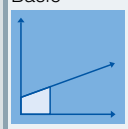
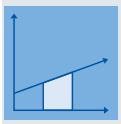
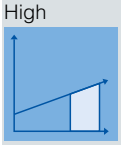
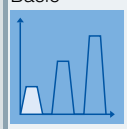
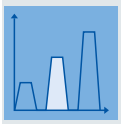
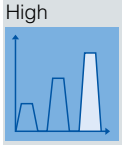
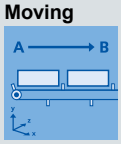
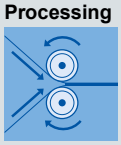
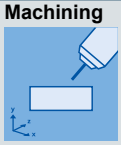
SINAMICS G120 standard inverters

0.37 kW to 250 kW (0.5 hp to 400 hp)

Introduction

Application

Application	Continuous motion			Non-continuous motion		
	Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality			Requirements for torque accuracy / speed accuracy / position accuracy / coordination of axes / functionality		
	Basic 	Medium 	High 	Basic 	Medium 	High 
Pumping, ventilating, compress-ing 	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	G110, G120C (G130, G150, GM150, GL150)	**G120P, G120C, G120** (G130, G150, GM150, GL150)	**S120**	**S110**	**S110, S120**	**S120** (GM150)
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	G110, G110D, G120C (G130, G150, GM150)	**G120D, G120C, G120, S120** (G130, G150, S150, GM150, GL150, SM150, DCM)	**S120** (S150, SM150, SL150, GM150, DCM)	**G120D, S110**	**S110, S120** (DCM)	**S120** (DCM)
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders and unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Tubular bagging machines Single-axis motion control such as • Position profile • Path profile	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	G120C (G130, G150, GM150)	**G120C, G120** (G130, G150, S150, GM150, GL150, DCM)	**S120** (S150, DCM)	**S110**	**S110, S120**	**S120** (SM150, SL150, DCM)
Machining 	Main drives for • Turning • Drilling • Milling	Main drives for • Drilling • Sawing	Main drives for • Turning • Drilling • Milling • Gear cutting • Grinding	Axle drives for • Turning • Drilling • Milling	Axle drives for • Drilling • Sawing	Axle drives for • Turning • Drilling • Milling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	**S110, S120**	**S120**	**S110**	**S110, S120**	**S120**

(Devices in brackets are not included in Catalog D 31)

The standard SINAMICS G120 inverter is especially well-suited

- as a universal drive in all industrial and commercial applications
- e.g. in the automotive, textile, printing and chemical industries
- for higher-level applications, e.g. in conveyor systems

More information

You may also be interested in these inverters:

- Higher degree of protection for power ratings up to 7.5 kW (10 hp) ⇒ SINAMICS G110D, SINAMICS G120D
- With positioning function for distributed drive solutions in IP65 degree of protection ⇒ SINAMICS G120D
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS S110
- Special functions for pumps, fans, and compressors ⇒ SINAMICS G120P

Overview

The SINAMICS G120 inverter is designed to provide precise and cost-effective speed/torque control of three-phase motors.

With different device versions (frame sizes FSA to FSGX) in an output range of 0.37 kW to 250 kW (0.5 hp to 400 hp), it is suitable for a wide variety of drive solutions.

Example: SINAMICS G120, frame sizes FSA, FSB and FSC; each with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

Example: SINAMICS G120, frame sizes FSD, FSE and FSF; each with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

SINAMICS G120 standard inverters

Overview

Example: SINAMICS G120, frame size FSGX; with Power Module, CU240E-2 F Control Unit and Basic Operator Panel BOP-2

Operator-friendly design

SINAMICS G120 is a modular inverter system that essentially comprises two function units:

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor using several different closed-loop control types that can be selected. It supports communication with a local or central controller and monitoring devices.

The Power Module supplies the motor in the power range 0.37 kW to 250 kW (0.5 hp to 400 hp). It features state-of-the-art IGBT technology with pulse-width-modulated motor voltage and selectable pulse frequency. It also features a range of functions offering a high degree of protection for the Power Module and motor.

