

SINAMICS G120C compact inverters

0.55 kW to 18.5 kW (0.75 hp to 25 hp)

SINAMICS G120C compact inverters

Overview



SINAMICS G120C frame sizes FSA, FSB and FSC with mounted blanking cover

SINAMICS G120C compact inverters offer a well-balanced combination of features to address a wide range of applications. SINAMICS G120C inverters are compact, rugged devices that are easy to operate and can be optionally equipped with a basic or advanced operator panel.

SINAMICS G120C inverters are especially suitable when it comes to meeting the requirements of system integrators, OEMs and distributors regarding high productivity and tailored performance.

Benefits

- Compact design
- Side-by-side design
- High power density, low envelope dimensions
- Simple installation in the tightest space
- Low space requirement
- Use in small control cabinets, close to the machine
- Optimized parameter set
- Optimized commissioning
- Getting Started document
- BOP-2 or IOP operator panels can be used
- Integrated USB connection
- Simple and fast software parameter assignment
- Simple to use during commissioning and in operation
- Minimized training costs, existing SINAMICS know-how can be used
- High degree of service friendliness, simple maintenance
- Plug-in terminals
- Cloning function using BOP-2, IOP or memory card
- Operating hours counter for "drive on" and "motor on"
- Fast mechanical installation
- Intuitive standard commissioning
- Integrated component of Totally Integrated Automation
- Energy-efficient, sensorless vector control
- Automatic flux reduction with V/f ECO
- Integrated energy saving computer
- Safety Integrated (STO)
- Communications versions with PROFINET, PROFIBUS DP, CAN, USS/Modbus RTU
- Coated modules
- Operation up to an ambient temperature of 60 °C (140 °F)

Design

SINAMICS G120C is a compact inverter for control cabinet mounting in IP20 degree of protection where the Control Unit (CU) and Power Module (PM) function units are combined in one device.

The compact mechanical design and the high power density allow these devices to be installed in machine control enclosures and control cabinets for maximum space utilization. The SINAMICS G120C compact inverter can be butt-mounted directly, without derating; the PROFINET version can be butt-mounted up to 55 °C (131 °F).



SINAMICS G120C, frame size FSB, with BOP-2

SINAMICS G120C can be integrated into the widest range of applications, either using the integrated digital and analog inputs or via the integrated fieldbus interface (available in the USS/Modbus RTU, PROFIBUS DP, PROFINET, CANopen versions). Especially the product versions with integrated PROFIBUS DP or PROFINET interface make full integration into the Siemens TIA family possible, therefore allowing the advantages of the seamless TIA product family to be fully utilized. SINAMICS G120C devices are preset in the factory so that they can be immediately connected to PROFIBUS DP, PROFINET and CANopen fieldbuses and used without parameterization.

SINAMICS G120C is also equipped with the safety function STO (Safe Torque Off) as standard, which is used to safely stop drives. As a consequence, machine manufacturers can simply comply with current machinery directives with minimum associated costs.

SINAMICS G120C can control asynchronous (induction) motors in the power range from 0.37 kW up to 18.5 kW (0.5 hp up to 25 hp). Reliable and efficient motor operation is achieved by using state-of-the-art IGBT technology combined with vector control. The extensive range of functions integrated in the SINAMICS G120C also offers a high degree of protection for the inverter and motor.

