

System configuration

SINAMICS G120P and SINAMICS G120P Cabinet pump, fan, compressor converters

Integrated Drive Systems

Overview

The core elements of a fully integrated drive system are frequency converters/inverters, motors, couplings and gear units. Siemens offers all the required components in top manufacturing quality from a single source, perfectly integrated – operating perfectly together, for all performance classes.

As a standard solution or tailored to individual requirements: no other provider on the market is able to offer a comparable portfolio. All Siemens drive components are optimally tuned to each other so that they interact ideally in every application.

Siemens Integrated Drive Systems turn simple drive components into real systems. Drive technology based on IDS ensures maximum productivity, energy efficiency and reliability in every automation environment and over the entire product lifecycle.

SINAMICS G120P frequency converters

SINAMICS G120P is an important element of an integrated drive system. The core elements of a fully integrated drive system are SINAMICS G120P frequency converters, motor types SIMOTICS SD and GP (VSD10 Line) and SIMOTICS FD, as well as couplings. Vertical integration is achieved by the CU230P-2 Control Unit.

Drives with a quadratic load torque ($M \sim n^2$), such as drives for pumps and fans, require the full torque at rated speed. Generally, increased starting torques or load surges do not occur.

The following applies to selection of a suitable converter for drives with a quadratic load torque: The rated current of the converter must be at least as large as the motor current at full torque in the required load point.

SIMOTICS GP and SIMOTICS SD – VSD10 Line motors

VSD10 Line motors are based on the 1LE1 platform and are available in the following versions:

- General Purpose Motors, shaft heights from 100 to 160, aluminum
- Severe Duty Motors, shaft heights from 100 to 315, cast iron

These motors are optimized for operation on a SINAMICS G120 converter. They are intended solely for converter operation. They must not be connected directly to a mains supply.

Functions integrated as standard for converter operation:

- Insulation system optimized for converter operation
- Built-in temperature sensor
- Bearing insulation NDE (shaft height 280/315)

The VSD10 Line provides the link to the SIMOTICS FD series for converter-fed motors.

SIMOTICS FD motors

The new generation of SIMOTICS FD (Flexible Duty) low-voltage motors will be available in four shaft heights with output ratings ranging from 200 kW to 1600 kW and higher. SIMOTICS FD motors are based on an innovative modular system. These air-cooled and water-cooled converter motors are available in numerous different versions and therefore suitable for a wide variety of applications in a host of different industries.

SIMOTICS FD in shaft heights 315 to 400 is designed for operation on SINAMICS G120P converters with output ratings ranging from 200 kW to 630 kW.

FLENDER couplings as part of the drive system

A drive system comprises individual machines, including the motor and gear unit. Couplings combine these components and frequently also establish the connection to the driven machine.

The coupling can perform other tasks in addition to the transmission of rotary motion and torque, such as:

- Compensation for **shaft misalignment** with low restorative forces
- Influencing of intrinsic torsional frequency and **damping**
- Torque interruption or limitation in response to **overload**
- Electrical **insulation**, noise insulation
- Function in **explosive environments**

Overview of relevant coupling types

Design	Description
N-EUPEX	Flexible cam coupling • Universally implementable coupling for compensation of shaft misalignment • Suitable for plug-in installation and easy assembly with three-part design Rated torque: 19 ... 62000 Nm
RUPEX	Flexible pin and bush coupling • Fail-safe, universal coupling for medium to very high torques with a good misalignment range • Compact design, low weights and mass moments of inertia • Suitable for plug-in assembly Rated torque: 200 ... 1300000 Nm
ARPEX	All-steel couplings • Zero-backlash, torsionally rigid coupling • For compensating radial, angular, and axial shaft misalignment by means of two flexible lamella packages made of stainless spring steel • Easy assembly thanks to compact lamella packages Rated torque: 92 ... 1450000 Nm

Overview (continued)

SINAMICS G120P Power Modules for use in building technology for heating, air-conditioning and ventilation applications, with degree of protection IP55, 380 to 480 V 3 AC

