What is your **drive? Lead** instead of follow? SINAMICS S120: the high-performance drive system.

sinamics S120







What is your **drive?** Full speed instead of idling?

SINAMICS

SINAMICS is the new drive family from Siemens for innovative drive solutions that are fit-for-the-future:

- Wide range of power ratings from 0.12 kW - 28 MW (0.16 - 38000 HP)
- Both in low-voltage as well as in medium-voltage versions
- Uniform, integrated functionality due to the common hardware and software platform
- One common engineering system for all drives using just two tools: SIZER for engineering and STARTER for parameterization and commissioning
- High degree of flexibility and the ability to be freely combined

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 the same way with the same look & feel.

SINAMICS – the new drive family



The best perspectives for a productive future: the SINAMICS S120 drive system.

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 availability and reduces the lifecycle costs. When considering everything: SINAMICS S120 increases the competitiveness of both machine manufacturers and operating companies.

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:

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

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, all without any major engineering costs.

SINAMICS S120 – versions



AC/AC drive units for single-axis applications

DC/AC drive units for multi-axis applications

SINAMICS S120 for high-performance single and multi-axis applications: **The response to many questions.**

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 0.25 through to 4500 kW (0.34 – 6000 HP):

SINAMICS S120 offers high-performance single AC/AC drives in the following versions:

- Blocksize
- Chassis

as well as coordinated DC/AC drives for multi-axis applications in the following versions:

- Booksize
- Chassis
- Cabinet Modules

SINAMICS S120

- AC/AC single-axis and DC/AC multi-axis drive units
- Power range: 0.12 4500 kW (0.16 6000 HP)
- 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

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** where drive-related I/Os are interconnected to adapt the drive system to the machine environment in a user-friendly fashion
- 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

Increased flexibility with central control intelligence

For SINAMICS S120, the drive intelligence is combined together with the control functions in Control Units (CU), which handles 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 at the same time position control with a high dynamic response using servomotors. For instance, in textile, packaging, printing and machine tools.

Distributed drive concept with individual AC/AC drives

Multi-axis applications with central DC/AC drive concept



Faster to the machine: Extremely simple engineering and commissioning.

Cost effective with system-based flexibility

The increasing complexity of automation tasks is demanding drives that can be simply integrated into automation solutions with low associated engineering costs. The SINAMICS family of drives 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 and experience has been gained, this can be directly transferred to other applications. For instance, using the tools for engineering, configuring and commissioning that 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 so quickly and reliably as never before. The reason for this is that the SIZER engineering tool includes all of the components that can be used to create a drive system. Not only this, it allows users to design the widest range of drive systems simply and in a focused fashion – no matter whether it involves basic single-motor drives or complex multi-axis applications.

SIZER is easy to learn as the tool can be intuitively used through the graphical user interface. Once you have learned how to use SIZER, you can use it to quickly engineer each and every SINAMICS drive system. SIZER allows manufacturing costs to be reduced as a result of accelerated engineering.

Speeds-up commissioning: STARTER tool

SINAMICS drive systems are also quickly commissioned: Using STARTER – the standard commissioning tool for all of the drives in the SINAMICS family. The technician can even configure complex systems in an extremely short period of time without any special system knowhow; drives can be easily optimized at any time. START-ER is available in three versions: 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 requirement 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 included.



Made easy: engineering and handling

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



STARTER tool

SINAMICS S120 DC/AC drive units: **perfect for multi-axis applications.**

Flexibility and scalability through modular design

DC/AC drive units distinguish themselves due to their modular design. The complete 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 PROFI-BUS DP or PROFINET as central interface to couple to higherlevel automation systems. SIMOTION D or SINUMERIK 840D sl as special control units can be used for motion control and NC applications.

Line Modules feed the energy centrally 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.

Flexible cooling: Booksize drive units

While chassis drive units have an integrated cooling fan, Booksize units are available either 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. Double-axis modules in the Booksize version are especially suitable for achieving compact drive arrangements.



Modular design using the digital DRIVE-CLiQ system interface



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
- All interfaces communicate through pre-fabricated cables
- Drive components are detected using electronic rating plates

Digital DRIVE-CLiQ interface: 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 serial interface connects all of the components including motors and encoders
- Drive-related I/Os and encoder systems integrated in the motor are connected
- A 24 V power supply is integrated in the encoder cable, standard cable and connector systems
- Standard cable and connector systems reduce the variety of parts, inventory costs and commissioning costs

All sizes and types can be freely combined

Through the DRIVE-CLiQ interface, the various SINAMICS S120 versions can be combined as required. For instance, Line Modules in the chassis version with Motor Modules in the Booksize version for multi-axis applications with a high total power.