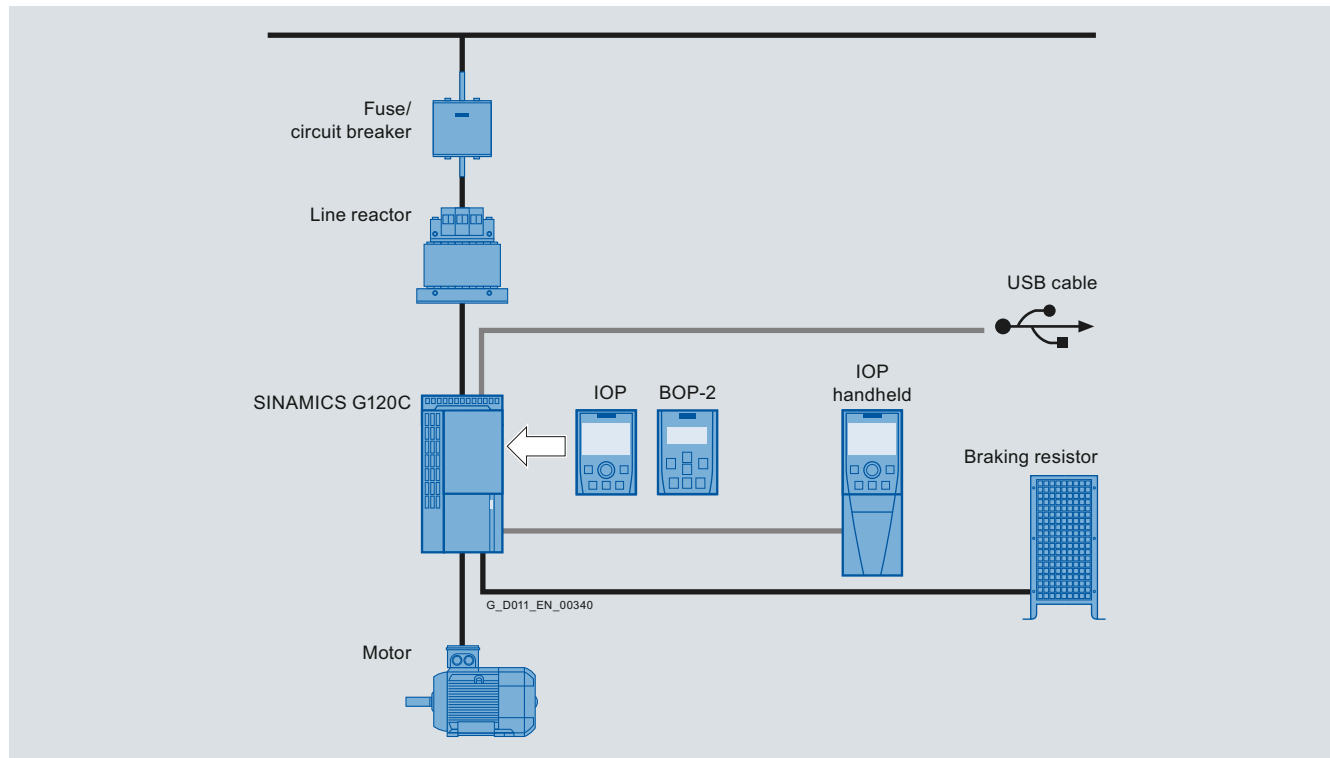
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Design

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Line-side components

Line reactors

A line reactor is used to smooth voltage peaks (inverter protection) and to reduce commutating dips (line harmonic distortion).

Recommended line-side power components

Standard fuses can be used for the SINAMICS G120C. These must be dimensioned to comply with local regulations. In this chapter, you will find recommended components such as fuses and circuit breakers in compliance with IEC and UL regulations.

DC link components

Braking resistors

The excess energy of the DC link is dissipated using the braking resistor. The braking resistors are designed for use with the SINAMICS G120C. This has an integrated brake chopper (electronic switch).

Supplementary system components

Intelligent Operator Panel IOP

Graphics-based, user-friendly and powerful operator panel for commissioning and diagnostics as well as local operator control and monitoring of SINAMICS G120C.

Basic Operator Panel BOP-2

A 2-line display to provide support when commissioning and troubleshooting the drive. The drive can be locally controlled.

Memory cards

The parameter settings for an inverter can be stored on the SINAMICS micro memory card (MMC) or SINAMICS SD card. When service is required, e.g. after the inverter has been replaced and the data have been downloaded from the memory card the drive system is immediately ready for use again. The associated memory card holder is integrated in the inverter.

PC inverter connection kit 2

For controlling and commissioning an inverter directly from a PC, if the STARTER commissioning tool V4.3 and higher has been installed on the PC.

Spare parts

Shield plates

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size of the SINAMICS G120C, and can also be ordered as spare parts.

Spare parts kit

This kit comprises 5 sets of I/O terminals, 1 RS485 terminal, 2 pairs of Control Unit doors (1 × PN and 1 × other communication versions) and 1 blanking cover.

Set of connectors

A set of connectors for the line feeder cable, braking resistor and motor cable can be ordered corresponding to the frame size of the SINAMICS G120C inverter.

Roof-mounted fan

A roof-mounted fan (at the top of the device) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C.

Fan unit

A replacement fan (at the rear of the device; heat sink) comprising a pre-assembled unit with holder and fan can be ordered corresponding to the frame size of the SINAMICS G120C.