SINAMICS G120P										
Rated power ¹⁾		Rated output current I_{rated} ²⁾	Power based on the base-load current I_H ³⁾		Base-load current I_H ³⁾	Power Module				
400 V	460 V		400 V	460 V		Frame size	Type	With integrated line filter class A (Category C2)	With integrated line filter class B (Category C1)	
kW	hp	A	kW	hp	A			Article No.	Article No.	
0.37	0.5	1.3	0.25	0.33	0.9	FSA	PM230	6SL3223-0DE13-7AG1	6SL3223-0DE13-7BG1	
0.55	0.5	1.7	0.37	0.33	1.3			6SL3223-0DE15-5AG1	6SL3223-0DE15-5BG1	
0.75	0.75	2.2	0.55	0.5	1.7			6SL3223-0DE17-5AG1	6SL3223-0DE17-5BG1	
1.1	1	3.1	0.75	0.75	2.2			6SL3223-0DE21-1AG1	6SL3223-0DE21-1BG1	
1.5	2	4.1	1.1	1	3.1			6SL3223-0DE21-5AG1	6SL3223-0DE21-5BG1	
2.2	3	5.9	1.5	1.5	4.1			6SL3223-0DE22-2AG1	6SL3223-0DE22-2BG1	
3	3	7.7	2.2	3	5.9			6SL3223-0DE23-0AG1	6SL3223-0DE23-0BG1	
4	5	10.2	3	3	7.7	FSB		6SL3223-0DE24-0AG1	6SL3223-0DE24-0BG1	
5.5	7.5	13.2	4	5	10.2			6SL3223-0DE25-5AG1	6SL3223-0DE25-5BG1	
7.5	10	18	5.5	5	13.2			6SL3223-0DE27-5AG1	6SL3223-0DE27-5BG1	
11	15	26	7.5	10	18	FSC		6SL3223-0DE31-1AG1	6SL3223-0DE31-1BG1	
15	15	32	11	15	26			6SL3223-0DE31-5AG1	6SL3223-0DE31-5BG1	
18.5	20	38	15	15	32			6SL3223-0DE31-8AG1	–	
						FSD		–	6SL3223-0DE31-8BA0	
22	25	45	18.5	20	38	FSE		6SL3223-0DE32-2AA0	6SL3223-0DE32-2BA0	
30	30	60	22	25	45			6SL3223-0DE33-0AA0	6SL3223-0DE33-0BA0	
37	40	75	30	30	60			6SL3223-0DE33-7AA0	6SL3223-0DE33-7BA0	
45	50	90	37	40	75	FSF		6SL3223-0DE34-5AA0	6SL3223-0DE34-5BA0	
55	60	110	45	50	90			6SL3223-0DE35-5AA0	6SL3223-0DE35-5BA0	
75	75	145	55	60	110			6SL3223-0DE37-5AA0	6SL3223-0DE37-5BA0	
90	100	178	75	75	145			6SL3223-0DE38-8AA0	6SL3223-0DE38-8BA0	

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).

²⁾ The rated output current I_{rated} is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

³⁾ The base-load current I_H is based on the duty cycle for high overload (HO).

Overview (continued)

SINAMICS G120P Power Modules for use in building technology for heating, air-conditioning and ventilation applications, with degree of protection IP55, 380 to 480 V 3 AC

SINAMICS G120P		Power Module	Recommended line-side overcurrent protection devices		Load-side power components	
Rated power			IEC-compliant		Output reactor	Sine-wave filter
400 V kW	460 V hp		Fuse type 3NA3	Circuit breaker		
		Type	Article No.	Article No.	Article No.	Article No.
0.37	0.5	6SL3223-0DE13-7 . G1	3NA3803	3RV2011-1CA10	6SL3202-0AE16-1CA0	—
0.55	0.5	6SL3223-0DE15-5 . G1	3NA3803	3RV2011-1DA10	6SL3202-0AE16-1CA0	—
0.75	0.75	6SL3223-0DE17-5 . G1	3NA3803	3RV2011-1FA10	6SL3202-0AE16-1CA0	—
1.1	1	6SL3223-0DE21-1 . G1	3NA3803	3RV2011-1GA10	6SL3202-0AE16-1CA0	—
1.5	2	6SL3223-0DE21-5 . G1	3NA3803	3RV2011-1JA10	6SL3202-0AE16-1CA0	—
2.2	3	6SL3223-0DE22-2 . G1	3NA3803	3RV2011-1KA10	6SL3202-0AE16-1CA0	—
3	3	6SL3223-0DE23-0 . G1	3NA3803	3RV2021-4AA10	6SL3202-0AE18-8CA0	—
4	5	6SL3223-0DE24-0 . G1	3NA3805	3RV2021-4BA10	6SL3202-0AE21-8CA0	—
5.5	7.5	6SL3223-0DE25-5 . G1	3NA3807	3RV2021-4BA10	6SL3202-0AE21-8CA0	—
7.5	10	6SL3223-0DE27-5 . G1	3NA3810	3RV1031-4EA10	6SL3202-0AE21-8CA0	—
11	15	6SL3223-0DE31-1 . G1	3NA3814	3RV1031-4FA10	6SL3202-0AE23-8CA0	—
15	15	6SL3223-0DE31-5 . G1	3NA3820	3RV1031-4HA10	6SL3202-0AE23-8CA0	—
18.5	20	6SL3223-0DE31-8AG1	3NA3820	3RV1042-4KA10	6SL3202-0AE23-8CA0	—
18.5	20	6SL3223-0DE31-8BA0	3NA3820	—	6SE6400-3TC03-8DD0	—
22	25	6SL3223-0DE32-2 . A0	3NA3822	—	6SE6400-3TC03-8DD0	6SL3202-0AE24-6SA0
30	30	6SL3223-0DE33-0 . A0	3NA3824	—	6SE6400-3TC05-4DD0	6SL3202-0AE26-2SA0
37	40	6SL3223-0DE33-7 . A0	3NA3830	—	6SE6400-3TC08-0ED0	6SL3202-0AE28-8SA0
45	50	6SL3223-0DE34-5 . A0	3NA3832	—	6SE6400-3TC07-5ED0	6SL3202-0AE28-8SA0
55	60	6SL3223-0DE35-5 . A0	3NA3836	—	6SE6400-3TC14-5FD0	6SL3202-0AE31-5SA0
75	75	6SL3223-0DE37-5 . A0	3NA3140	—	6SE6400-3TC15-4FD0	6SL3202-0AE31-5SA0
90	100	6SL3223-0DE38-8 . A0	3NA3144	—	6SE6400-3TC14-5FD0	6SL3202-0AE31-8SA0