All of the sizes and types can be mixed, e.g. Booksize and Chassis units







Chassis units from 75 - 1200 kW (100 - 1600 HP)

SINAMICS S120 AC Drives: the solution for single-axis applications.

For SINAMICS S120 AC Drives, the infeed and motor power supplies are combined in just one unit - the socalled Power Module. For single-axis applications, a special Control Unit (CU 310) mounted on the power module handles the drive control. For multi-axis application this is handled using a Control Unit (e.g. CU 320), coupled through DRIVE-CLiQ. In this case, instead of the Control Unit, a CU adapter is mounted on the Power Modules. SINAMICS S120 AC drives are suitable for single-axis applications in all industry sectors - for instance, traversing drives, centrifuges, elevators and extruders as well as mixers and kneaders. For applications, where the drive axes are separated from one another over a considerable distance. SINAMICS S120 AC Drives are the ideal solution. The same is true for modular machine concepts, which are being increasingly implemented in the packaging and woodworking industries.

SINAMICS S120 AC Drives, coupled to a higher-level control in a distributed topology through PROFIBUS DP or PROFINET can be used, for example, for positioning tasks in automatic assembly equipment and handling systems.



SINAMICS S120 AC Drive



SINAMICS S120 AC Drives

- The SINAMICS S120 AC Drive comprises a Control Unit and a Power Module
- For individual applications with a dedicated Control Unit
- To extend multi-axis groups using a CU adapter

C



Connection to the control: CU 310 Control Unit AC Drives have a CU 310 control unit to link them to the higher-level control. They offer a functional scope extending from a basic speed controller through extensive positioning functions. Either CU 310 DP with a PROFIBUS DP connection or CU 310 PN with an integrated Profinet port can be selected. Drive-related inputs/outputs can be simply connected to the CU using BiCo technology. This means that there is the highest possible decoupling between the drive and the higher-level control.

Drive-related I/Os and encoder are connected simply through the DRIVE-CLiQ interface. Safety concepts can be simply implemented using integrated safety functions such as "safe standstill STO" and "safe brake control SBC".

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

The drive is coupled to a CU 320 Control Unit via the CUA31 CU adapter and DRIVE-CLiQ interface. The CU 320 then handles the drive functions for the AC Drive. SIMOTION D modules can be used as a Control Unit for motion control applications that go beyond positioning tasks. SINAMICS S120 AC Drives can also be operated together with SINAM-ICS S120 multi-axis drive units. This provides the highest degree of flexibility when using SINAMICS S120 drive units.



Single-axis applications can also be implemented by mixing Booksize and Blocksize modules.



Blocksize drive units from 0.12 - 90 kW (0.16 - 120 HP)

SINAMICS S120 mixed group with DRIVE-CLiQ adapter

Totally Integrated Automation: the unique automation platform.

Totally Integrated Automation[™] from Siemens

With its Totally Integrated Automation (TIA), Siemens is the only supplier that offers a seamless range of products and systems from a single source for all industry sectors. Harmonized to the individual customer requirements, based on Totally Integrated Automation (TIA), efficient industry-sector specific automation solutions can be implemented. Lower lifecycle costs when operating machines and systems and considerably shorter times to market result in significant increases in productivity and a higher investment security.

Straightforward: Totally Integrated Automation with SINAMICS S120

In addition to SIMATIC, SIMOTION and SINUMERIK, SINAMICS also belongs to the core components of TIA. For instance, the STARTER commissioning tool is an integral component of the TIA platform. All of the automation solution components can be parameterized, programmed and commissioned using a unified engineering platform within the same environment. The integrated data management ensures consistent data and simple archiving of the complete plant or machine project.

PROFIBUS: No. 1 in field buses

SINAMICS S120 supports, as standard PROFIBUS DP – the standard field bus of the TIA concept. It ensures powerful and seamless communications between all of the components involved in the automation solution: HMI (operator control and visualization), control, drives and I/O.

PROFINET: for increased performance and open IT communications

SINAMICS S120 is also available with a PROFINET interface. This Ethernet-based bus allows control data to be quickly exchanged and means that SINAMICS S120 drives can even be used in the highest performance multi-axis applications. PROFINET simultaneously transmits, for example, operating and diagnostics data to higher-level systems using standard IT mechanisms (TCP/IP). This means that it can be simply integrated into an IT factory environment.



SINAMICS S120 is a fully integrated component of Totally Integration Automation from Siemens

Totally Integrated Automation with SINAMICS S120

- TIA: unified, industry sector-specific automation solutions
- PROFIBUS and PROFINET are integral components of TIA
- Motion control with SIMOTION
- Numerical control with SINUMERIK



SINAMICS 5120 and SINUMERIK solution line



SINAMICS S120 axis group with SIMOTION D

Total solutions in machinery construction: SINAMICS S120 as the perfect basis.

