Overview

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

With different device versions (frame sizes FSA to FSG) in a power range from 0.37 kW to 250 kW, 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, FSF and FSG; each with Power Module, CU240E-2 F Control Unit and Intelligent Operator Panel IOP-2

Overview (continued)

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. It features state-of-the-art IGBT technology with pulse-width-modulated motor voltage and selectable pulse frequency. Comprehensive protection functions provide a high degree of protection for the Power Module and the motor.

The Control Units can be combined with the following Power Modules:

Control Units	Power Modules degree of protection IP20	
	PM240-2	PM250
CU230P-2	✓	✓
CU240E-2	✓	✓
CU250S-2	✓	✓

Safety Integrated

SINAMICS G120 standard inverters are available in different versions for safety-related applications. The PM240-2 and PM250 Power Modules are already designed for Safety Integrated. A drive can be combined with a Control Unit with safety functions (see overview) in order to create a Safety Integrated drive. The availability of Safety Integrated functions depends on the type of Control Unit.

Control Unit	Basic Safety functions			Extended Safety functions		
	STO	SS1	SBC [1]	SLS	SDI	SSM
CU230P-2	–	–	–	–	–	–
CU240E-2	✓	–	–	–	–	–
CU240E-2 F	✓	✓	–	✓	✓	✓ [2]
CU250S-2	✓	✓	✓	✓ [3]	✓ [3]	✓ [3]

Basic Safety functions (certified according to IEC 61508 SIL 2, and EN ISO 13849-1 PL d and Category 3)

- Safe Torque Off (STO)
  to protect against active movement of the drive
- The PM240-2 Power Modules, frame sizes FSD to FSG, offer additional terminals to achieve STO acc. to IEC 61508 SIL 3 and EN ISO 13489-1 PL e and Category 3.
- Safe Stop 1 (SS1)
  for continuous monitoring of a safe braking ramp
- Safe Brake Control (SBC) is used to safely control a holding brake. When enabled, SBC is always activated at the same time as STO. The Safe Brake Relay is used for SBC.

Extended Safety functions (certified according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3)

- 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 Monitor (SSM)
  This function signals if a drive operates below a specific speed/feed velocity.

Basic Safety and Extended Safety functions can be activated via PROFIsafe or by means of the safety inputs.

None of the safety functions require a motor encoder and they are thus 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.

Further information can be found in the section Safety Integrated.

Efficient Infeed Technology

The innovative Efficient Infeed Technology is employed in PM250 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.

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 vector control with or without sensors
- Automatic flux reduction with V/f ECO mode
- Integrated energy saving computer

Further information can be found in the section Energy efficiency.

[1] The SBC function can be utilized only if a Safe Brake Relay is installed.

[2] SSM possible only for CU240E-2 DP-F / CU240E-2 PN-F Control Units with PROFIsafe.

[3] With license for Extended Safety functions.

Benefits

- Modularity ensures flexibility for a drive concept that is fit for the future
  - Control Unit can be hot-swapped
  - 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
- The PM240-2 Power Modules, frame sizes FSD to FSG, offer additional terminals to achieve STO acc. to IEC 61508 SIL 3 and EN ISO 13489-1 PL e and Category 3.
- Communications-capable via PROFINET or PROFIBUS with PROFIdrive Profile 4.0
  - Plant-wide engineering
  - Easy to handle
- Wireless commissioning, operation and diagnostics via mobile device or laptop thanks to the optional SINAMICS G120 Smart Access
- 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 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
- With Control Unit CU230P-2: Application-specific functions for pumps, fans and compressors
  Integrated are, e.g.:
  - 4 freely-programmable PID controllers
  - Application-specific wizards
  - Pt1000-/LG-Ni1000-/DIN-Ni1000 temperature sensor interface
  - 230 V AC relay
  - 3 freely-programmable digital time switches

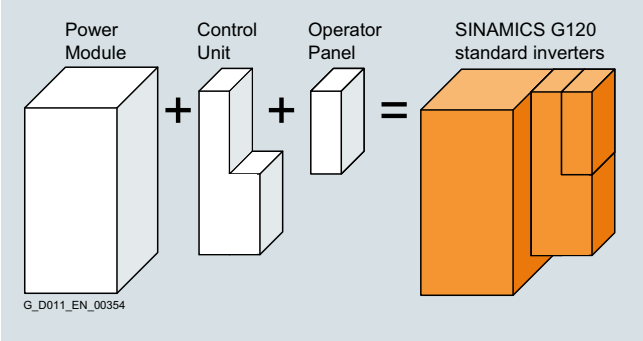
Detailed information can be found in Catalog D 35.

- With CU250S-2 Control Units: Integrated positioning functionality (basic positioner EPos) supports process-related implementation of positioning tasks with a high dynamic response. Positioning can be implemented with an incremental and/or absolute encoder (SSI)
  - Encoder interfaces DRIVE-CLiQ, HTL/TTL/SSI (SUB-D) and resolver/HTL (terminal)
  - Vector control with or without sensors
- Integrated control functionality by using BICO technology
- 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 an optional Operator Panel or an optional memory card
- Quiet motor operation as a result of the high pulse frequency
- Compact, space-saving design
- 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
- Certified worldwide for compliance with CE, UL, cUL, RCM, SEMI F47 and Safety Integrated according to IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3

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. Three 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.
The CU230P-2 is the Control Unit for the pump, fan and compressor inverters SINAMICS G120P and SINAMICS G120P Cabinet. Detailed information can be found in Catalog D 35.