Safety Integrated

SINAMICS G120 standard inverters are available in different versions for safety-related applications. The PM240-2, PM240, PM250 and PM260 Power Modules are prepared for Safety Integrated. In conjunction with a fail-safe Control Unit, the drive can be turned into a Safety Integrated Drive. PM240 Power Modules in frame size FSGX (i.e. 160 kW/250 hp and higher) are currently approved only for the Safe Torque Off (STO) function.

The safety function "Safe Torque Off" (STO) (certified according to EN 954-1, Category 3 and IEC 61508 SIL 2 – as well as ISO 13849-1 PL d) is already integrated into the basic versions of the CU240E-2 series (CU240E-2, CU240E-2 DP, CU240E-2 PN)

With the fail-safe variants of the CU240E-2 series (CU240E-2 F, CU240E-2 DP-F, CU240E-2 PN-F), the fail-safe SINAMICS G120 inverter provides five safety functions which are certified according to EN 954-1 Category 3 and IEC 61508 SIL 2 as well as ISO 13849-1 PL d:

- Safe Torque Off (STO)
  to protect against active movement of the drive
- Safe Stop 1 (SS1)
  for continuous monitoring of a safe braking ramp
- Safely Limited Speed (SLS)
  for protection against dangerous movements on exceeding a speed limit
- Safe direction (SDI)
  This function ensures that the drive can only rotate in the selected direction.
- Safe speed monitoring (SSM)
  This function signals if a drive operates below a specific speed/feed velocity.

These functions can be activated by means of PROFIsafe or via the safety inputs.

None of the safety functions require a motor encoder and they are thus much cheaper and easier to implement. Existing systems in particular can be simply updated with safety technology without the need to change the motor or mechanical system.

The Safe Torque Off (STO) function can be used without restriction for all applications. The SS1, SLS, SSM and SDI functions are only permissible for applications where the load can never accelerate when the inverter is switched off. They are therefore not permitted for applications involving pull-through loads such as hoisting gear and unwinders.

Additional information is provided in Catalog D 31, chapter Highlights, section Safety Integrated.

Overview

Efficient Infeed Technology

The advanced Efficient Infeed Technology is employed in PM250 and PM260 Power Modules. This technology allows the energy produced by motors operating in generator mode connected to standard inverters to be fed back into the supply system. For control cabinets, an additional temperature rise can be avoided and the amount of space required can be reduced due to the fact that components such as braking resistors, braking choppers and line reactors can be eliminated. Further, wiring and engineering costs are significantly reduced. At the same time, energy consumption can be reduced and ongoing operating costs noticeably reduced.

Additional information is provided in Catalog D 31, chapter Highlights, section Efficient Infeed Technology.

Innovative cooling concept and varnishing of electronic modules

The new cooling system and varnishing of the electronic modules significantly increases the service life or useful life of the device.

- Disposal of all heat losses via an external heat sink
- Consequential convection cooling of the Control Unit, electronic modules are not located in the air duct
- All cooling air from the fan is directed through the heat sink

Energy efficiency

Integrated technologies help when optimizing the energy usage of the plant or system referred to the particular application:

- Energy-efficient, sensorless vector control
- Automatic flux reduction with *V/f* ECO mode
- Integrated energy saving computer