The drive solution that offers everything.

The broad range of functionality and the different versions mean that SINAMICS S120 represents a universal drive solution for machinery construction. A wide range of motors and control systems optimally tailored to the various applications permit fully integrated solutions – simple to design, user-friendly when it comes to commissioning and straightforward in operation. The coupling to the automation system is established through PROFIBUS DP, PROFINET or CAN Open field buses.

SINAMICS S120 and SIMOTION - the perfect team

Increasingly, complex motion control tasks must be handled in machinery construction and at the same time, they must be able to run even more precisely and faster. This is where the SIMOTION motion control system and the high-performance SINAMICS S120 drive system form a perfect team. SIMOTION D, the version that is physically integrated into the SINAMICS S120 drive, is the ideal solution for machines with very many axes and where high requirements placed on the precision. This distributed automation structure allows the machine to be sub-divided into various axis groups, that are controlled from one SIMOTION motion control system.

Communications between SIMOTION systems is either established via PROFIBUS DP or PROFINET. In this case, there is another important aspect – the compact machine design, which is due to the distributed automation structure and the motion control unit that is directly integrated in the drive.

SINAMICS S120 and SINUMERIK solution line – the innovative solution for machine tools

SINUMERIK solution line and SINAMICS S120 form the ideal system platform for machine tool construction. Thanks to the scalable hardware and software, SINUM-ERIK solution line opens up almost limitless application



opportunities. Whether for basic turning, milling applications, highly complex tasks and high-speed applications, in woodworking and glass processing or when handling transfer lines – SINUMERIK solution line is the perfect solution for the widest range of requirements.

An essential feature is the distributed, simplified system architecture and the expanded diagnostic capabilities down to the component level. SINUMERIK solution line is completely integrated into the SINAMICS communications structure.

SINAMICS S120 range of motors						
Torque motors	Linear motors for innovative machine concepts	Synchronous and induction motors for dynamic applications	Induction, synchronous and reluctance motors for standard applications			
	SIEMENS					

Plant construction with SINAMICS S120: modular and fit for the future.

The perfect solution – quickly and reliably

Using the SINAMICS S120 Cabinet Modules and chassis units, complete drive groups can be interlinked and assembled with one another. This is because it is possible to combine module types with freely selectable power ratings as required. Fast and straightforward, due to the standardized interfaces that are harmonized with one another.

For paper machines, rolling mills, test stands or cranes – that typically require multi-motor applications with high power ratings, both the modular cabinet units as well as also the chassis units are the ideal solution as part of a modular system.

The highly flexible, modular system follows the trend to shift intelligence into the drive, which is achieved using its harmonized, standard interfaces. Planning is simplified and reliability increased thanks to the ready-to-connect cabinet solution with several Cabinet Modules. The chassis design of the SINAMICS S120 is the ideal approach for companies that wish to engineer their own chassis-type solutions.

SINAMICS S120 Cabinet Modules: modular cabinet concept for multi-motor drives

A modular cabinet system is available in the form of the SINAMICS S120 Cabinet Modules. These can be used to engineer almost any drive solution for multimotor drive systems in plant construction. Thanks to the standardized interfaces, the modules can be interlinked and combined to quickly configure readyto-connect drive solutions up to 4500 kW (6000 HP).

- High degree of flexibility through the finely scalable power and module types as well as an extensive range of options
- Extremely compact drive solution that is ready to be connected
- DC coupling using pre-fabricated sets of busbars
- Data is coupled through DRIVE-CLiQ
- Fast and reliable installation and commissioning
- Short delivery times and reduced ordering costs





top: Chassis Units from 75 – 1200 kW (100 – 1600 HP)

right: Cabinet Modules from 75 – 4500 kW (100 – 6000 HP)



N-compact motors

By combining SINAMICS S120 with N-compact low-voltage motors, system solutions can be implemented that are precisely tailored to individual requirements.

N-compact motors distinguish themselves through their rugged design with gray cast iron frame and bearing endshields as well as their long service life. The compact design makes it easy to integrate them into plants and reduces the dimensions of the complete unit. The 2-8 pole motors are convincing thanks to their high efficiency and availability.

The right moment - torque motors

In addition to N-compact, it is also possible to use 1FW3 torque motors and in the future 1FW4 (HT-direct) motors. State-of-the-art direct drive concepts can be implemented using these motors – and not only that, they make gearboxes superfluous.



