

Flexible and high performance

The SINAMICS S120 drive system






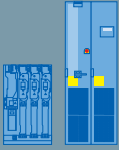
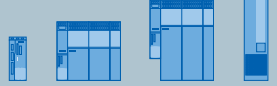
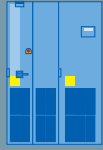
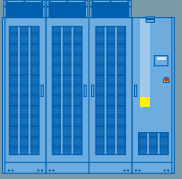
SINAMICS drives

Answers for industry.

SIEMENS

SINAMICS – the optimum drive for every task

The drive family for drive solutions that are fit for the future

Low voltage						Medium voltage
For basic applications	For demanding applications			For sophisticated applications		For applications with high power ratings
						
SINAMICS G110	SINAMICS G120	SINAMICS G120D	SINAMICS G130/G150	SINAMICS S120	SINAMICS S150	SINAMICS GM150/SM150/GL150
V/f control	V/f control, vector control			V/f control, vector control, servo control		V/f control, vector control
0.12–3 kW	0.37–90 kW	0.75–7.5 kW	75–1,500 kW	0.12–4,500 kW	75–1,200 kW	0.8–120 MW
Pumps, fans, conveyor belts	Pumps, fans, conveyor belts, compressors, mixers, crushers, extruders			Production machines – e.g. packaging, textile and printing machines, paper machines, plastics machines, machine tools, plants and process lines		Test stands, crosscutters, centrifuges
Common standard engineering tools						
SIZER – for simple planning and engineering				STARTER – for fast commissioning, optimization and diagnostics		

The SINAMICS family offers the optimum drive for each and every drive application – and all of the drives can be engineered, parameterized, commissioned and operated in a standard way.

SINAMICS – can tackle any drive application







- Wide range of power ratings from 0.12 kW to 120 MW
- Available in low-voltage and medium-voltage versions
- Standard functionality using a common hardware and software platform
- Standard engineering using just two tools for all drives: SIZER for engineering and STARTER for parameterization and commissioning
- High degree of flexibility and combinability

The SINAMICS S120 drive system

The best perspectives for a productive future

SINAMICS S120 – versions

Modular drive system for sophisticated single-/multi-axis applications

AC/AC drive units for single-axis applications		DC/AC drive units for multi-axis application			
Blocksize	Chassis	Booksize Compact	Booksize	Chassis	Cabinet Modules
					

High degree of flexibility for successful machine concepts

As a member of the new SINAMICS drive family, the SINAMICS S120® drive is part of the modular drive system for high-performance applications in machinery and plant construction. SINAMICS S120 offers high-performance single- and multi-axis drives for an extremely wide range of industrial applications.

Through its scalability and flexibility, SINAMICS S120 perfectly fulfills the growing requirements relating to the number of axes and performance. SINAMICS S120 allows flexible machine concepts to be created, which can be used to quickly implement specific customer requirements.

The response to increasing demands

Today, machines must be able to be manufactured more cost-effectively and at the same time they should offer operating companies increasingly higher levels

of productivity. The SINAMICS S120 drive concept fulfills both of these tasks! Engineering times are shortened due to the fact that it can be engineered in a user-friendly fashion. Its high dynamic performance and accuracy permits higher cyclic machine rates for a maximum degree of productivity. Not only this, its simple handling and maintenance increases the degree of availability and reduces the life cycle costs. When considering everything: SINAMICS S120 increases the competitiveness of both machine manufacturers and operating companies.

Modularity for machine construction

SINAMICS S120 allows power and control performance to be freely combined. Multi-axis drive solutions with higher-level motion control can be implemented using the modular SINAMICS S120 drive system just the same as solutions involving single-motor drives. This means that the machines can be designed to be fully modular therefore addressing the growing number of different versions. Where modules or individual components

are to be combined or innovated, SINAMICS S120 guarantees the perfect compatibility between all of the system components without requiring any major engineering costs.