Control Unit CU240E-2

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

CU250S-2 Control Units

The CU250S-2 Control Units are suitable for applications involving single drives with exacting speed control requirements such as extruders and centrifuges, and for positioning tasks such as conveyor belts, lifting/lowering devices, etc. They can also be used to implement multi-motor drives without DC coupling such as wire-drawing machines and simple material lines.

Design (continued)

Description	Fieldbus	Profile	Inputs Outputs	Integrated safety technology	Fail-safe digital inputs digital outputs	**Control Unit** Article No.
CU230P-2 series – the specialist for pumps, fans, compressors, water, buildings Technology functions (selection): Free function blocks (FFB), 4 × PID controller, cascade connection, hibernation mode, essential service mode, multi-zone control						
CU230P-2 HVAC	• USS • Modbus RTU • BACnet MS/TP • FLN P1	–	6 DI 4 AI 3 DO 2 AO	–	–	**6SL3243-0BB30-1HA3**
CU230P-2 DP	• PROFIBUS DP	• PROFIdrive				**6SL3243-0BB30-1PA3**
CU230P-2 PN	• PROFINET	• PROFIdrive • PROFIenergy				**6SL3243-0BB30-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–				
CU240E-2 series – for standard applications in general machinery construction, such as conveyor belts, mixers and extruders – without encoder Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake						
CU240E-2	• USS • Modbus RTU	–	6 DI 2 AI 3 DO 2 AO	STO	1 F-DI (opt. for each 2 DI)	**6SL3244-0BB12-1BA1**
CU240E-2 DP	• PROFIBUS DP	• PROFIdrive • PROFIsafe				**6SL3244-0BB12-1PA1**
CU240E-2 PN	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy				**6SL3244-0BB12-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–				
CU240E-2 F	• USS • Modbus RTU	–		STO, SS1, SLS, SDI	3 F-DI (opt. for each 2 DI)	**6SL3244-0BB13-1BA1**
CU240E-2 DP-F	• PROFIBUS DP	• PROFIdrive • PROFIsafe		STO, SS1, SLS, SSM [1], SDI		**6SL3244-0BB13-1PA1**
CU240E-2 PN-F	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy				**6SL3244-0BB13-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–				
CU250S-2 series – for complex applications such as extruders and centrifuges – with and without encoder (basic positioner (EPos) optional) Technology functions (selection): Free function blocks (FFB), 1 × PID controller, motor holding brake						
CU250S-2	• USS • Modbus RTU	–	11 DI 2 AI 3 DO 2 AO 4 DI/DO (DI can be used as high-speed inputs)	STO, SBC, SS1	3 F-DI (opt. for each 2 DI) 1 F-DO (opt. for each 2 DO)	**6SL3246-0BA22-1BA0**
CU250S-2 DP	• PROFIBUS DP	• PROFIdrive • PROFIsafe				**6SL3246-0BA22-1PA0**
CU250S-2 PN	• PROFINET	• PROFIdrive • PROFIsafe • PROFIenergy				**6SL3246-0BA22-1FA0**
	• EtherNet/IP - ODVA AC drive - SINAMICS profile	–				
CU250S-2 CAN	• CANopen	–				**6SL3246-0BA22-1CA0**

[1] SSM is possible only with PROFIsafe.

Design (continued)

Optional memory card with firmware V4.7 SP10 for CU230P-2, CU240E-2 and CU250S-2 Control Units

Description	Suitable for		Article No.
SINAMICS SD card 512 MB + firmware V4.7 SP10 (Multicard V4.7 SP10)	CU230P-2 CU240E-2 CU250S-2	NEW	**6SL3054-7TF00-2BA0**

Optional memory cards with licenses for CU250S-2 Control Units only

Description	**SINAMICS SD card 512 MB + licenses** Article No.	**SINAMICS SD card 512 MB + firmware V4.7 SP10 (Multicard V4.7 SP10) + licenses** Article No.	**Licenses (without SD card) for upgrading license of an existing SD card** Article No.
License Extended Functions Basic positioner (EPos)	**6SL3054-4AG00-2AA0-Z E01**	**6SL3054-7TF00-2BA0-Z E01**	**6SL3074-7AA04-0AA0**
License Extended Functions Safety (SLS, SSM, SDI)	**6SL3054-4AG00-2AA0-Z F01**	**6SL3054-7TF00-2BA0-Z F01**	**6SL3074-0AA10-0AA0**
Licenses Extended Functions Basic positioner (EPos) + Safety (SLS, SSM, SDI)	**6SL3054-4AG00-2AA0-Z E01+F01**	**6SL3054-7TF00-2BA0-Z E01+F01**	**–**

More information on firmware V4.7 SP10:
https://support.industry.siemens.com/cs/document/109755811

For an overview and more information on all available firmware versions, see
https://support.industry.siemens.com/cs/document/67364620

Selecting the Power Module

The optimum power unit can be quickly selected based on the required motor power, the supply voltage and the braking cycles to be expected. Power Modules in degree of protection IP20 are intended for installation in a control cabinet.

PM240-2 Power Modules – degree of protection IP20

PM240-2 Power Modules have an integrated braking chopper (four-quadrant applications) and are suitable for a large number of applications in general machinery construction.