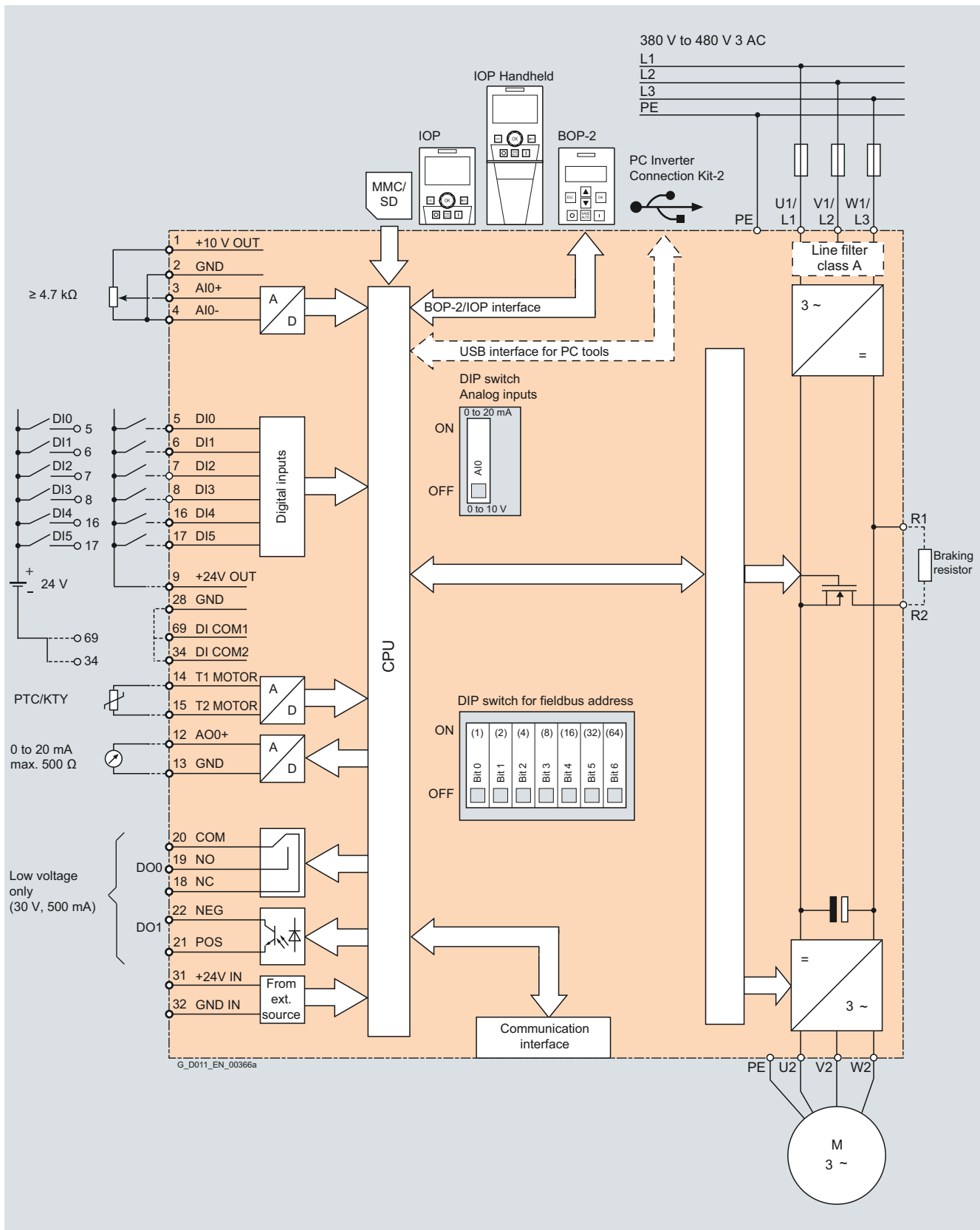
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Integration

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Connection example for SINAMICS G120C