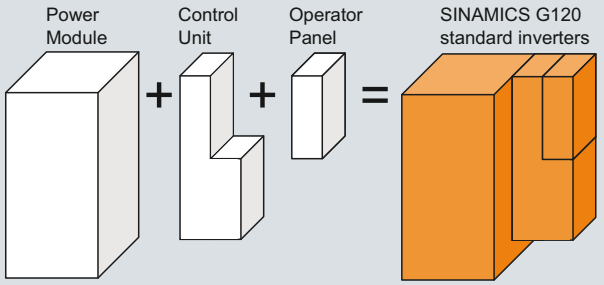
Benefits

- Modularity ensures flexibility for a drive concept that is fit for the future
  - Module replacement under voltage (hot swapping)
  - Pluggable terminals
  - The modules can be easily replaced, which makes the system extremely service friendly
- The integrated safety functions significantly reduce the costs when integrating drives into safety-oriented machines or systems
- Communications-capable via PROFINET or PROFIBUS with PROFIdrive Profile 4.0
  - Reduced number of interfaces
  - Plant-wide engineering
  - Easy to handle
- The innovative circuit design (bidirectional input rectifier with "pared-down" DC link) allows the kinetic energy of a load to be fed back into the supply system when PM250 and PM260 Power Modules are used. This feedback capability provides enormous potential for savings because generated energy no longer has to be converted into heat in a braking resistor
- Integrated USB interface for simplified, local commissioning and diagnostics
- Application-specific modules for pumps, fans and compressors
  are integrated, e.g.:
  - 4 freely-programmable PID controllers
  - Application-specific wizards
  - Pt1000/LG-Ni1000 temperature sensor interface
  - 230 V relay
  - 3 freely-programmable digital time switches
- Integrated control functionality by using BICO technology
- Innovative SiC semiconductor technology ensures that when a PM260 Power Module is used, the inverter is more compact than a comparable standard inverter with an optional sine-wave filter for the same power rating
- An innovative cooling concept and coated electronic modules increase robustness and service life
  - External heat sink
  - Electronic components are not located in air duct
  - Control Unit that is completely cooled by convection
  - Additional coating of the most important components
- Simple unit replacement and quick copying of parameters using the optional Basic Operator Panel or the optional memory cards
- Quiet motor operation as a result of the high pulse frequency
- Compact, space-saving design
- Software parameters for simple adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- 2/3-wire control for static/pulsed signals for universal control via digital inputs
- Fast engineering and commissioning by using standard engineering tools such as SIZER for Siemens Drives, STARTER and Drive ES – STARTER is integrated into STEP 7 using Drive ES Basic, with all of the benefits of central data management and totally integrated communication
- Certified worldwide for compliance with CE, UL, cUL, c-tick and Safety Integrated IEC 61508 SIL 2

Design

Application-orientated design of SINAMICS G120

SINAMICS G120 standard inverters are modular inverters for standard drives. Selection of the SINAMICS G120 is reduced to two or three steps thanks to the modular system used.



Selecting the Control Unit

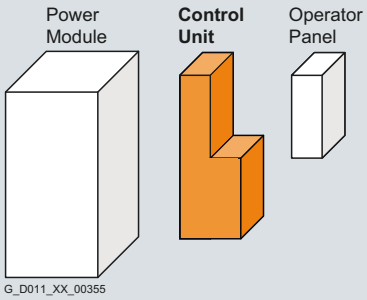
The optimum Control Unit is selected first, based on the number of I/Os and any additional functions required such as Safety Integrated or HVAC. The communication options are already integrated and do not have to be additionally ordered or plugged in. Two product series are available corresponding to the particular application.

CU230P-2 Control Units

The CU230P-2 Control Units have been specifically designed for pump, fan and compressor applications.

CU240B-2 and CU240E-2 Control Units

The CU240B-2 and CU240E-2 Control Units are suitable for a wide range of applications in general machine construction, such as conveyor belts, mixers and extruders.



Technology functions (selection)	Inputs	Outputs	Integrated safety technology	Digital inputs, fail-safe	Communication	Designation		**Control Unit** Order No.
CU230P-2 series – the specialist for pumps, fans, compressors, water, buildings								
• Free function blocks (FFB) • 4 × PID controllers • Pump staging • Hibernation • Essential service mode • 2-zone control	6 digital 4 analog	3 digital 2 analog	–	–	RS485/USS / Modbus RTU / BACnet MS/TP	CU230P-2 HVAC		**6SL3243-0BB30-1HA2**
					PROFIBUS DP	CU230P-2 DP		**6SL3243-0BB30-1PA2**
					PROFINET	CU230P-2 PN	new	**6SL3243-0BB30-1FA0**
					CANopen	CU230P-2 CAN		**6SL3243-0BB30-1CA2**
CU240B-2 series – for basic applications with variable-speed drives								
• Free function blocks (FFB) • 1 × PID controller • Motor holding brake	4 digital 1 analog	1 digital 1 analog	–	–	RS485/USS / Modbus RTU	CU240B-2		**6SL3244-0BB00-1BA1**
					PROFIBUS DP	CU240B-2 DP		**6SL3244-0BB00-1PA1**
CU240E-2 series – for standard applications in general machinery construction, such as conveyor belts, mixers and extruders								
• Free function blocks (FFB) • 1 × PID controller • Motor holding brake	6 digital 2 analog	3 digital 2 analog	STO	1 F-DI (opt. for each 2 DI)	RS485/USS / Modbus RTU	CU240E-2		**6SL3244-0BB12-1BA1**
					PROFIBUS DP PROFIsafe	CU240E-2 DP		**6SL3244-0BB12-1PA1**
					PROFINET	CU240E-2 PN	new	**6SL3244-0BB12-1FA0**
			STO, SS1, SLS, SSM, SDI	3 F-DI (opt. for each 2 DI)	RS485/USS / Modbus RTU	CU240E-2 F		**6SL3244-0BB13-1BA1**
					PROFIBUS DP PROFIsafe	CU240E-2 DP-F		**6SL3244-0BB13-1PA1**
					PROFINET	CU240E-2 PN-F	new	**6SL3244-0BB13-1FA0**