PM250 Power Modules – degree of protection IP20

PM250 Power Modules are suitable for the same applications as the PM240-2. Any braking energy is directly fed back into the line supply (four-quadrant applications – a braking resistor is not required).

The Power Modules can be combined with the following Control Units:

Control Units	**Power Modules degree of protection IP20**	
	PM240-2	**PM250**
CU230P-2	✓	✓
CU240E-2	✓	✓
CU250S-2	✓	✓

Design (continued)

PM240-2 and PM250 Power Modules

Rated power [1]		Rated output current I_{rated} [2]	Frame size	PM240-2 Power Modules Degree of protection IP20 All CUs pluggable	PM250 Power Modules Degree of protection IP20 All CUs pluggable
kW	hp	A		Article No.	Article No.
200 ... 240 V 1 AC/3 AC					
0.55	0.75	3.2	FSA	**6SL3210-1PB13-0■L0**	–
0.75	1	4.2	FSA	**6SL321■-1PB13-8■L0**	–
1.1	1.5	6	FSB	**6SL3210-1PB15-5■L0**	–
1.5	2	7.4	FSB	**6SL3210-1PB17-4■L0**	–
2.2	3	10.4	FSB	**6SL321■-1PB21-0■L0**	–
3	4	13.6	FSC	**6SL3210-1PB21-4■L0**	–
4	5	17.5	FSC	**6SL321■-1PB21-8■L0**	–
200 ... 240 V 3 AC					
5.5	7.5	22	FSC	**6SL3210-1PC22-2■L0**	–
7.5	10	28	FSC	**6SL3210-1PC22-8■L0**	–
11	15	42	FSD	**6SL3210-1PC24-2UL0**	–
15	20	54	FSD	**6SL3210-1PC25-4UL0**	–
18.5	25	68	FSD	**6SL321■-1PC26-8UL0**	–
22	30	80	FSE	**6SL3210-1PC28-0UL0**	–
30	40	104	FSE	**6SL321■-1PC31-1UL0**	–
37	50	130	FSF	**6SL3210-1PC31-3UL0**	–
45	60	154	FSF	**6SL3210-1PC31-6UL0**	–
55	75	178	FSF	**6SL321■-1PC31-8UL0**	–
380 ... 480 V 3 AC					
0.37 [3]	0.5	1.3	–	– [3]	–
0.55	0.75	1.7	FSA	**6SL3210-1PE11-8■L1**	–
0.75	1	2.2	FSA	**6SL3210-1PE12-3■L1**	–
1.1	1.5	3.1	FSA	**6SL3210-1PE13-2■L1**	–
1.5	2	4.1	FSA	**6SL3210-1PE14-3■L1**	–
2.2	3	5.9	FSA	**6SL3210-1PE16-1■L1**	–
3	4	7.7	FSA	**6SL321■-1PE18-0■L1**	–
4	5	10.2	FSB	**6SL3210-1PE21-1■L0**	–
5.5	7.5	13.2	FSB	**6SL3210-1PE21-4■L0**	–
Heat sink variant				↑	
Standard				**0**	
Push-through				**1**	
Integrated line filter				↑	
Without	(for IT systems)			**U**	
Class A	(for TN systems)			**A**	
Class B	(for TN systems)			–	–

Data based on a duty cycle with low overload (LO).
Data based on duty cycle with high overload (HO), see section Power Modules.

[1] Rated power based on the rated output current I_{rated}. The rated output current I_{rated} is based on the duty cycle for low overload (LO). Low overload (LO) generally applies for applications with low dynamic response (continuous operation), quadratic torque characteristic with low break loose torque and low speed accuracy. Examples: Centrifugal pumps, radial/axial fans, rotary piston fans, radial compressors, vacuum pumps, chain conveyors, agitators. High overload (HO) generally applies for applications with increased dynamic response (cyclic operation) and constant torque characteristics with high break loose torque. Examples: Gear pumps, eccentric worm pumps, mills, mixers, crushers, lifting/lowering gear, centrifuges.

[2] The rated output current I_{rated} is based on the duty cycle for low overload (LO). These current values are applicable for 200 V, 400 V or 690 V.

[3] The PM240-2 Power Module with Article No. 6SL3210-1PE11-8. L1 corresponds to 0.37 kW (0.5 hp) with duty cycle HO.

[4] The 690 V versions of the PM240-2 Power Modules, frame size FSG are only available with an integrated Category C3 filter. To operate the inverter also within TN systems with grounded outer conductor, you must remove the grounding screw.

Design (continued)