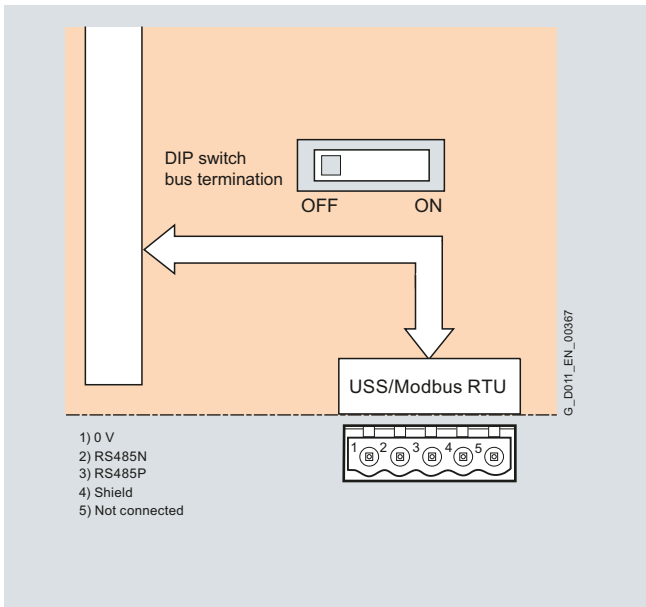
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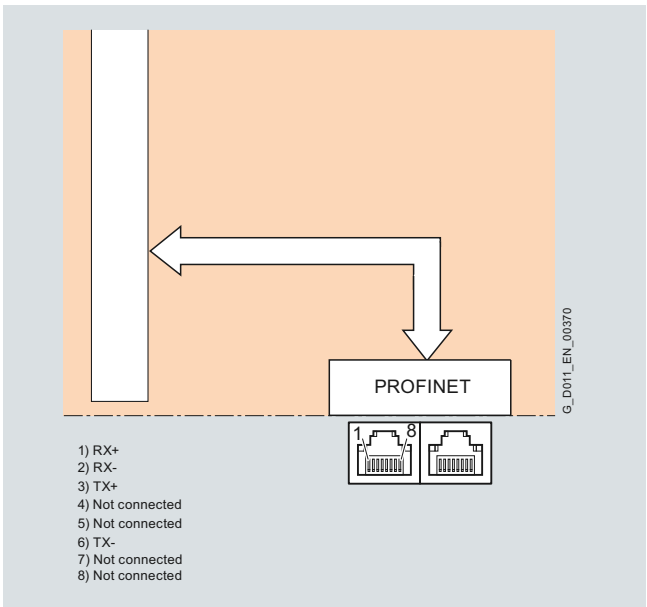
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Integration

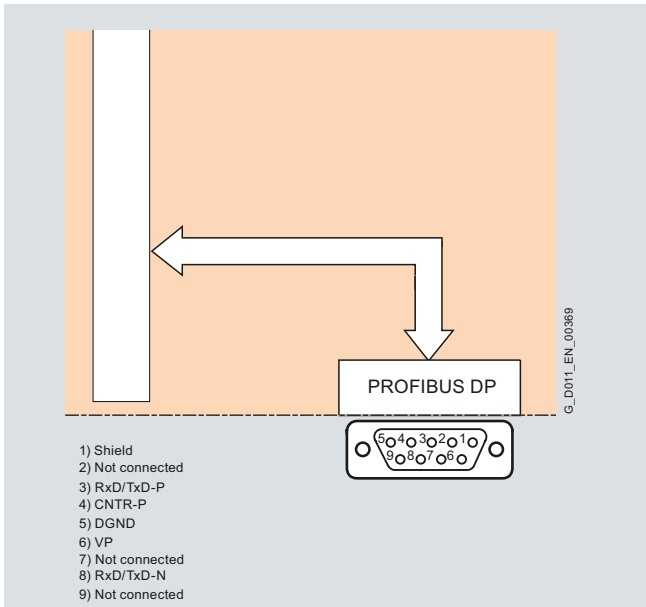
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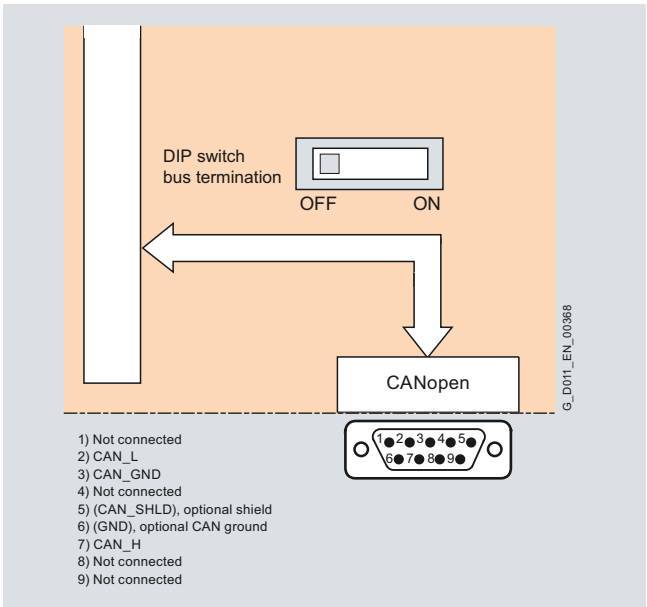
USS/Modbus RTU communication interface