SINAMICS G120P built-in and wall-mounted units

PM230 Power Modules, 0.37 kW to 90 kW

PM230 Power Modules

Selection and ordering data

To ensure that a suitable Power Module is selected, the following currents should be used for applications:

- **Rated output current for applications with low overload (LO)**
- **Base-load current for applications with high overload (HO)**

With reference to the rated output current, the modules support at least 2-pole to 6-pole low-voltage motors, e.g. the SIMOTICS GP and SIMOTICS SD 1LE1 motor series. The rated power is merely a guide value. For a description of the overload performance, please refer to the general technical specifications of the Power Modules.

PM230 Power Modules degree of protection IP55/UL Type 12

Rated power ¹⁾		Rated output current I_{rated} ²⁾	Power based on the base-load current ³⁾		Base-load current I_H ³⁾	Frame size	PM230 Power Module degree of protection IP55/UL Type 12 with integrated line filter class <u>A</u>	PM230 Power Module degree of protection IP55/UL Type 12 with integrated line filter class <u>B</u>
400 V	460 V		400 V	460 V				
kW	hp	A	kW	hp	A		Article No.	Article No.
380 ... 480 V 3 AC								
0.37	0.5	1.3	0.25	0.33	0.9	FSA	6SL3223-0DE13-7AG1	6SL3223-0DE13-7BG1
0.55	0.5	1.7	0.37	0.33	1.3	FSA	6SL3223-0DE15-5AG1	6SL3223-0DE15-5BG1
0.75	0.75	2.2	0.55	0.5	1.7	FSA	6SL3223-0DE17-5AG1	6SL3223-0DE17-5BG1
1.1	1	3.1	0.75	0.75	2.2	FSA	6SL3223-0DE21-1AG1	6SL3223-0DE21-1BG1
1.5	2	4.1	1.1	1	3.1	FSA	6SL3223-0DE21-5AG1	6SL3223-0DE21-5BG1
2.2	3	5.9	1.5	1.5	4.1	FSA	6SL3223-0DE22-2AG1	6SL3223-0DE22-2BG1
3	3	7.7	2.2	3	5.9	FSA	6SL3223-0DE23-0AG1	6SL3223-0DE23-0BG1
4	5	10.2	3	3	7.7	FSB	6SL3223-0DE24-0AG1	6SL3223-0DE24-0BG1
5.5	7.5	13.2	4	5	10.2	FSB	6SL3223-0DE25-5AG1	6SL3223-0DE25-5BG1
7.5	10	18	5.5	5	13.2	FSB	6SL3223-0DE27-5AG1	6SL3223-0DE27-5BG1
11	15	26	7.5	10	18	FSC	6SL3223-0DE31-1AG1	6SL3223-0DE31-1BG1
15	15	32	11	15	26	FSC	6SL3223-0DE31-5AG1	6SL3223-0DE31-5BG1
18.5	20	38	15	15	32	FSC	6SL3223-0DE31-8AG1	–
						FSD	–	6SL3223-0DE31-8BA0
22	25	45	18.5	20	38	FSD	6SL3223-0DE32-2AA0	6SL3223-0DE32-2BA0
30	30	60	22	25	45	FSD	6SL3223-0DE33-0AA0	6SL3223-0DE33-0BA0
37	40	75	30	30	60	FSE	6SL3223-0DE33-7AA0	6SL3223-0DE33-7BA0
45	50	90	37	40	75	FSE	6SL3223-0DE34-5AA0	6SL3223-0DE34-5BA0
55	60	110	45	50	90	FSF	6SL3223-0DE35-5AA0	6SL3223-0DE35-5BA0
75	75	145	55	60	110	FSF	6SL3223-0DE37-5AA0	6SL3223-0DE37-5BA0
90	100	178	75	75	145	FSF	6SL3223-0DE38-8AA0	6SL3223-0DE38-8BA0