Rated power [1]		Rated output current I_{rated} [2]	Frame size	PM240-2 Power Modules Degree of protection IP20 All CUs pluggable	PM250 Power Modules Degree of protection IP20 All CUs pluggable
kW	hp	A		Article No.	Article No.
380 ... 480 V 3 AC (continued)					
7.5	10	18	FSB	**6SL321■-1PE21-8■L0**	**6SL3225-0BE25-5AA1**
11	15	26/25	FSC	**6SL3210-1PE22-7■L0**	**6SL3225-0BE27-5AA1**
15	20	32	FSC	**6SL321■-1PE23-3■L0**	**6SL3225-0BE31-1AA1**
18.5	25	38	FSD	**6SL3210-1PE23-8■L0**	**6SL3225-0BE31-5■A0**
22	30	45	FSD	**6SL3210-1PE24-5■L0**	**6SL3225-0BE31-8■A0**
30	40	60	FSD	**6SL3210-1PE26-0■L0**	**6SL3225-0BE32-2■A0**
37	50	75	FSD	**6SL321■-1PE27-5■L0**	**6SL3225-0BE33-0■A0**
45	60	90	FSE	**6SL3210-1PE28-8■L0**	**6SL3225-0BE33-7■A0**
55	75	110	FSE	**6SL321■-1PE31-1■L0**	**6SL3225-0BE34-5■A0**
75	100	145	FSF	**6SL3210-1PE31-5■L0**	**6SL3225-0BE35-5■A0**
90	125	178	FSF	**6SL3210-1PE31-8■L0**	**6SL3225-0BE37-5■A0**
110	150	205	FSF	**6SL3210-1PE32-1■L0**	–
132	200	250	FSF	**6SL321■-1PE32-5■L0**	–
160	250	302	FSG NEW	**6SL3210-1PE33-0■L0**	–
200	300	370	FSG NEW	**6SL3210-1PE33-7■L0**	–
250	400	477	FSG NEW	**6SL3210-1PE34-8■L0**	–
500 ... 690 V 3 AC					
11	10	14	FSD	**6SL3210-1PH21-4■L0**	–
15	15	19	FSD	**6SL3210-1PH22-0■L0**	–
18.5	20	23	FSD	**6SL3210-1PH22-3■L0**	–
22	25	27	FSD	**6SL3210-1PH22-7■L0**	–
30	30	35	FSD	**6SL3210-1PH23-5■L0**	–
37	40	42	FSD	**6SL3210-1PH24-2■L0**	–
45	50	52	FSE	**6SL3210-1PH25-2■L0**	–
55	60	62	FSE	**6SL3210-1PH26-2■L0**	–
75	75	80	FSF	**6SL3210-1PH28-0■L0**	–
90	100	100	FSF	**6SL3210-1PH31-0■L0**	–
110	100	115	FSF	**6SL3210-1PH31-2■L0**	–
132	125	142	FSF	**6SL3210-1PH31-4■L0**	–
160	150	171	FSG NEW	**6SL3210-1PH31-7CL0**	–
200	200	208	FSG NEW	**6SL3210-1PH32-1CL0**	–
250	250	250	FSG NEW	**6SL3210-1PH32-5CL0**	–
Heat sink variant				↑	↑
Standard				**0**	**0**
Push-through				**1**	Not available
Integrated line filter				↑	↑
Without			(for IT systems)	**U**	**U**
Category C3 (only for FSG)			(for IT systems [4])	**C**	–
Class A and Category C2 (for FSG)			(for TN systems)	**A**	**A**
Class B			(for TN systems)	–	Integrated line filter not available, as external option only

Data based on a duty cycle with low overload (LO).
Data based on duty cycle with high overload (HO), see section Power Modules.

Footnotes see page 9/8.

Design (continued)

Selecting optional system components

IOP-2 Intelligent Operator Panel

Color display, new functions, functional design for faster commissioning and easy adjustment of settings during operation. The most striking features are the new flat design of the operator panel and its integrated membrane keyboard with a central sensor control field.

IOP-2 Handheld Intelligent Operator Panel

A handheld version of the IOP-2 can be ordered for mobile use. In addition to the IOP-2, this includes a housing with rechargeable batteries, charging unit and RS232 connecting cable.

BOP-2 Basic Operator Panel

Menu navigation and 2-line display permit fast and user-friendly commissioning of the inverter. Simple basic commissioning by simultaneously displaying parameter and parameter value, as well as the option of filtering parameters.

Door mounting kit for IOP-2/BOP-2

Using the optionally available door mounting kit, the IOP-2/BOP-2 can be mounted in a control cabinet door with just a few manual operations (IP55/UL Type 12 degree of protection is achieved).

Push-through mounting frame for push-through variants of the PM240-2 Power Modules

It is advisable to use an optionally available mounting frame to install the push-through unit in a control cabinet. This mounting frame includes the necessary seals and frame to ensure compliance with degree of protection IP54. If the Power Module is installed without use of the optional mounting frame, the user is responsible for ensuring that the requisite degree of protection is provided. The kit contains all the necessary nuts and seals. For push-through Power Modules, frame sizes FSD to FSF, installation handles are available.

Memory card

The parameter settings for an inverter can be stored on the SINAMICS SD memory card. When service is required, e.g. after the inverter has been replaced, the drive system is immediately ready for use again. The memory card can also be used to upgrade the firmware of the Control Unit.

SINAMICS G120 Smart Access

Wireless commissioning, operation and diagnostics via mobile device or laptop thanks to the optional web server module SINAMICS G120 Smart Access enabling user-friendly operation and easy access to the inverter, even if this is installed in areas difficult to access.

Brake Relay

The Brake Relay allows the Power Module to be connected to an electromechanical motor brake. This allows the motor brake to be controlled directly from the Control Unit.

Safe Brake Relay

The Safe Brake Relay allows the Power Module to be safely connected to an electromechanical motor brake, allowing the brake to be directly and safely controlled from the CU250S-2 Control Unit in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

PC inverter connection kit 2

For controlling and commissioning an inverter directly from a PC if the appropriate software (STARTER commissioning tool or SINAMICS Startdrive) has been installed.