PROFINET communication interface



PROFIBUS DP communication interface



CANopen communication interface

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Configuration

The following electronic configuring guides and engineering tools are available for the SINAMICS G120C compact inverters:

Selection guide DT Configurator within the CA 01

The interactive catalog CA 01 – the offline mall of Siemens Industry Automation & Drive Technologies – contains over 100000 products with approximately 5 million possible drive system product variants. The DT Configurator has been developed to facilitate selection of the optimum motor and/or inverter from the wide spectrum of drives. The configurator is integrated as a "selection guide" in this catalog on the DVD-ROM with the selection and configuration tools.

Online DT Configurator

In addition, the DT Configurator can be used in 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 engineer the SINAMICS and MICROMASTER 4 drive families. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives covers the full range of operations required to configure a complete drive system, from basic single drives to demanding multi-axis applications.

[Additional information on the SIZER for Siemens Drives engineering tool is provided in Catalog D 31, chapter Engineering tools.](#)

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. For SINAMICS G120D, STARTER version 4.3 and higher.

[Additional information on the STARTER commissioning tool is provided in Catalog D 31, chapter Engineering tools.](#)

Drive ES engineering system

Drive ES is the engineering system used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The STEP 7 Manager user interface provides the ideal basis for this. A variety of software packages are available for SINAMICS – Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7.1.

[Additional information on the Drive ES engineering system is provided in Catalog D 31, chapter Engineering tools.](#)

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Selection and ordering data

The order number is selected corresponding to

- the required motor power or the motor current required and the overload requirements of the application,
- the necessary EMC classification and
- the required integrated fieldbus interface