It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP55/UL Type 12.

For more information, see [Operator panels and Blanking cover](#) for PM230 Power Modules in section Supplementary system components.

Note:

The power data in hp units are based on the NEC/CEC standards for the North American market.

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).

²⁾ The rated output current I_{rated} is based on the duty cycle for low overload (LO). These current values are valid for 400 V and are specified on the rating plate of the Power Module.

³⁾ The base-load current I_H is based on the duty cycle for high overload (HO).

SINAMICS G120P built-in and wall-mounted units

PM230 Power Modules, 0.37 kW to 90 kW

PM230 Power Modules

Technical specifications (continued)

Line voltage 380 ... 480 V 3 AC		PM230 Power Modules, degree of protection IP55/UL Type 12					
With integrated line filter class A		6SL3223-0DE31-1AG1	6SL3223-0DE31-5AG1	6SL3223-0DE31-8AG1	–	6SL3223-0DE32-2AA0	6SL3223-0DE33-0AA0
With integrated line filter class B		6SL3223-0DE31-1BG1	6SL3223-0DE31-5BG1	–	6SL3223-0DE31-8BA0	6SL3223-0DE32-2BA0	6SL3223-0DE33-0BA0
Output current at 50 Hz 400 V 3 AC							
• Rated current I_{rated} ¹⁾	A	26	32	38	38	45	60
• Base-load current I_{L} ¹⁾	A	26	32	38	38	45	60
• Base-load current I_{H} ²⁾	A	18	26	32	32	38	45
• Maximum current I_{max}	A	39	52	64	48	57	67
Rated power							
• Based on I_{L}	kW	11	15	18.5	18.5	22	30
• Based on I_{H}	kW	7.5	11	15	15	18.5	22
Rated pulse frequency	kHz	4	4	4	4	4	4
Efficiency η	%	97	97	98	97	97	97
Power loss ³⁾ at rated current	kW	0.299	0.365	0.435	0.478	0.569	0.784
Cooling air requirement	m ³ /s (ft ³ /s)	0.02 (0.7)	0.02 (0.7)	0.02 (0.7)	0.039 (1.4)	0.039 (1.4)	0.039 (1.4)
Sound pressure level L_{pA} (1 m)	dB	66.1	66.1	66.1	56	56	56
24 V DC power supply for Control Unit	A	1	1	1	1	1	1
Input current ⁴⁾							
• Rated current	A	27	33	39	39	42	56
• Based on I_{H}	A	19	27	33	33	36	42
Line supply connection U1/L1, V1/L2, W1/L3		Screw-type terminals, plug-in	Screw-type terminals, plug-in	Screw-type terminals, plug-in	M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm ²	6 ... 16	6 ... 16	6 ... 16	10 ... 35	10 ... 35	10 ... 35
Motor connection U2, V2, W2		Screw-type terminals, plug-in	Screw-type terminals, plug-in	Screw-type terminals, plug-in	M6 screw studs	M6 screw studs	M6 screw studs
• Conductor cross-section	mm ²	6 ... 16	6 ... 16	6 ... 16	10 ... 35	10 ... 35	10 ... 35
Motor cable length, max. ⁵⁾							
• Shielded	m (ft)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)	25 (82)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
Degree of protection ⁶⁾		IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12	IP55/UL Type 12
Dimensions							
• Width	mm (in)	230 (9.06)	230 (9.06)	230 (9.06)	320 (12.60)	320 (12.60)	320 (12.60)
• Height	mm (in)	620 (24.41)	620 (24.41)	620 (24.41)	640 (25.20)	640 (25.20)	640 (25.20)
• Depth							
- Without operator panel	mm (in)	249 (9.80)	249 (9.80)	249 (9.80)	329 (12.95)	329 (12.95)	329 (12.95)
- With operator panel, max.	mm (in)	266 (10.47)	266 (10.47)	266 (10.47)	346 (13.62)	346 (13.62)	346 (13.62)
Frame size		FSC	FSC	FSC	FSD	FSD	FSD
Weight, approx.	kg (lb)	9.5 (20.95)	9.5 (20.95)	9.5 (20.95)	31 (68.36)	31 (68.36)	31 (68.36)

¹⁾ The rated output current I_{rated} and the base-load current I_{L} are based on the duty cycle for low overload (LO).