Shield connection kits for Power Modules

The shield connection kit makes it easier to connect the shields of supply and control cables, provides mechanical strain relief and thus ensures optimum EMC performance.

A shield connection kit is supplied as standard with PM240-2 Power Modules in frame sizes FSA to FSC.

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size for the frame sizes FSD to FSG. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered for frame sizes FSD to FSG.

Shield connection kits for Control Units

The shield connection kit offers optimum shield connection and strain relief for all signal and communication cables. It includes a matching shield connection plate and all of the necessary connecting and retaining elements for mounting.

Design (continued)

Description	Article No.
IOP-2 Intelligent Operator Panel Operating languages: English, German, French, Italian, Spanish, Portuguese, Dutch, Swedish, Finnish, Russian, Czech, Polish, Turkish, Chinese Simplified	**6SL3255-0AA00-4JA2**
IOP-2 Handheld Operator Panel	**6SL3255-0AA00-4HA1**
BOP-2 Operator Panel	**6SL3255-0AA00-4CA1**
Door mounting kit for IOP-2/BOP-2	**6SL3256-0AP00-0JA0**
Push-through mounting frame	
• For PM240-2 Power Modules degree of protection IP20, push-through variants	
- Frame size FSA	**6SL3260-6AA00-0DA0**
- Frame size FSB	**6SL3260-6AB00-0DA0**
- Frame size FSC	**6SL3260-6AC00-0DA0**
- Frame size FSD	**6SL3200-0SM17-0AA0**
- Frame size FSE	**6SL3200-0SM18-0AA0**
- Frame size FSF	**6SL3200-0SM20-0AA0**
Installation handles	
• For PM240-2 Power Modules – push-through variants	
- Frame sizes FSD to FSF	**6SL3200-0SM22-0AA0**
Memory card SINAMICS SD card [1] 512 MB	**6SL3054-4AG00-2AA0**
Brake Relay	**6SL3252-0BB00-0AA0**
Safe Brake Relay	**6SL3252-0BB01-0AA0**
PC inverter connection kit 2	**6SL3255-0AA00-2CA0**

Description	Article No.
Shield connection kits	
• For PM240-2 Power Modules	
- Frame sizes FSA to FSC	Supplied with the Power Modules, available as a spare part
- Frame sizes FSD to FSG A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered.	
- Frame size FSD	**6SL3262-1AD01-0DA0**
- Frame size FSE	**6SL3262-1AE01-0DA0**
- Frame size FSF	**6SL3262-1AF01-0DA0**
- Frame size FSG NEW	**6SL3262-1AG01-0DA0**
• For PM250 Power Modules	
- Frame size FSC	**6SL3262-1AC00-0DA0**
- Frame sizes FSD and FSE	**6SL3262-1AD00-0DA0**
- Frame size FSF	**6SL3262-1AF00-0DA0**
• For Control Units	
- For CU230P-2 HVAC and CU230P-2 DP	**6SL3264-1EA00-0FA0**
- For CU240E-2	**6SL3264-1EA00-0HA0**
- For CU230P-2 PN, CU240E-2 PN and CU240E-2 PN-F	**6SL3264-1EA00-0HB0**
- For CU250S-2	**6SL3264-1EA00-0LA0**
STARTER commissioning tool [2] on DVD-ROM	**6SL3072-0AA00-0AG0**
SINAMICS Startdrive commissioning tool [3] on DVD-ROM	**6SL3072-4EA02-0XG0**

[1] Approved for CU230P-2 HVAC and CU230P-2 DP Control Units with firmware version V4.6 and higher.

[2] STARTER commissioning tool is also available on the Internet at www.siemens.com/starter

[3] The SINAMICS Startdrive commissioning tool is also available on the Internet at https://support.industry.siemens.com/cs/document/68034568

Design (continued)

Line-side components

The following line-side components are available for SINAMICS G120 standard inverters:

Line filters

With one of the additional line filters, the Power Module attains a higher radio interference class.

Line reactors
(for PM240-2 Power Modules only)

Line reactors smooth the current drawn by the inverter and thus reduce harmonic components in the line current. Through the reduction of the current harmonics, the thermal load on the power components in the rectifier and in the DC link capacitors is reduced as well as the harmonic effects on the supply. The use of a line reactor increases the service life of the inverter.

A DC link reactor is integrated in the PM240-2 Power Modules, frame sizes FSD to FSG, and therefore no line reactor is required. No line reactor is provided for the PM250 Power Modules, nor may one be used.

Recommended line-side overcurrent protection devices

Overcurrent protection devices are absolutely necessary for the operation of the inverters. The tables listed in the section "Recommended line-side overcurrent protection devices" provide recommendations according to IEC and UL regulations, depending on the area of application. Recommendations on further overcurrent protection devices are available at:
https://support.industry.siemens.com/cs/document/109486009

More information about the listed Siemens fuses is available in Catalog LV 10 as well as in the Industry Mall.

DC link components

The following DC link components are available for the SINAMICS G120 standard inverters:

Braking resistors
(for PM240-2 Power Modules only)

Excess energy in the DC link is dissipated in the braking resistor. The braking resistors are designed for use with PM240-2 Power Modules. They are equipped with an integrated braking chopper (electronic switch).

For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered for frame sizes FSD to FSG.