Rated power ¹⁾		Base-load current I_L ²⁾	Base-load current I_H ³⁾	Frame size	Version	SINAMICS G120C without filter		SINAMICS G120C with integrated filter class A	
kW	hp					Order No.	Order No.		
Line voltage 380 ... 480 V 3 AC									
0.55	0.75	1.7	1.3	FSA	USS/Modbus RTU	new	6SL3210-1KE11-8UB1	new	6SL3210-1KE11-8AB1
					PROFIBUS DP	new	6SL3210-1KE11-8UP1	new	6SL3210-1KE11-8AP1
					PROFINET	new	6SL3210-1KE11-8UF1	new	6SL3210-1KE11-8AF1
					CANopen	new	6SL3210-1KE11-8UC1	new	6SL3210-1KE11-8AC1
0.75	1.0	2.2	1.7	FSA	USS/Modbus RTU	new	6SL3210-1KE12-3UB1	new	6SL3210-1KE12-3AB1
					PROFIBUS DP	new	6SL3210-1KE12-3UP1	new	6SL3210-1KE12-3AP1
					PROFINET	new	6SL3210-1KE12-3UF1	new	6SL3210-1KE12-3AF1
					CANopen	new	6SL3210-1KE12-3UC1	new	6SL3210-1KE12-3AC1
1.1	1.5	3.1	2.2	FSA	USS/Modbus RTU	new	6SL3210-1KE13-2UB1	new	6SL3210-1KE13-2AB1
					PROFIBUS DP	new	6SL3210-1KE13-2UP1	new	6SL3210-1KE13-2AP1
					PROFINET	new	6SL3210-1KE13-2UF1	new	6SL3210-1KE13-2AF1
					CANopen	new	6SL3210-1KE13-2UC1	new	6SL3210-1KE13-2AC1
1.5	2.0	4.1	3.1	FSA	USS/Modbus RTU	new	6SL3210-1KE14-3UB1	new	6SL3210-1KE14-3AB1
					PROFIBUS DP	new	6SL3210-1KE14-3UP1	new	6SL3210-1KE14-3AP1
					PROFINET	new	6SL3210-1KE14-3UF1	new	6SL3210-1KE14-3AF1
					CANopen	new	6SL3210-1KE14-3UC1	new	6SL3210-1KE14-3AC1
2.2	3.0	5.6	4.1	FSA	USS/Modbus RTU	new	6SL3210-1KE15-8UB1	new	6SL3210-1KE15-8AB1
					PROFIBUS DP	new	6SL3210-1KE15-8UP1	new	6SL3210-1KE15-8AP1
					PROFINET	new	6SL3210-1KE15-8UF1	new	6SL3210-1KE15-8AF1
					CANopen	new	6SL3210-1KE15-8UC1	new	6SL3210-1KE15-8AC1
3.0	4.0	7.3	5.6	FSA	USS/Modbus RTU	new	6SL3210-1KE17-5UB1	new	6SL3210-1KE17-5AB1
					PROFIBUS DP	new	6SL3210-1KE17-5UP1	new	6SL3210-1KE17-5AP1
					PROFINET	new	6SL3210-1KE17-5UF1	new	6SL3210-1KE17-5AF1
					CANopen	new	6SL3210-1KE17-5UC1	new	6SL3210-1KE17-5AC1
4.0	5.0	8.8	7.3	FSA	USS/Modbus RTU	new	6SL3210-1KE18-8UB1	new	6SL3210-1KE18-8AB1
					PROFIBUS DP	new	6SL3210-1KE18-8UP1	new	6SL3210-1KE18-8AP1
					PROFINET	new	6SL3210-1KE18-8UF1	new	6SL3210-1KE18-8AF1
					CANopen	new	6SL3210-1KE18-8UC1	new	6SL3210-1KE18-8AC1
5.5	7.5	12.5	8.8	FSB	USS/Modbus RTU	new	6SL3210-1KE21-3UB1	new	6SL3210-1KE21-3AB1
					PROFIBUS DP	new	6SL3210-1KE21-3UP1	new	6SL3210-1KE21-3AP1
					PROFINET	new	6SL3210-1KE21-3UF1	new	6SL3210-1KE21-3AF1
					CANopen	new	6SL3210-1KE21-3UC1	new	6SL3210-1KE21-3AC1
7.5	10	16.5	12.5	FSB	USS/Modbus RTU	new	6SL3210-1KE21-7UB1	new	6SL3210-1KE21-7AB1
					PROFIBUS DP	new	6SL3210-1KE21-7UP1	new	6SL3210-1KE21-7AP1
					PROFINET	new	6SL3210-1KE21-7UF1	new	6SL3210-1KE21-7AF1
					CANopen	new	6SL3210-1KE21-7UC1	new	6SL3210-1KE21-7AC1
11	15	25	16.5	FSC	USS/Modbus RTU	new	6SL3210-1KE22-6UB1	new	6SL3210-1KE22-6AB1
					PROFIBUS DP	new	6SL3210-1KE22-6UP1	new	6SL3210-1KE22-6AP1
					PROFINET	new	6SL3210-1KE22-6UF1	new	6SL3210-1KE22-6AF1
					CANopen	new	6SL3210-1KE22-6UC1	new	6SL3210-1KE22-6AC1
15	20	31	25	FSC	USS/Modbus RTU	new	6SL3210-1KE23-2UB1	new	6SL3210-1KE23-2AB1
					PROFIBUS DP	new	6SL3210-1KE23-2UP1	new	6SL3210-1KE23-2AP1
					PROFINET	new	6SL3210-1KE23-2UF1	new	6SL3210-1KE23-2AF1
					CANopen	new	6SL3210-1KE23-2UC1	new	6SL3210-1KE23-2AC1
18.5	25	37	31	FSC	USS/Modbus RTU	new	6SL3210-1KE23-8UB1	new	6SL3210-1KE23-8AB1
					PROFIBUS DP	new	6SL3210-1KE23-8UP1	new	6SL3210-1KE23-8AP1
					PROFINET	new	6SL3210-1KE23-8UF1	new	6SL3210-1KE23-8AF1
					CANopen	new	6SL3210-1KE23-8UC1	new	6SL3210-1KE23-8AC1

¹⁾ The rated power of the device based on the rated output current I_L and a rated input voltage of 400 V 3 AC. The rated power is specified on the device rating plate.

²⁾ The base-load current I_L is based on the duty cycle for low overload (LO). The current value is specified on the device rating plate.

³⁾ The base-load current I_H is based on the duty cycle for high overload (HO). The current value is not specified on the device rating plate.

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Technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all SINAMICS G120C compact inverters.