Applications in machine and plant construction

SINAMICS S120 means increased machine performance in many sectors – whether continuous material webs or cyclic and high-dynamic processes, for instance in:

- Packaging machines
- Plastics machines
- Textile machines
- Printing machines
- Paper machines
- Handling and assembly systems
- Machine tools
- Rolling mills
- Test stands

SINAMICS S120 for high-performance single- and multi-axis applications

The modular system for high-performance applications

The innovative SINAMICS S120 hardware and software concept tackles sophisticated drive tasks in industrial applications with a power range extending from 0.12 through to 4,500 kW:

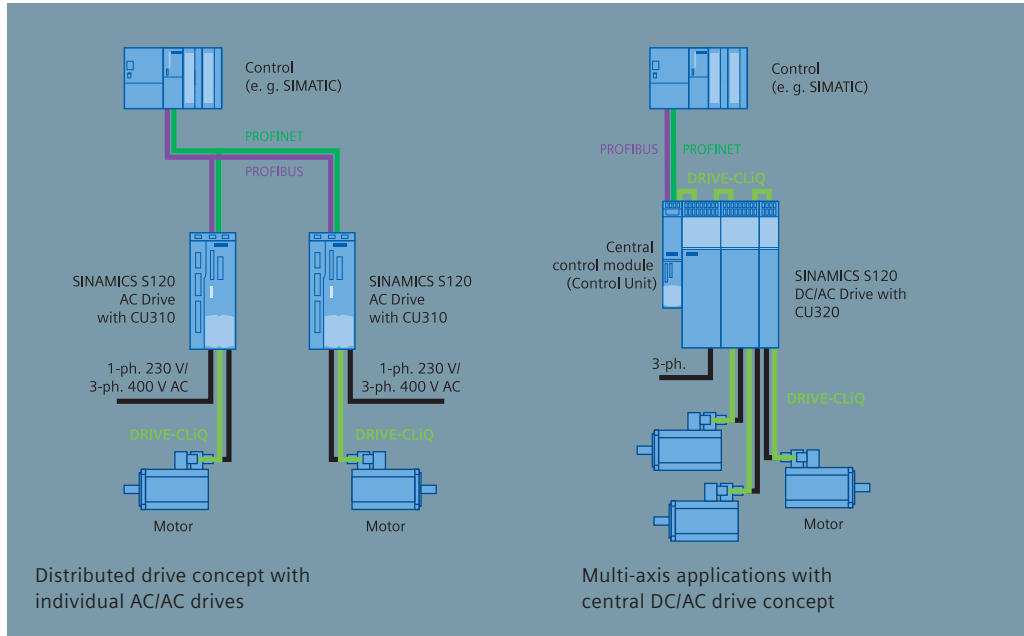
SINAMICS S120 offers high-performance individual AC/AC drives in the Blocksize and Chassis formats as well as coordinated DC/AC drives for multi-axis applications in the Booksize Compact and Chassis formats and Cabinet Modules.

Increased flexibility with central control intelligence

For SINAMICS S120, the drive intelligence is combined together with the control functions in Control Units (CU), which handle both vector and servo control as well as V/f control. For all drive axes, they also handle the speed and torque control as well as additional intelligent drive functions.

Performance can be freely selected for vector and servo controls

SINAMICS S120 vector control is recommended for drive solutions involving continuous material webs – for instance, wire drawing, foil making and paper machines – as well as for hoisting gear, centrifuges and marine drives with harmonious, rotary motion. Servo control with SINAMICS S120 is used for cyclic processes with precise and fast closed-loop position control using servomotors. For instance, this includes applications in the packaging and printing industries as well as machine tools.