²⁾ The base-load current I_{H} is based on the duty cycle for high overload (HO).

³⁾ Typical values. You can find more information on the Internet at <https://support.industry.siemens.com/cs/document/94059311>

⁴⁾ The input current depends on the motor load and line impedance and applies for a line impedance corresponding to $u_{\text{K}} = 1\%$. The rated input currents apply for a load at rated power (based on I_{rated}) – these current values are specified on the rating plate.

⁵⁾ Max. motor cable length 25 m (82 ft) (shielded) for PM230 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2 (filter A) or C1 table 14 (filter B). With unshielded cables, Categories C2 and C1 are not achieved.

⁶⁾ It is essential to plug on an operator panel or the blanking cover in order to achieve degree of protection IP55/UL Type 12.
For more information, see [Operator panels and blanking cover for PM230 Power Modules](#) in section [Supplementary system components](#).

SINAMICS G120P built-in and wall-mounted units

PM230 Power Modules, 0.37 kW to 90 kW

Output reactors

Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor			
		6SL3202-0AE16-1CA0	6SL3202-0AE18-8CA0	6SL3202-0AE21-8CA0	6SL3202-0AE23-8CA0
Rated current	A	6.1	9	18.5	39
Power loss	kW	0.09	0.08	0.08	0.11
Connection to the Power Module		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm ²	4	4	10	16
Motor connection		Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
• Conductor cross-section	mm ²	4	4	10	16
PE connection		M4 screw stud	M4 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between output reactor and motor					
• 380 V -10 % ... 415 V +10 % 3 AC					
- Shielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
- Unshielded	m (ft)	225 (738)	225 (738)	225 (738)	225 (738)
• 440 ... 480 V 3 AC +10 %					
- Shielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
- Unshielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
Dimensions					
• Width	mm (in)	207 (8.15)	207 (8.15)	247 (9.72)	257 (10.12)
• Height	mm (in)	175 (6.89)	180 (7.09)	215 (8.46)	235 (9.25)
• Depth	mm (in)	72.5 (2.85)	72.5 (2.85)	100 (3.94)	114.7 (4.52)
Possible as base component		No	No	No	No
Degree of protection		IP20	IP20	IP20	IP20
Weight, approx.	kg (lb)	3.4 (7.50)	3.9 (8.60)	10.1 (22.3)	11.2 (24.7)
Suitable for PM230 Power Module degree of protection IP20	Type	6SL3210-1NE11-3 . G1 6SL3210-1NE11-7 . G1 6SL3210-1NE12-2 . G1 6SL3210-1NE13-1 . G1 6SL3210-1NE14-1 . G1 6SL3210-1NE15-8 . G1	6SL3210-1NE17-7 . G1	6SL3210-1NE21-0 . G1 6SL3210-1NE21-3 . G1 6SL3210-1NE21-8 . G1	6SL3210-1NE22-6 . L1 6SL3210-1NE23-2 . L1 6SL3210-1NE23-8 . L1
Suitable for PM230 Power Module degree of protection IP20 Push Through variant	Type	-	6SL3211-1NE17-7 . G1	6SL3211-1NE21-8 . G1	6SL3211-1NE23-8 . L1
Suitable for PM230 Power Module degree of protection IP55/UL Type 12	Type	6SL3223-0DE13-7 . G1 6SL3223-0DE15-5 . G1 6SL3223-0DE17-5 . G1 6SL3223-0DE21-1 . G1 6SL3223-0DE21-5 . G1 6SL3223-0DE22-2 . G1	6SL3223-0DE23-0 . G1	6SL3223-0DE24-0 . G1 6SL3223-0DE25-5 . G1 6SL3223-0DE27-5 . G1	FSC: 6SL3223-0DE31-1 . G1 6SL3223-0DE31-5 . G1 6SL3223-0DE31-8AG1 FSD: 6SL3223-0DE31-8BA0
• Frame size		FSA	FSA	FSB	FSC/FSD