Load-side power components

The following load-side power components are available for the SINAMICS G120 standard inverters. This means that during operation with output reactors or sine-wave filters, longer, shielded motor cables are possible and the motor service life can be extended:

Output reactors

Output reactors reduce the rate of voltage rise (dv/dt) and the height of the current peaks, and can allow longer motor cables to be connected.

Sine-wave filters
(not for PM240-2 Power Modules)

Sine-wave filters limit the rate of voltage rise (dv/dt) and the peak voltages on the motor winding. Similar to an output reactor, they enable the connection of longer motor cables.

dv/dt filters plus VPL
(for PM240-2 Power Modules 400 V and 690 V versions only)

dv/dt filters plus voltage peak limiters limit the rate of voltage rise and the typical voltage peaks.

Additional options

Further selected accessories are available from "Siemens Product Partner for Drives Options":
www.siemens.com/drives-options-partner

Spare parts

Spare parts kit for Control Units

The spare parts kit contains small parts for all variants of the following SINAMICS G120 Control Units:

- CU230P-2
- CU240E-2
- CU240E-2 F
- CU250S-2

Shield connection kits for PM240-2 Power Modules

A shield connection kit is supplied as standard with PM240-2 Power Modules in frame sizes FSA to FSC. This shield connection kit is also available as a spare part.

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size for the frame sizes FSD to FSG. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered for frame sizes FSD to FSG.

Terminal cover kits for frame sizes FSD to FSG

The terminal cover kit includes a replacement cover for the connecting terminals. Terminal cover kits which are suitable for the PM240-2 and PM250 Power Modules are available.

Replacement connectors for PM240-2 Power Modules

A set of connectors for the line feeder cable, braking resistor and motor cable can be ordered corresponding to the frame size of the PM240-2 Power Module.

Fan units for PM240-2 Power Modules

The fans of PM240-2 Power Modules are designed for extra long service life. For special requirements, replacement fans are available that can be exchanged quickly and easily.

Replacement fans for PM250 Power Modules

The fans of PM250 Power Modules are designed for extra long service life. Replacement fans can be ordered for special applications.

Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS G120 standard inverters:

Drive Technology Configurator (DT Configurator) within the CA 01

The interactive catalog CA 01 – the offline Industry Mall of Siemens – contains over 100000 products with approximately 5 million possible drive system product variants. The Drive Technology Configurator (DT Configurator) has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of drives. It is integrated as a selection tool in Catalog CA 01.

Online DT Configurator

In addition, the DT Configurator can be used on the Internet without requiring any installation. The DT Configurator can be found in the Siemens Industry Mall at the following address:
www.siemens.com/dt-configurator

SIZER for Siemens Drives engineering tool

The SIZER for Siemens Drives engineering tool makes it easy to configure the SINAMICS drive family. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives is designed to support configuring of the entire drive system.

You can find further information on the SIZER for Siemens Drives engineering tool in the section Engineering tools.

The SIZER for Siemens Drives engineering tool is available free on the Internet at
www.siemens.com/sizer

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics. Apart from the SINAMICS drives, STARTER is also suitable for MICROMASTER 4 devices.

You can find further information about the STARTER commissioning tool in the section Engineering tools.

Additional information about the STARTER commissioning tool is available on the Internet at
www.siemens.com/starter

SINAMICS Startdrive commissioning tool

SINAMICS Startdrive is a tool for configuring, commissioning, and diagnosing the SINAMICS family of drives and is integrated into the TIA Portal. SINAMICS Startdrive can be used to implement drive tasks with the SINAMICS G110M, SINAMICS G120, SINAMICS G120C, SINAMICS G120D and SINAMICS G120P inverter series. The commissioning tool has been optimized with regard to user friendliness and consistent use of the TIA Portal benefits of a common working environment for PLC, HMI and drives.

You can find further information about the SINAMICS Startdrive commissioning tool in the section Engineering tools.

The SINAMICS Startdrive commissioning tool is available free on the Internet at
www.siemens.com/startdrive

Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. Two software packages are available for SINAMICS – Drive ES Basic Maintenance and Drive ES PCS.

You can find further information about the Drive ES engineering system in the section Engineering tools.

Additional information about the Drive ES engineering system is available on the Internet at
www.siemens.com/drive-es

Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all the following components of the SINAMICS G120 standard inverters.

General technical specifications	
Mechanical ambient conditions	
Long-term storage acc. to EN 60721-3-1	
• Devices and components, frame sizes FSA ... FSG [1]	Class 1M2
Transport acc. to EN 60721-3-2	
• Devices and components, frame sizes FSA ... FSG [2]	Class 2M3
Operation acc. to EN 60721-3-3	
• Devices and components, frame sizes FSA ... FSG	Class 3M1
- Vibration test	Test Fc (sinusoidal) according to EN 60068-2-6 Deflection: 0.075 mm at 10 ... 57 Hz Acceleration: 10 m/s^2 (1 × *g*) at 57 ... 150 Hz 10 frequency cycles per axis
- Shock test	Test Ea (semi-sinusoidal) according to EN 60068-2-27 Acceleration: 49 m/s^2 (5 × *g*) at 30 ms 3 shocks in all three axes in both directions