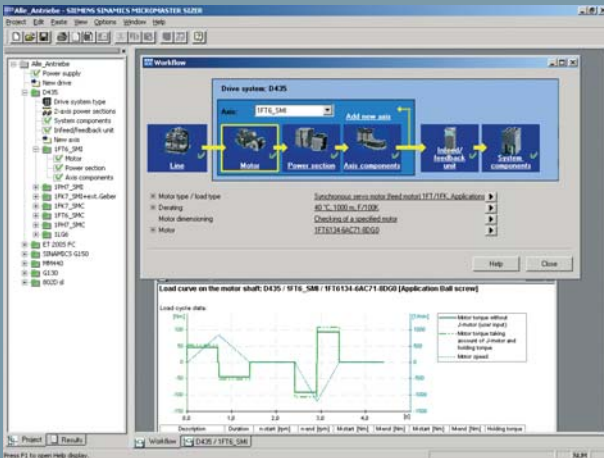
SINAMICS S120 Range of power ratings

- AC/AC single-axis and DC/AC multi-axis drive units
- Power range: 0.12–4,500 kW
- Line supply voltages 230 V, 380–480 V and 660–690 V (50/60 Hz)
- Servo, vector control, V/f control
- Induction and synchronous motors (incl. torque and linear motors)

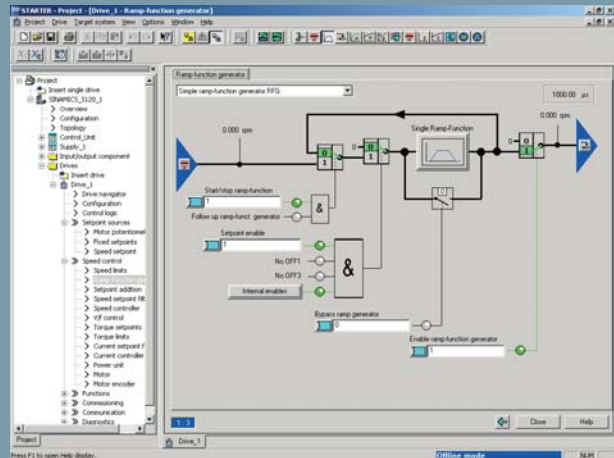
SINAMICS S120 – functions for increased efficiency

- Basis functions: Speed and torque control, positioning functions
- Intelligent starting functions for automatic restart after a power interruption
- BICO technology with interconnection to drive-related I/Os
- Graphic configuring with free blocks using DCC to adapt the drive system in a user-friendly fashion to the machine environment
- Integrated safety functions to cost-effectively implement safety concepts
- Controlled infeed / regenerative feedback to avoid undesirable harmonics fed back into the line supply, regenerative feedback when braking and for an increased degree of ruggedness with respect to line supply fluctuations

Extremely simple engineering and commissioning



SIZER tool



STARTER tool

Cost-effective with system-based flexibility

The SINAMICS family of drives – that represents a completely new design – addresses the potential to reduce costs – from single-motor drives and drive converters with low power ratings through servo and vector drives up to drives in the highest power range. SINAMICS covers the complete range of power ratings with a unique, unified philosophy and operator navigation! This means simple entry into the system. And once know-how has been established, it can be directly transferred to other applications – for instance, using the tools for engineering, configuring and commissioning, which are applicable across the complete range of SINAMICS drives.

The optimum configuration is quickly and reliably found: SIZER engineering tool

With SINAMICS, a drive system is engineered as quickly and reliably as never before. This is because the SIZER engineering tool includes all of the components that

can be used when designing a drive system and permits users to engineer drives simply and in a focused fashion. SIZER is easy to get to know and can be intuitively handled thanks to its graphic interface and integrated Wizard.

Speeds up commissioning: STARTER tool

STARTER is the standard commissioning tool for all drives in the SINAMICS family. The commissioning engineer can even transparently configure and optimize complex systems in a short time. STARTER is available in three installation variants: As stand-alone version, integrated in Drive ES for applications with SIMATIC or integrated in SCOUT for applications with SIMOTION.

