

SINAMICS G120 standard inverters

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

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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/fECO 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

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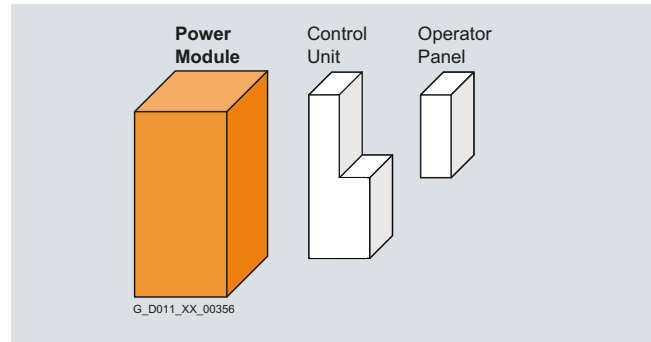
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Design

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.



PM230, PM240-2 and PM240 Power Modules

Rated power ¹⁾		Rated output current ²⁾ <i>I</i> _{rated}	PM230 Power Module degree of protection IP55 Only CU230P-2 pluggable		PM230 Power Module degree of protection IP20 The following Control Units are supported: CU230P-2 ..., CU240B-2 ..., CU240E-2 ...		PM240-2 Power Module degree of protection IP20 The following Control Units are supported: CU230P-2 ..., CU240B-2 ..., CU240E-2 ...		PM240 Power Module degree of protection IP20 All CUs pluggable		
kW	hp		A	Order No.	Order No.	Order No.	Order No.				
380 ... 480 V 3 AC											
0.37	0.50	1.3	6SL3223-0DE13-7A0	new	6SL3210-1NE11-3L0		–		6SL3224-0BE13-7UA0		
0.55	0.75	1.7	6SL3223-0DE15-5A0	new	6SL3210-1NE11-7L0	new	6SL3210-1PE11-8L0		6SL3224-0BE15-5UA0		
0.75	1.0	2.2	6SL3223-0DE17-5A0	new	6SL3210-1NE12-2L0	new	6SL3210-1PE12-3L0		6SL3224-0BE17-5UA0		
1.1	1.5	3.1	6SL3223-0DE21-1A0	new	6SL3210-1NE13-1L0	new	6SL3210-1PE13-2L0		6SL3224-0BE21-1UA0		
1.5	2.0	4.1	6SL3223-0DE21-5A0	new	6SL3210-1NE14-1L0	new	6SL3210-1PE14-3L0		6SL3224-0BE21-5UA0		
2.2	3.0	5.9	6SL3223-0DE22-2A0	new	6SL3210-1NE15-8L0	new ³⁾	6SL321-1PE16-1L0		6SL3224-0BE22-2A0		
3.0	4.0	7.7	6SL3223-0DE23-0A0	new	6SL321-1NE17-7L0	new	6SL321-1PE18-0UL0		6SL3224-0BE23-0A0		
4.0	5.0	10.2	6SL3223-0DE24-0A0	new	6SL3210-1NE21-0L0		–		6SL3224-0BE24-0A0		
5.5	7.5	13.2	6SL3223-0DE25-5A0	new	6SL3210-1NE21-3L0		–		–		
7.5	10	18	6SL3223-0DE27-5A0	new	6SL321-1NE21-8L0		–		6SL3224-0BE25-5A0		
11.0	15	25 (PM230:26)	6SL3223-0DE31-1A0	new	6SL3210-1NE22-6L0		–		6SL3224-0BE27-5A0		
15.0	20	32	6SL3223-0DE31-5A0	new	6SL3210-1NE23-2L0		–		6SL3224-0BE31-1A0		
18.5	25	38	6SL3223-0DE31-8A0	new	6SL321-1NE23-8L0		–		6SL3224-0BE31-5A0		
22	30	45	6SL3223-0DE32-2A0	new	6SL3210-1NE24-5L0		–		6SL3224-0BE31-8A0		
30	40	60	6SL3223-0DE33-0A0	new	6SL3210-1NE26-0L0		–		6SL3224-0BE32-2A0		
37	50	75	6SL3223-0DE33-7A0	new	6SL3210-1NE27-5L0		–		6SL3224-0BE33-0A0		
45	60	90	6SL3223-0DE34-5A0	new	6SL3210-1NE28-8L0		–		6SL3224-0BE33-7A0		
55	75	110	6SL3223-0DE35-5A0	new	6SL3210-1NE31-1L0		–		6SL3224-0BE34-5A0		
75	100	145	6SL3223-0DE37-5A0	new	6SL3210-1NE31-5L0		–		6SL3224-0BE35-5A0		
90	125	178	6SL3223-0DE38-8A0		–		–		6SL3224-0BE37-5A0		
110	150	205	–		–		–		6SL3224-0BE38-8UA0		
132	200	250	–		–		–		6SL3224-0BE41-1UA0		
160	250	302	–		–		–		6SL3224-0XE41-3UA0		
200	300	370	–		–		–		6SL3224-0XE41-6UA0		
250	400	477	–		–		–		6SL3224-0XE42-0UA0		
Heat sink variant					↑		↑				
Standard					0		0				
Push-through					1		1				
Integrated line filter			↑		↑		↑		↑		
Without (for IT systems)		Not supported			U		U		U		
Class A (for TN systems)		A			A		A		A		
Class B (for TN systems)		B			Are not available integrated		Are not available integrated		Are not available integrated		