Technical specifications

Control Unit	CU230P-2 series 6SL3243-0BB30-1 . A2 6SL3243-0BB30-1FA0	CU240B-2 series 6SL3244-0BB00-1 . A1	CU240E-2 series 6SL3244-0BB1 . -1 . A1 6SL3244-0BB1 . -1FA0
Integrated bus interface			
USS/Modbus RTU RS485 connected at a terminal, isolated, bus terminating resistors can be switched in, slave address can be set using DIP switches USS: max. 187.5 kBaud Modbus RTU:19.2 kBaud	CU230P-2 HVAC 6SL3243-0BB30-1HA2	CU240B-2 6SL3244-0BB00-1BA1	CU240E-2 6SL3244-0BB12-1BA1 CU240E-2 F 6SL3244-0BB13-1BA1
BACnet MS/TP RS485 connected to a terminal, isolated, bus terminating resistors can be switched in Max. 187.5 kBaud	CU230P-2 HVAC 6SL3243-0BB30-1HA2	–	–
PROFIBUS DP 9-pin SUB-D connector, isolated, PROFIdrive profile V4.1, slave address can be set using DIP switches Max. 12 Mbit/s	CU230P-2 DP 6SL3243-0BB30-1PA2	CU240B-2 DP 6SL3244-0BB00-1PA1	CU240E-2 DP 6SL3244-0BB12-1PA1 CU240E-2 DP-F 6SL3244-0BB13-1PA1
PROFINET 2 × RJ45, PROFIdrive profile V4.1, device name can be stored on the device Max. 100 Mbit/s (full duplex)	CU230P-2 PN 6SL3243-0BB30-1FA0	–	CU240E-2 PN 6SL3244-0BB12-1FA0 CU240E-2 PN-F 6SL3244-0BB13-1FA0
CANopen 9-pin SUB-D socket, isolated, slave address can be set using DIP switches Max. 1 Mbit/s	CU230P-2 CAN 6SL3243-0BB30-1CA2	–	–
Tool interfaces			
Memory card	1 SINAMICS micro memory card (MMC) or 1 SINAMICS SD card		
Operator panels	• IOP Supported connection options between CU230P-2 and IOP: can be directly plugged on, door mounting (not possible in conjunction with PM230 IP55) or handheld (use of the IOP Handheld in conjunction with the PM230 Power Module in degree of protection IP55 is restricted since degree of protection IP55 is no longer assured when the IOP Handheld is connected.) • BOP-2 Supported connection options between CU230P-2 and BOP-2: can be directly plugged on or door-mounted • Blanking cover Necessary in combination with the PM230 Power Module degree of protection IP55/UL Type 12 if an operator panel is not inserted in order to achieve degree of protection IP55		
PC interface	USB (connection via PC inverter connection kit 2)		
Open-loop/closed-loop control techniques			
***V/f* linear/square/parameterizable**	✓		
***V/f* with flux current control (FCC)**	✓		
***V/f* ECO linear/square**	✓		
Vector control, sensorless	✓		
Vector control, with sensor	–		
Torque control, sensorless	✓		
Torque control, with sensor	–		