Fast and automatic: electronic rating plate

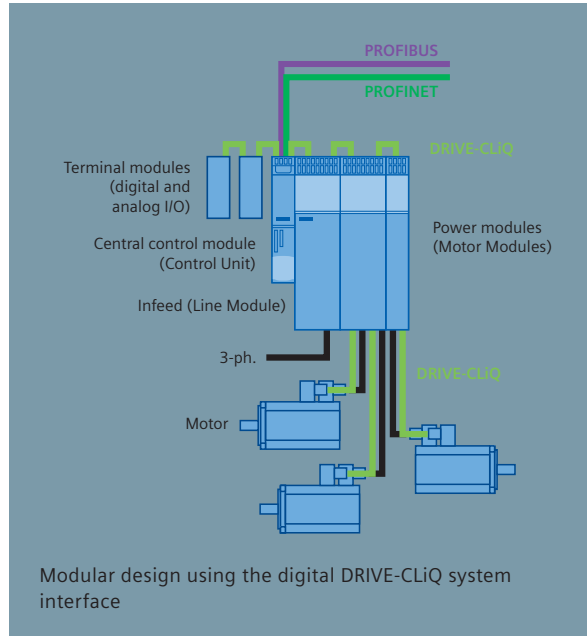
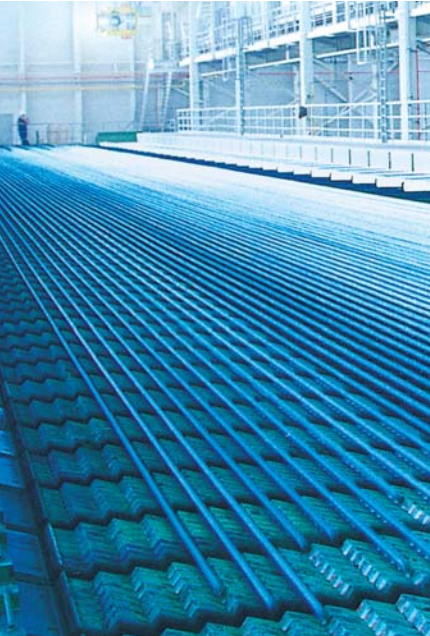
The electronic rating plates used in every component are an important component when it comes to digitally interlinking the SINAMICS S120 drive system. These electronic rating plates allow all of the drive components to be automatically identified

through the DRIVE-CLiQ connection. This means that data does not have to be manually entered while commissioning the system, or when replacing components – commissioning becomes even more reliable! For instance, parameters of the electrical equivalent circuit diagram and the characteristic values of the integrated motor encoder are saved in the electronic motor rating plates. Information such as ordering and identification numbers are also saved.

Made easy: engineering and handling

- All of the drive components can be simply interconnected using prefabricated DRIVE-CLiQ cables
- The drive configuration is automatically parameterized using the electronic rating plates
- Drives are quickly and reliably engineered using the SIZER engineering tool
- Drives are commissioned in a user-friendly fashion using the STARTER commissioning tool

SINAMICS S120 – DC/AC Drives for multi-axis applications



Booksize Compact drive units from 0.9 to 10.7 kW

SINAMICS S120 DC/AC drive units for multi-axis applications

The modular drive configuration for multi-axis applications consists of:

- One Control Unit with the complete drive intelligence (including interface to the higher-level controls or HMI devices)
- One Line Module for the central power infeed
- One or several Motor Modules to control the power
- Simple, straightforward cabling using DRIVE-CLiQ
- Optional Terminal Modules to connect encoders and drive-related I/Os
- All interfaces communicate through pre-fabricated cables
- Drive components are detected using electronic rating plates
- Motor Modules and Line Modules are available in the Booksize Compact, Booksize and Chassis formats

Flexibility and scalability through modular design

DC/AC drive units distinguish themselves due to their modular design. All of the drive intelligence is provided in the Control Units (CU), which handle all of the control functions in the drive group. Further, they execute all additional drive functions – e.g. logically interlocking drive-related I/Os, positioning functions, etc. – and have either PROFIBUS DP or PROFINET as central interface to couple to higher-level automation systems. SIMOTION D or SINUMERIK 840D sl can be used as special Control Units for motion control and NC applications.

Line Modules centrally feed the energy into the DC link. Line Modules with regulated infeed/regenerative feedback can optionally ensure a constant DC link voltage and a high degree of compatibility with the line supply.