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

¹⁾ The LO duty cycle is generally used for applications with square torque characteristic such as for pumps, fans and compressors; the HO duty cycle for constant torque characteristics, for example conveyor belts.

²⁾ These current values are applicable for 400 V.

³⁾ Push-through variant only available in filtered form.

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Power Modules

Selection and ordering data

PM240 Power Modules

Rated power ¹⁾		Rated output current <i>I</i> _{rated} ²⁾ A	Power based on the base-load current ³⁾		Base-load current <i>I</i> _H ³⁾ A	Frame size	PM240 Power Module without integrated line filter	PM240 Power Module with integrated line filter class <u>A</u>
kW	hp		kW	hp			Order No.	Order No.
380 ... 480 V 3 AC								
0.37	0.50	1.3	0.37	0.50	1.3	FSA	6SL3224-0BE13-7UA0	–
0.55	0.75	1.7	0.55	0.75	1.7	FSA	6SL3224-0BE15-5UA0	–
0.75	1.0	2.2	0.75	1.0	2.2	FSA	6SL3224-0BE17-5UA0	–
1.1	1.5	3.1	1.1	1.5	3.1	FSA	6SL3224-0BE21-1UA0	–
1.5	2.0	4.1	1.5	2.0	4.1	FSA	6SL3224-0BE21-5UA0	–
2.2	3.0	5.9	2.2	3.0	5.9	FSB	6SL3224-0BE22-2UA0	6SL3224-0BE22-2AA0
3.0	4.0	7.7	3.0	4.0	7.7	FSB	6SL3224-0BE23-0UA0	6SL3224-0BE23-0AA0
4.0	5.0	10.2	4.0	5.0	10.2	FSB	6SL3224-0BE24-0UA0	6SL3224-0BE24-0AA0
7.5	10	18	5.5	7.5	13.2	FSC	6SL3224-0BE25-5UA0	6SL3224-0BE25-5AA0
11.0	15	25	7.5	10	19	FSC	6SL3224-0BE27-5UA0	6SL3224-0BE27-5AA0
15.0	20	32	11.0	15	26	FSC	6SL3224-0BE31-1UA0	6SL3224-0BE31-1AA0
18.5	25	38	15.0	20	32	FSD	6SL3224-0BE31-5UA0	6SL3224-0BE31-5AA0
22	30	45	18.5	25	38	FSD	6SL3224-0BE31-8UA0	6SL3224-0BE31-8AA0
30	40	60	22	30	45	FSD	6SL3224-0BE32-2UA0	6SL3224-0BE32-2AA0
37	50	75	30	40	60	FSE	6SL3224-0BE33-0UA0	6SL3224-0BE33-0AA0
45	60	90	37	50	75	FSE	6SL3224-0BE33-7UA0	6SL3224-0BE33-7AA0
55	75	110	45	60	90	FSF	6SL3224-0BE34-5UA0	6SL3224-0BE34-5AA0
75	100	145	55	75	110	FSF	6SL3224-0BE35-5UA0	6SL3224-0BE35-5AA0
90	125	178	75	100	145	FSF	6SL3224-0BE37-5UA0	6SL3224-0BE37-5AA0
110	150	205	90	125	178	FSF	6SL3224-0BE38-8UA0	–
132	200	250	110	150	205	FSF	6SL3224-0BE41-1UA0	–
160	250	302	132	200	250	FSGX	6SL3224-0XE41-3UA0	–
200	300	370	160	250	302	FSGX	6SL3224-0XE41-6UA0	–
250	400	477	200	300	370	FSGX	6SL3224-0XE42-0UA0	–

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).

