 (D410/D425); 1 (D435); 0.5 (D445)
Number of axes, maximum per controller	32	64	1 (D410); 16 (D425); 32 (D435); 64 (D445)
– integrated drive control	–	–	1 (D410); 1...6 (D4x5)
Onboard inputs/outputs	18 DI, 8 DO	–	4 DI, 4 DI/DO (D410) 8 DI, 8 DI/DO (D4x5)
Additional inputs/outputs	Central or distributed via PROFIBUS	Via PROFIBUS and PROFINET	Via PROFIBUS, PROFINET and DRIVE-CLiQ
Drive interface, digital	2 x PROFIBUS DP with PROFIdrive	2 x PROFIBUS DP with PROFIdrive and PROFINET (option)	DRIVE-CLiQ, D410 DP: 1 x PROFIBUS DP D410 PN: 2 Ports PROFINET D4x5: 2 x PROFIBUS DP (PROFINET optional) each with PROFIdrive
Drive interface, analog*)	Integrated for four drives (analog or step), addition- al drives via interface on PROFIBUS	Via interface on PROFIBUS only (ADI 4 a. IM 174)	Via interface on PROFIBUS only (ADI 4 a. IM 174)
Other interfaces	Industrial Ethernet	Industrial Ethernet, other PC interfaces	Industrial Ethernet (D4x5)
PROFINET	–	with MCI-PN	D410 PN: onboard D4x5: with CBE30
Remote diagnostics/teleservice	Via teleservice adapter, Industrial Ethernet or IT Diag	Via teleservice adapter, Industrial Ethernet or IT Diag	Via teleservice adapter, Industrial Ethernet or IT Diag

*) Hydraulic drives also via ET 200 I/O; stepping drives also via IM 174

Components that can be used together with SIMOTION

Drives

Via PROFIBUS DP with PROFIdrive

Siemens drives

SINAMICS S120
SIMODRIVE: 611 universal, POSMO A/CA/CD/SI
MASTERDRIVES: Motion control, Vector control
MICROMASTER, COMBIMASTER

Third-party drives

Standard drives with PROFIBUS DP

Via PROFINET

SINAMICS S120

Via analog port

All drives

HMI systems

SIMATIC OP/TP 277, MP 277, MP 377
SIMATIC OP/TP 177B, MP 177B, MP 277
SIMATIC Panel PC 477/577/677/877
PCs with visualization software ProTool/Pro or WinCC flexible
PCs with any visualization software and OPC

I/O

SIMATIC ET 200M, ET 200S, ET 200eco, ET 200pro
All certified standard slaves (DP-VO, DP-V1, DP-V2)

Siemens AG
Industry Sector
Motion Control Systems
P.O. Box 31 80
91050 ERLANGEN
DEUTSCHLAND

www.siemens.com/simotion

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