Mechanical specifications	
Vibratory load According to EN 60068-2-6	
• Transport in the transport packaging	5 ... 9 Hz: Constant deflection 3.1 mm 9 ... 200 Hz: Constant acceleration = 9.81 m/s ² (1 × g)
• Operation	2 ... 9 Hz: Constant deflection 7 mm 9 ... 200 Hz: Constant acceleration = 19.62 m/s ² (2 × g)
Shock load According to EN 60068-2-27	
• Transport in the transport packaging	147.15 m/s ² (15 × g)/11 ms 3 shocks in each axis and direction
• Operation	147.15 m/s ² (15 × g)/11 ms 3 shocks in each axis and direction
Degree of protection	IP20/ UL open type
Permissible mounting position	Horizontal panel mounting
Ambient conditions	
Protection class According to EN 61800-5-1	Class III (PELV1)
Touch protection According to EN 61800-5-1	Class I (with protective conductor system)
Humidity, max.	95 % at 40 °C (104 °F), condensation and icing not permissible
Ambient temperature	
• Storage ¹⁾ acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Transport ¹⁾ acc. to EN 60068-2-1	-40 ... +70 °C (-40 ... +158 °F)
• Operation acc. to EN 60068-2-2	-10 ... +40 °C (14 ... 104 °F) without derating >40 ... 60 °C (104 ... 140 °F) see derating characteristics
Environmental class in operation	
• Harmful chemical substances	Class 3C2 to EN 60721-3-3
• Organic/biological pollutants	Class 3B1 to EN 60721-3-3
• Degree of pollution	2 acc. to EN 61800
Standards	
Compliance with standards	CE, cULus, c-tick
Fail-safe certification	Function: Safe Torque Off (STO)
• According to EN 60204 (2007)	Category 3
• According to IEC 61508, Parts 1 to 7 (1998 ... 2001)	SIL 2
• According to EN ISO 13849 Part 1 (2008)	PL d
• PFH _D	5 × 10 ⁻⁸
• T1	20 years
CE marking, according to	EMC Directive 2004/108/EC Low-Voltage Directive 2006/95/EC
EMC behavior According to EN 61800-3	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.
• Frame sizes FSA to FSC with integrated line filter class A	Category C2 with max. 25 m (82 ft) shielded motor cable and conducted interference
• Frame size FSA with integrated line filter class A	Category C2 with max. 25 m (82 ft) shielded motor cable
• Frame size FSB with integrated line filter class A and non-PROFINET version	Category C2 with max. 25 m (82 ft) shielded motor cable
• Frame size FSB with integrated line filter class A and PROFINET version as well as mandatory use of a line reactor at the inverter	Category C2 with max. 25 m (82 ft) shielded motor cable
• Frame size FSB with integrated line filter class A and PROFINET version	Category C3 with max. 25 m (82 ft) shielded motor cable
• Frame size FSC with integrated line filter class A	Category C3 with max. 25 m (82 ft) shielded motor cable

¹⁾ In transport packaging.

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	6SL3210-1KE...B1	6SL3210-1KE...P1	6SL3210-1KE...F1	6SL3210-1KE...C1
Integrated bus interface				
Protocols	USS Modbus RTU (switchable using a parameter)	PROFIdrive Profile V4.1	PROFINET IO PROFIdrive profile V4.1 PROFIsave PROFenergy	CANopen
Hardware	Plug-in terminal, insulated, USS: max. 187.5 kbaud Modbus RTU: 19.2 kbaud, Bus terminating resistors that can be switched in	9-pin SUB-D connector, insulated, Max. 12 Mbit/s Slave address can be set using DIP switches	2 × RJ45, max. 100 Mbit/s (full duplex), device name can be stored on the device	9-pin SUB-D socket, insulated, Max. 1 Mbit/s
I/O interfaces				
Signal cable cross-section	0.15 mm ² ... 1.5 mm ² (AWG28 ... AWG16)			
Digital inputs – Standard	6 isolated inputs Optically isolated; Free reference potential (own potential group) NPN/PNP logic can be selected using the wiring			
• Switching level: 0 → 1	11 V			
• Switching level: 1 → 0	5 V			
• Input current, max.	15 mA			
Fail-safe input	1 safety input When using the standard digital inputs (DI4+DI5) Safety function: Safe Torque OFF (STO)			
Digital outputs	1 relay changeover contact 30 V DC, 0.5 A (ohmic load) 1 transistor 30 V DC, 0.5 A (ohmic load)			
Analog inputs	1 analog input Differential input Switchable between voltage (-10 ... +10 V) and current (0/4 ... 20 mA) using a DIP switch 10-bit resolution Can be used as additional digital input Analog inputs are protected in a voltage range of ± 30 V and have a common-mode voltage in the ± 15 V range.			
• Switching threshold: 0 → 1	4 V			
• Switching threshold: 1 → 0	1.6 V			
Analog outputs	1 analog output Non-isolated output Switchable between voltage (0 ... 10 V) and current (0/4 ... 20 mA) using a parameter Voltage mode: 10 V, min. burden 10 kΩ Current mode: 20 mA, max. burden 500 Ω The analog outputs have short circuit protection			
PTC/KTY interface	1 motor temperature sensor input Sensors that can be connected: PTC, KTY and Thermo-Click, Accuracy ±5 °C			
Voltage supply for the integrated Control Unit	24 V DC via the Power Module or by connecting to an external 20.4 ... 28.8 V DC power supply			
Tool interfaces				
Memory cards	Optional 1 SINAMICS micro memory card (MMC) or 1 SINAMICS SD card			
Operator panels	Optional Basic Operator Panel BOP-2 or Intelligent Operator Panel IOP			
PC interface	USB			