General technical specifications	
Ambient conditions	
Protection class acc. to EN 61800-5-1	Class I (with protective conductor system) and class III (PELV)
Touch protection acc. to EN 61800-5-1	For the intended purpose
Permissible ambient and coolant temperature (air) during operation for line-side components and Power Modules	
• Low overload (LO)	
- PM240-2, frame sizes FSA ... FSC	-10 ... +40 °C (14 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics
- PM240-2, frame sizes FSD ... FSG	-20 ... +40 °C (-4 ... +104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics
- PM250	0 ... 40 °C (32 ... 104 °F) without derating >40 ... 60 °C (>104 ... 140 °F) see derating characteristics
• High overload (HO)	
- PM240-2, frame sizes FSA ... FSC	-10 ... +50 °C (14 ... 122 °F) without derating >50 ... 60 °C (>104 ... 140 °F) see derating characteristics
- PM240-2, frame sizes FSD ... FSG	-20 ... +50 °C (-4 ... +122 °F) without derating >50 ... 60 °C (>104 ... 140 °F) see derating characteristics
- PM250	0 ... 50 °C (32 ... 122 °F) without derating >50 ... 60 °C (>122 ... 140 °F) see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units and supplementary system components	With CU230P-2 HVAC and CU230P-2 DP: -10 ... +60 °C (14 ... 140 °F) With CU230P-2 PN: -10 ... +55 °C (14 ... 131 °F) With CU240E-2 (without PN): -10 ... +55 °C (14 ... 131 °F) With CU240E-2 PN and CU240E-2 PN-F: -10 ... +53 °C (14 ... 127.4 °F) With CU250S-2: -10 ... +50 °C (14 ... 122 °F) With IOP/BOP-2: 0 ... 50 °C (32 ... 122 °F) Derating of 3 K/1000 m (3281 ft) applies to Control Units as of an installation altitude of 1000 m (3281 ft) above sea level.

[1] In product packaging.
[2] In transport packaging.

Technical specifications (continued)

General technical specifications	
Ambient conditions (continued)	
Climatic ambient conditions	
• Storage [1] acc. to EN 60721-3-1	Class 1K4 Temperature: -25 ... +55 °C (-13 ... +131 °F)
• Transport [1] acc. to EN 60721-3-2	Class 2K4 Temperature -40 ... +70 °C (-40 ... +158 °F)
• Operation acc. to EN 60721-3-3	Better than class 3K3 with regard to • Temperature: -10 ... +40 °C (14 ... 104 °F) without derating >40 ... 60 °C (>32 ... 140 °F) see derating characteristics • Relative humidity: 5 … 95 % (no condensation) Oil mist, salt mist, ice formation, condensation, dripping water, spraying water, splashing water and water jets are not permitted
Environmental class/harmful chemical substances	
• Storage [1] acc. to EN 60721-3-1	Class 1C2
• Transport [2] acc. to EN 60721-3-2	Class 2C2
• Operation acc. to EN 60721-3-3	
- PM250 and PM240-2 Power Modules FSA to FSC	Class 3C2 [2]
- PM240-2 Power Modules, FSD to FSG	Class 3C3 [2]
Organic/biological influences	
• Storage [1] acc. to EN 60721-3-1	Class 1B1
• Transport [1] acc. to EN 60721-3-2	Class 2B1
• Operation acc. to EN 60721-3-3	Class 3B1
Degree of pollution acc. to EN 61800-5-1	2
Certification for fail-safe versions	
Applies to Control Units of the CU240E-2 and CU250S-2 series. The values include Control Unit and Power Module. Note: The Safety Integrated Function Manual contains detailed information about the safety functions: https://support.industry.siemens.com/cs/document/109477367	The PM240-2 Power Modules, frame sizes FSD to FSG additionally offer STO acc. to IEC 61508 SIL 3 and EN ISO 13489-1 PL e and Category 3.
• According to IEC 61508	SIL 2
• According to EN ISO 13849-1	PL d and Category 3
Standards	
Compliance with standards	
- PM240-2	CE, cULus, RCM, SEMI F47, RoHS, EAC, KC (only with internal or external line filters Category C2) For frame sizes FSD ... FSG also: WEEE (Waste Electrical & Electronic Equipment)
- PM250	CE, UL, cUL, RCM, SEMI F47
CE marking	According to Low-Voltage Directive 2014/35/EU

General technical specifications	
EMC Directive acc. to EN 61800-3	
Interference immunity	
PM240-2 Power Modules **PM250 Power Modules**	The Power Modules are tested according to the interference immunity requirements for environments according to Category C3
Interference emissions	
PM240-2 Power Modules	
• Frame sizes FSA to FSF without integrated line filter	[3]
• Frame sizes FSA to FSC with integrated line filter class A	Observance of the limit values - according to Category C3 - for conducted interferences and field-conducted interference emissions according to Category C2 [4]
• Frame sizes FSD to FSG with integrated line filter class A	Observance of the limit values according to Categories C3 and C2 [4]
• Frame sizes FSA to FSC without integrated line filter with optional line filter class B	Observance of the limit values - for conducted interferences according to Category C1 - for field-conducted interference emissions according to Category C2 [4]
PM250 Power Modules	
• Frame size FSC with integrated line filter class A	Observance of the limit values according to Categories C3 and C2 [4]
• Frame size FSC with integrated line filter class A and optional line filter class B	Observance of the limit values - for low-frequency harmonic effects and conducted interferences according to Category C1 - for field-conducted interference emissions according to Category C2 [4]
• Frame sizes FSD to FSF without integrated line filter	[3]
• Frame sizes FSD to FSF with integrated line filter class A	Observance of the limit values according to Categories C3 and C2 [4]

Note:

The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter. The frequency inverters on their own do not generally require identification according to the EMC Directive.