SINAMICS S120 in plant construction

- Drive versions can be flexibly developed
- Scalable power
- Ready-to-connect Cabinet Modules
- Chassis units for integration into cabinets
- Low costs for training, engineering and commissioning
- Simple to replace, spare parts inventory, logistics
- Low lifecycle costs through energy saving and low maintenance costs
- Highest possible security of investment

Low costs for plant integration, engineering and installation

The SINAMICS S120 concept means that drives can be quickly and simply integrated into overall plants and systems, both mechanically and electrically. Further, engineering costs are reduced and with them, the engineering risks. The drive system can be flexibly adapted to plant-specific requirements through an extensive range of options. A drive system can be quickly and reliably engineered using the SIZER engineering tool; using the STARTER commissioning tool, technicians can even configure complex systems in an extremely short time, without having any special system know-how.

Reliable and line-friendly

SINAMICS S120 also takes into account the trend to line-friendly converters due to the increasing demands of power supply utilities. Its constant regulated DC link voltage essentially de-couples the motor voltage from the influence of the line supply voltage. On the other hand, the low-frequency harmonics fed back into the line supply can almost be completely neglected through the optional "Clean Power Filter". Further, the losses in the low-voltage distribution, line-side transformer and line feeder cables, caused by harmonic currents, are eliminated.

Applications in plant construction

- Paper machines
- Rolling mills
- Test stands
- Foil machines
- Man-made textile systems



SINAMICS S120: the technical data.

Modules and expansion options: Components for every application

- Control modules (Control Units) handle drive and technological functions spanning axes and provide you the central link to higher-level controls
- Motor modules operate as inverters, supplying the connected motors
- Line Modules centrally feed power into the DC link, regenerate into the line supply and compensate for line fluctuations
- Power Modules for AC Drives combine power infeed and power module in the form of a unit that is ready to be powered-up
- Electronic options extend the functionality and cover various interfaces to encoders and process signals
- DC link components are optionally used to stabilize the DC link voltage
- Line-side power components such as fuses, contactors, reactors, filters round-off the system
- High dynamic performance and precise: 32-bit technology
- Fast: short current rise times
- Universal: for synchronous and induction motors
- Rugged: high overload factor
- Safe: Safety Integrated
- Flexible and simple: BICO technology
- Plug & Play: DRIVE-CLiQ makes it possible

- STO Safe Torque Off (safe standstill)
- SBC Safe Brake Control
- SS1 Safe Stoping Cat. 1

Degree of protection

Line supply voltage Vline supply/power ratings

- · 1-ph. 230 V
- · 3-ph. 380 480 V AC
- · 3-ph. 660 690 V AC

Power infeed

Regenerative feedback into the line supply Line frequency

Control principle

- · V/f open-loop control
- · Vector control, with/without encoder
- · Servo control, with/without encoder

Motors

- \cdot Induction
- · Synchronous
- Torque
- \cdot Linear

Dynamic control response

- \cdot Rise time, closed-loop speed control
- · Rise time, closed-loop torque control

Technology functions Safety functions Interfaces

SINAMICS S120

Modular drive system for sophisticated single/multi-axis applications

Blocksize	Chassis	Booksize	Chassis	Cabinet Modules		
	SINAMICS I					
AC/AC drive units for single-axis applications		DC/AC drive units for multi-axis applications				
IP20	IP20	IP20	IP00, IP20	IP20 (IP21, 23, 54)		
0.12 – 0.75 kW (0.16 – 1 HP)	-	-	-	-		
0.37 – 90 kW (0.5 – 120 HP)	110 – 250 kW (150 – 340 HP)	1.6 – 107 kW (2 – 145 HP)	110 – 800 kW (150 – 1000 HP)	110 – 3000 kW (150 – 4000 HP)		
-	-	-	75 – 1200 kW (100 – 1600 HP)	75 – 4500 kW (100 – 6000 HP)		
Non-regulated		Optionally non-regulated or regulated				
-		(for regulated infeeds)				
47 – 63 Hz						
•		•	•			
•		•	•			
•	•	•	•	•		
•		•	•			
		•	•			
•		•	•			
Closed-loop vector control: 25 ms without encoder, 11 – 15 ms with encoder and 2.1 ms with internal acceleration pre-control Closed-loop servo control: 1.1 ms (for 125 µs current controller clock cycle)						
Closed-loop vector control: approx. 1 ms Closed-loop servo control: approx. 0.6 ms						
Flying restart, automatic restart, kinetic buffering, positioning, BICO technology, motion control (in conjunction with SIMOTION)						
STO, SBC, SS1	STO	STO, SBC, SS1	STO	STO		
Digital, analog, serial (RS232/RS485), Profibus DP, Profinet, CAN-Open						

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