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	6SL3210-1KE...-B1	6SL3210-1KE...-P1	6SL3210-1KE...-F1	6SL3210-1KE...-C1
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	–			
Software functions				
Setpoint input	✓			
Fixed frequencies	16, parameterizable			
JOG	✓			
Digital motorized potentiometer (MOP)	✓			
Ramp smoothing	✓			
Extended ramp-function generator (with ramp smoothing Off3)	✓			
Positioning down ramp	–			
Slip compensation	✓			
Signal interconnection with BICO technology	✓			
Free function blocks (FFB) for logical and arithmetic operations	–			
Switchable drive data sets (DDS)	–			
Switchable command data sets (CDS)	✓ (2)			
Flying restart	✓			
Automatic restart after line supply failure or operating fault (AR)	✓			
Technology controller (internal PID)	✓			
Energy consumption counter	✓			
Energy saving computer	✓			
Thermal motor protection	✓ (I^2t , sensor: PTC/KTY/Thermo-Click)			
Thermal inverter protection	✓			
Motor identification	✓			
Motor holding brake	✓			
Auto-ramping (V_{dcmax} controller)	✓			
Kinetic buffering (V_{dcmin} controller)	✓			
Braking functions				
• DC braking	✓			
• Compound braking	✓			
• Dynamic braking with integrated brake chopper	✓			

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General technical specifications of the power electronics

System operating voltage	380 ... 480 V 3 AC +10 % -20 %
Line supply requirements Line short circuit voltage u_K	No restriction
Input frequency	47 ... 63 Hz
Output frequency	
• Control type V/f	0 ... 650 Hz
• Control type Vector	0 ... 240 Hz
Pulse frequency	4 kHz for higher pulse frequencies up to 16 kHz, see derating data
Power factor λ	0.7 ... 0.85
Offset factor $\cos \varphi$	≥ 0.95
Output voltage, max. In % of input voltage	95 %
Overload capability	
• Low overload LO <u>Note:</u> No reduction in base-load current I_L for use of overload.	1.5 × base-load current I_L (i. e. 150 % overload) for 3 s plus 1.1 × base-load current I_L (i. e. 110 % overload) for 57 s within a cycle time of 300 s
• High overload HO <u>Note:</u> No reduction in base-load current I_H for use of overload.	2 × base-load current I_H (i. e. 200 % overload) for 3 s plus 1.5 × base-load current I_H (i. e. 150 % overload) for 57 s within a cycle time of 300 s
Electromagnetic compatibility	With integrated line filter Category C2/C3 according to EN 61800-3
Cooling	Air cooling using an integrated fan
Installation altitude	Up to 1000 m (3281 ft) above sea level without derating, > 1000 m (3281 ft) see derating characteristics
Standard SCCR (Short Circuit Current Rating) ¹⁾	65 kA
Protection functions	<ul style="list-style-type: none"> • Undervoltage • Overvoltage • Overcontrol/overload • Ground fault • Short-circuit • Stall protection • Motor blocking protection • Motor overtemperature • Inverter overtemperature

¹⁾ Applies to industrial control cabinet installations to NEC article 409/UL 508A.