[1] In transport packaging.

[2] SIPLUS components for extreme requirements are available. More information is available on the Internet at www.siemens.com/siplus-drives

[3] Non-filtered devices are designed for operation on IT systems or in conjunction with an RCD. The customer must provide suitable RI suppression equipment to ensure that these devices comply with the limits defined for Category C3 or C2.

[4] Max. permissible cable lengths see section Power Modules → Integration.

Technical specifications (continued)

Compliance with standards

CE marking

The SINAMICS G120 inverters meet the requirements of 2014/35/EU.

Low-Voltage Directive

The inverters comply with the following standards listed in the official journal of the EU:

- EN 60204
  Safety of machinery, electrical equipment of machines
- EN 61800-5-1
  Adjustable speed electrical power drive systems – Part 5-1: Requirements regarding safety – electrical, thermal, and energy requirements

UL listing

Inverter devices in UL category NMMS certified to UL and cUL, in compliance with UL508C. UL list numbers E121068 and E192450. This applies to all PM240-2 and PM250 Power Modules.

For use in environments with pollution degree 2.

See also on the Internet at
www.ul.com

Machinery Directive

The inverters are suitable for installation in machines. Compliance with the Machinery Directive 2006/42/EC requires a separate certificate of conformity. This must be provided by the plant construction company or the organization marketing the machine.

EMC Directive

- EN 61800-3
  Adjustable speed electrical power drive systems
  Part 3: EMC product standard including specific test methods

The following information applies to SINAMICS G120 frequency inverters from Siemens:

- The EMC product standard EN 61800-3 does not apply directly to a frequency inverter but to a PDS (Power Drive System), which comprises the complete circuitry, motor and cables in addition to the inverter.
- Frequency inverters are normally only supplied to experts for installation in machines or systems. A frequency inverter must, therefore, only be considered as a component which, on its own, is not subject to the EMC product standard EN 61800-3. The inverter's operating instructions, however, specify the conditions regarding compliance with the product standard if the frequency inverter is expanded to become a PDS. For a PDS, the EMC Directive in the EU is complied with by observing the product standard EN 61800-3 for variable-speed electric drive systems. The frequency inverters on their own do not generally require identification according to the EMC Directive.
- Different categories C1 to C4 have been defined in accordance with the environment of the PDS at the operating location:
  - **Category C1:** Drive systems for rated voltages < 1000 V for use in the first environment
  - **Category C2:** Stationary drive systems not connected by means of a plug connector for rated voltages < 1000 V. When used in the first environment, the system must be installed and commissioned by personnel familiar with EMC requirements. A warning note is required.
  - **Category C3:** Drive systems for rated voltages < 1000 V for exclusive use in the second environment. A warning note is required.
  - **Category C4:** Drive systems for rated voltages ≥ 1000 V or for rated currents ≥ 400 A or for use in complex systems in the second environment. An EMC plan must be created.
- The EMC product standard EN 61800-3 also defines limit values for conducted interference and radiated interference for the "second environment" (= industrial power supply systems that do not supply households). These limit values are below the limit values of filter class A acc. to EN 55011. Unfiltered inverters can be used in industrial environments as long as they are part of a system that contains line filters on the higher-level infeed side.
- With SINAMICS G120, Power Drive Systems (PDS) that fulfill the EMC product standard EN 61800-3 can be configured when observing the installation instructions in the product documentation.
- A differentiation must be made between the product standards for electrical drive systems (PDS) of the range of standards EN 61800 (of which Part 3 covers EMC topics) and the product standards for the devices/systems/machines, etc. This will probably not result in any changes in the practical use of frequency inverters. Since frequency inverters are always part of a PDS and these are part of a machine, the machine manufacturer must observe various standards depending on their type and environment (e.g. EN 61000-3-2 for line harmonics and EN 55011 for radio interference). The product standard for PDS on its own is, therefore, either insufficient or irrelevant.
- With respect to the compliance with limits for line supply harmonics, the EMC product standard EN 61800-3 for PDS refers to compliance with the EN 61000-3-2 and EN 61000-3-12 standards.
- Regardless of the configuration with SINAMICS G120 and its components, the machine construction company (OEM) can also apply other measures to ensure that the machine complies with the EU EMC Directive. The EU EMC Directive is generally fulfilled when the relevant EMC product standards are observed. If they are not available, the generic standards (e.g. DIN EN 61000-x-x) can be used instead. It is important that the conducted and emitted interference at the line supply connection point and outside the machine remain below the relevant limit values. Any suitable technical measures can be applied to ensure this.

SEMI F47

SEMI F47 is an industry standard relating to the immunity to voltage dips. This includes the requirement that industrial equipment must be able to tolerate defined dips or drops of the line supply voltage. As a result, industrial equipment that fulfills this standard is more reliable and productive. In the SINAMICS G120 product family, the PM240-2 and PM250 Power Modules fulfill the latest SEMI F47-0706 standard. In the case of a voltage dip, defined in accordance with SEMI F47-0607, these drives either continue to supply a defined output current, or using an automatic restart function, continue to operate as expected.