Motor Modules supply motors with power from the DC link. **Double-axis modules allow an especially compact design to be achieved.** Drive-related inputs/ outputs can be expanded in a scalable fashion using Terminal Modules.

An especially compact design allows drive systems to be packaged in the Booksize Compact format. Further, double-axis modules also allow the mounting width of Booksize Compact and Booksize drive units to be further reduced.



Booksize units from 1.6 to 107 kW



Chassis units from 75 to 1,200 kW



Control unit CU320

Flexible cooling types

SINAMICS S120 Chassis drive units are available both in air-cooled as well as liquid-cooled versions. The liquid-cooled version is ideal for dusty, salt-laden or aggressive ambient air and represents a cost-saving alternative with low operating costs. It allows hermetically sealed cabinet solutions to be implemented with a footprint that is up to 60% smaller. The Booksize units are either available with internal/external air cooling or with liquid cooling. Drive units with coldplate cooling allow heat to be dissipated through the rear of the units to the mounting surface.

Digital DRIVE-CLiQ interface: For lower wiring costs

Seamless component communications are a prerequisite for a modular, state-of-the-art drive system architecture. As the standard digital interface between all of the SINAMICS S120 drive components, the simple, plug-in DRIVE-CLiQ cable reduces the time required.

The DRIVE-CLiQ system interface:

- Connects all components – including motors and encoders
- Is used to connect drive-related I/Os and the encoder systems integrated in the motor
- Is supplied from a 24V power supply that is integrated in the encoder cable
- Reduces the variety of parts, storage costs and commissioning time and costs as a result of the standard cable and connector systems used

All of the different versions can be freely combined

The different SINAMICS S120 versions can be combined as required through the DRIVE-CLiQ interface. For instance, Line Modules in the Chassis format can be combined with Motor Modules in the Booksize format to address multi-axis applications with a high total power rating.

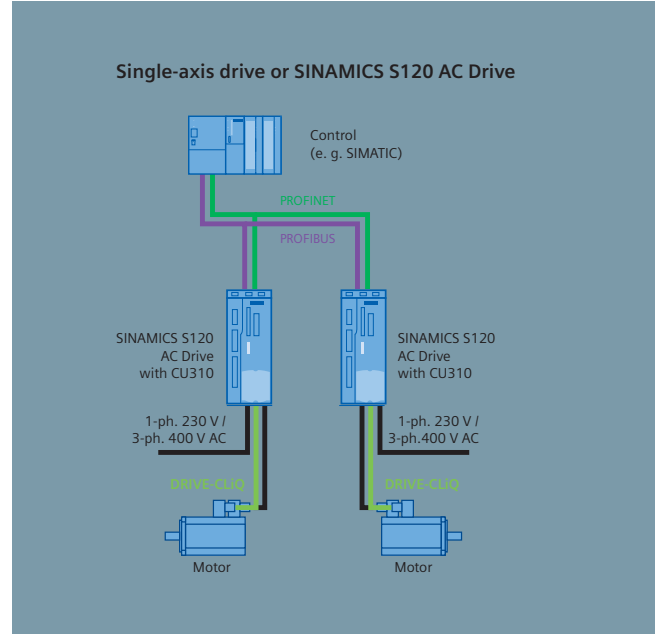
SINAMICS S120 – AC Drives for single-axis applications



Blocksize drive units from 0.25 to 90 kW



Chassis unit from 110 to 250 kW



AC Drives for single-axis applications

- An autonomous single-axis SINAMICS S120 AC Drive comprises a Control Unit and Power Module
- Alternatively, a Power Module can be integrated into a multi-axis group via CU adapter
- Power Modules are available in the Blocksize and Chassis formats

Typical applications

Single-axis drives are suitable for applications in all sectors, such as e.g. for travel drives, centrifuges, elevators and extruders as well as for mixers and kneaders.