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Power Modules

Technical specifications

Line voltage 380 ... 480 V 3 AC		PM240 Power Modules					
Without integrated line filter		6SL3224-0BE33-7UA0	6SL3224-0BE34-5UA0	6SL3224-0BE35-5UA0	6SL3224-0BE37-5UA0	6SL3224-0BE38-8UA0	6SL3224-0BE41-1UA0
With integrated line filter		6SL3224-0BE33-7AA0	6SL3224-0BE34-5AA0	6SL3224-0BE35-5AA0	6SL3224-0BE37-5AA0	–	–
Output current at 50 Hz 400 V 3 AC							
• Rated current I_{rated} ¹⁾	A	90	110	145	178	205	250
• Base-load current I_L ¹⁾	A	90	110	145	178	205	250
• Base-load current I_H ²⁾	A	75	90	110	145	178	205
• I_{max}	A	150	180	220	290	308	375
Rated power							
• Based on I_L	kW (hp)	45 (60)	55 (75)	75 (100)	90 (125)	110 (150)	132 (200)
• Based on I_H	kW (hp)	37 (50)	45 (60)	55 (75)	75 (100)	90 (125)	110 (150)
Rated pulse frequency	kHz	4	4	4	4	2	2
Efficiency η		>0.97	>0.97	>0.97	>0.97	>0.97	>0.97
Power loss at rated current	kW	1.21	1.42	1.93	2.31	2.43	2.53
Cooling air requirement	m ³ /s (ft ³ /s)	2 × 0.055 (1.94)	0.15 (5.3)	0.15 (5.3)	0.15 (5.3)	0.15 (5.3)	0.15 (5.3)
Sound pressure level L_{pA} (1 m)	dB	<62	<60	<60	<65	<65	<65
24 V DC power supply for the Control Unit	A	1	1	1	1	1	1
Rated input current ³⁾							
• With line reactor	A	94	115	151	186	210	250
• Without line reactor	A	105	129	168	204	245	299
Length of cable to braking resistor, max.	m (ft)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)	15 (49)
Line supply connection U1/L1, V1/L2, W1/L3		M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm ²	10 ... 50	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
Motor connection U2, V2, W2		M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm ²	10 ... 50	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
DC link connection, connection for braking resistor DCP/R1, DCN, R2		M6 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs	M8 screw studs
• Conductor cross-section	mm ²	10 ... 50	25 ... 120	25 ... 120	25 ... 120	25 ... 120	25 ... 120
PE connection		On housing with M6 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw	On housing with M8 screw
Motor cable length ⁴⁾, max.							
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	275 (10.83)	350 (13.78)	350 (13.78)	350 (13.78)	350 (13.78)	350 (13.78)
• Height							
- Without integrated line filter	mm (in)	499 (19.65)	634 (24.96)	634 (24.96)	634 (24.96)	634 (24.96)	634 (24.96)
- With integrated line filter	mm (in)	635 (25.0)	934 (36.77)	934 (36.77)	934 (36.77)	–	–
• Depth							
- Without Control Unit	mm (in)	204 (8.03)	316 (12.44)	316 (12.44)	316 (12.44)	316 (12.44)	316 (12.44)
- With Control Unit	mm (in)	260 (10.24)	372 (14.65)	372 (14.65)	372 (14.65)	372 (14.65)	372 (14.65)
Frame size		FSE	FSF	FSF	FSF	FSF	FSF
Weight, approx.							
• Without integrated line filter	kg (lb)	16 (35.3)	36 (79.4)	36 (79.4)	36 (79.4)	39 (86)	39 (86)
• With integrated line filter	kg (lb)	23 (50.7)	52 (115)	52 (115)	52 (115)	–	–

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⁾ The input current depends on the motor load and line impedance. The input currents apply for a load at rated power (based on I_{rated}) for a line impedance corresponding to $u_K = 1\%$. These current values without line reactor are specified on the rating plate of the Power Module.

⁴⁾ Max. motor cable length 25 m (82 ft) (shielded) for PM240 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.