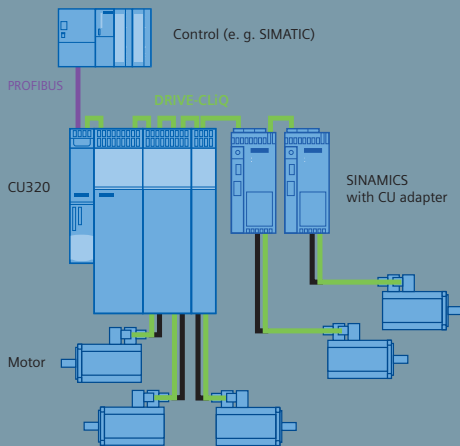
Single-axis SINAMICS S120 AC Drives are also the ideal solution for multi-axis applications where the drive axes are located remotely from one another. The same applies to modular machine concepts that are being increasingly implemented in the packaging and woodworking industries.

For a single-axis drive, the line supply infeed and the power supply of the motor are combined in one device – the so-called Power Module. For single-axis applications, a special Control Unit (e.g. CU310) mounted on the Power Module handles the drive control; for multi-axis

applications a Control Unit is used (e.g. CU320) coupled through DRIVE-CLiQ. In the latter case, instead of the Control Unit, a CU Adapter is mounted on the Power Module.

For instance, SINAMICS S120 AC Drives decentrally coupled to a higher-level control via PROFIBUS DP or PROFINET can reliably handle e.g. positioning tasks in automated assembly machines and handling systems.

SINAMICS S120 composite group with DRIVE-CLiQ adapter



Control Unit
CU310



Control Unit
SIMOTION D410



CU Adapter
CUA31



CU Adapter
CUA32

Central control intelligence with interface to the control: Control Unit CU310

The AC Drives have a CU310 Control Unit to couple them to the higher-level control. They offer a functional scope extending from a basic speed controller up to extensive positioning functions.

Either a CU310 DP with PROFIBUS DP port or CU310 PN with integrated PROFINET port can be selected. Drive-related inputs/outputs can be simply connected to the CU using BICO technology. This permits the highest possible decoupling between the drive and the higher-level control.

Also for the AC drives, when necessary, an additional encoder and drive-related I/Os can be connected through DRIVE-CLiQ.

Motion control integrated in the drive: SIMOTION D410 Control Unit

The SIMOTION D410 Control Unit is the ideal solution if, going beyond the pure control intelligence, motion control is required for an axis and PLC functionality in a compact package. SIMOTION D410 can be used for single-axis applications – such as winders, crosscutters or feed equipment – but also in synchronous groups for modular machine concepts. In this case, the machine module, automated using SIMOTION D410, receives the leading value from a higher-level control and synchronizes its axis to this leading value.

Either the D410 DP with PROFIBUS DP connection or D410 PN with integrated PROFINET port can be used.

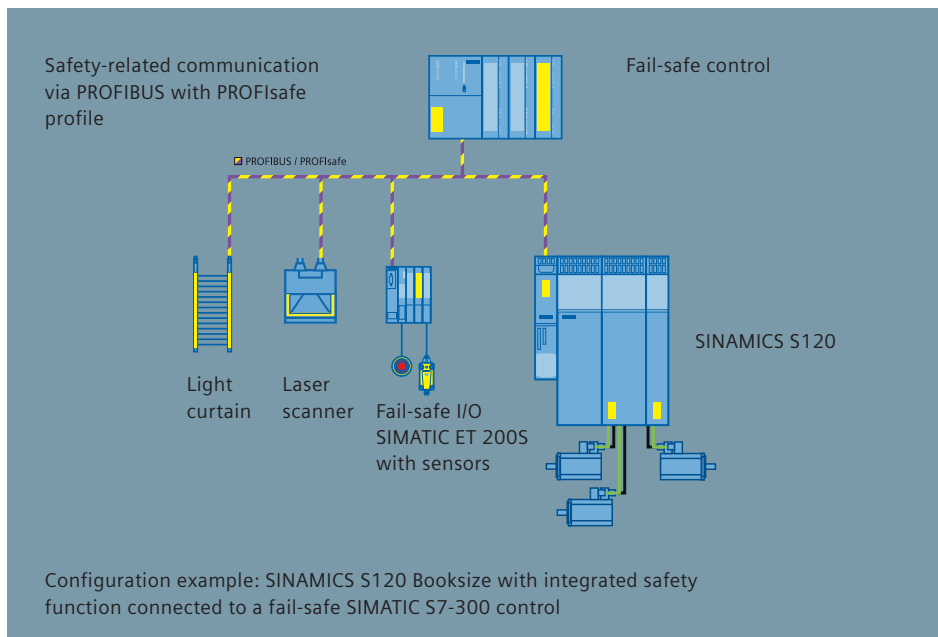
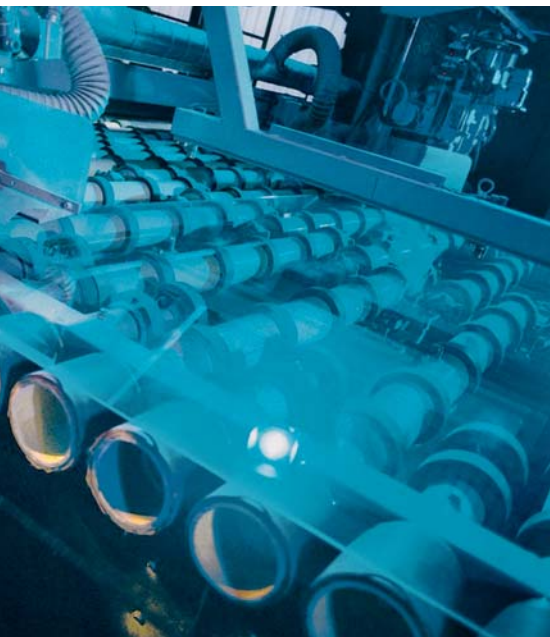
Up to four fast cam outputs or three measuring probe inputs can be implemented using the onboard inputs/outputs.

CUA31/32 Control Unit Adapter for multi-axis applications with SINAMICS S120 AC Drive

The drive is coupled to e.g. a CU320 multi-axis Control Unit through the CU Adapter CUA31 via a DRIVE-CLiQ interface. In this collection, SINAMICS S120 AC Drives can also be used together with SINAMICS S120 multi-axis drive units. This collection provides the highest degree of flexibility when using SINAMICS S120 Drives.

When compared to the CUA31, the CUA32 additionally has an HTL/TTL encoder interface to connect up an external encoder.

For even more safety – integrated functions for SINAMICS S120



Lower costs and higher availability

The safety functions integrated in SINAMICS S120 offer users clear advantages: As a result of their integration, they reduce the amount of space required and lower the wiring costs. The degree of availability increases through optimized process sequences and simple machine structures as well as machine operator concepts in line with those required in practice. SINAMICS safety solutions are certified according to EN 954-1 Cat. 3, IEC 61508 SIL2, as well as ISO 13849-1, PL d.

Safety Integrated functions to simply implement safety concepts

SINAMICS S120 drive systems have extensive safety functions. They allow innovative safety concepts to be simply realized in conformance with the appropriate standards. "Safe Torque Off", "Safe Stop 1"

and "Safe Brake Control" are included onboard as basic safety functions. When selected, e.g. in a dangerous situation, all three functions disconnect the energy feed to the motor in a safety-relevant fashion.

The extended safety functions

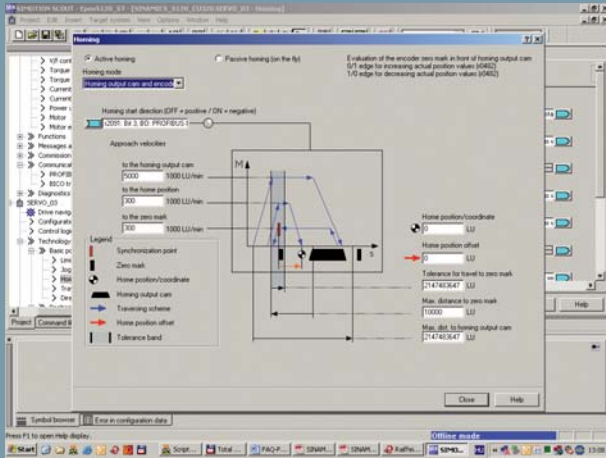
"Safe Operating Stop", "Safe Stop 2", "Safety-Limited Speed" and "Safe Speed Monitor" permit the drive to be reliably monitored in operation or when exceptional situations temporarily occur – such as when equipping machines or when service work is being carried out. The closed-loop position control normally remains active. As a consequence, the drive axis can immediately resume normal operation once the exceptional situation no longer exists. Service and maintenance work can be performed safely in a user-friendly fashion – which significantly reduces

machine and plant downtimes. The safety functions are either controlled via safety input terminals at the TM54F Terminal Module – or when the drive is integrated into a complete automation environment – via PROFIBUS with PROFI-safe.

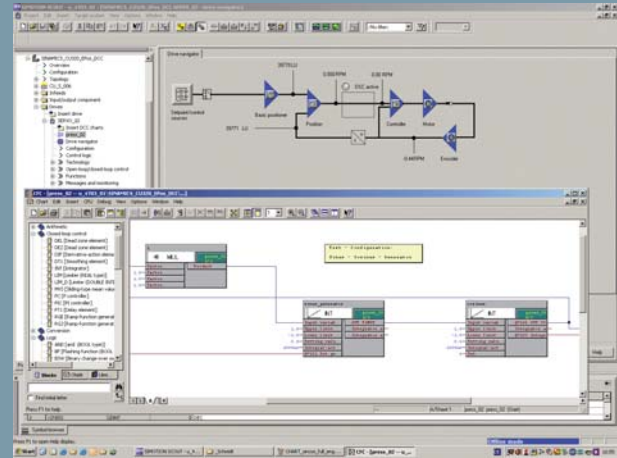
Integrated intelligence

SINAMICS S120 can do even more – beyond just classic drive control – as they also have:

- EPos – integrated functions for positioning tasks
- Safety Integrated – integrated safety functions to simply implement safety concepts
- Drive Control Chart (DCC) – freely programmable, drive-related open and closed-loop control and arithmetic functions



Parameterizing mask for EPos



Graphic configuring with DCC

EPos – positioning functions integrated in the drive

With the integrated EPos positioning functions, for many positioning applications, an additional, higher-level positioning control is just not required. And not only this, but this integrated functionality is also extremely flexible: Its functions for high-dynamic servo controls just the same as for more basic applications with vector-controlled induction motors. Up to 64 absolute target positions or traversing distances as well as the traversing velocities can be permanently saved in the drive when it is being commissioned. Beyond this, it is also possible to transfer these parameters as required from a higher-level PLC. It is even possible to change target positions and velocities on-the-fly while the drive is actually positioning.

Commissioning is simple and transparent thanks to the pre-configured parameterizing forms in the SINAMICS STARTER commissioning tool.

DCC – Drive Control Charts: To optimally adapt to the drive task

Using Drive Control Charts, the SINAMICS S120 drive system can do more than just handle the classic drive control. Drive Control Charts (DCC) also permit drive-related open-loop and closed-loop control tasks to be shifted into the drive. This means that the drive system can be flexibly and optimally adapted to a whole raft of drive and automation scenarios.

DCC – an overview of the advantages

- Higher-level controls are relieved, machine sequences can be simply implemented at lower costs and local processing in the drive increases the overall machine performance. As a whole, the implementation of modular machine concepts is further simplified.
- To define the open-loop and closed-loop control functions, a user-friendly DCC Editor is used to select blocks from a predefined library. These are then graphically interconnected with one another by dragging and dropping them. The program behavior can be verified using test and diagnostic functions – or in the case of an error, the cause can be identified.
- User-friendly graphic programming with DCC Editor