SIEMENS

Ingenuity for life



SINAMICS G120

The modular drive: space-saving, safe and rugged

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SINAMICS G120

Space-saving, safe and rugged

Whether pumping, ventilating, compressing, moving or processing, the SINAMICS G120 is the universal drive to address the widest range of application requirements. It leverages its strengths in general machinery construction, as well as in the automotive, textile and packaging industries.

Its modular design and wide range of power ratings extending from 0.55 kW up to 250 kW (.75–400 hp) always ensures that you can configure the perfect drive for your application.

With SINAMICS G120, you will benefit from the wide range of possibilities that its modular design offers — including flexiblity and cost-savings, thanks to the need for reduced spare parts. All of this is complemented by its user-friendliness — from installation through maintenance.

The advantages of the SINAMICS drives family — an overview:

- Wide range of power ratings from 0.05kW ($^1/_6$ hp) to 85 MW
- Available in low-voltage, medium-voltage as well as DC versions
- High degree of flexibility and combinability
- Simple coupling to SIMATIC control systems and seamless automation integration through the Siemens Totally Integrated Automation Portal
- Higher-level, standard Safety Integrated concept
- Standard and unified functionality resulting from common hardware and software
- Common engineering for all drives — SIZER for engineering and STARTER / SINAMICS Startdrive for parameterization and commissioning

Mechanical system

- Modular design
- Innovative cooling concept for a higher degree of flexibility

Functionality

- Application-oriented control modules with expanded I/O quantity scope and wide range of funcionality
- Positioning capability (EPos)
- Comprehensive range of encoder interfaces
- Safety Integrated: STO, SS1, SBC, SLS, SDI, SSM
- Power Modules with low line harmonics
- Energy recovery into the line supply without requiring additional modules
- Integrated SIL3 on PM240-2 frame sizes D, E and F



High-power density

- Extremely compact design
- Significantly smaller than previous generation

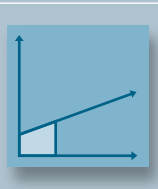
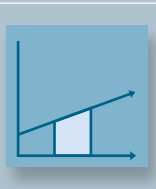
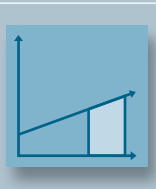
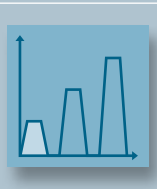
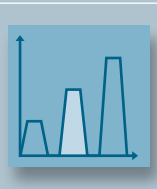
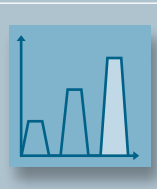
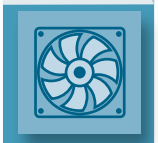
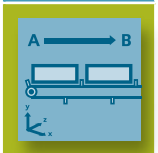
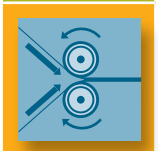
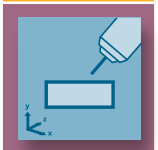
Communication

- Integral part of Totally Integrated Automation Automation — with interfaces for PROFINET and PROFIBUS
- Supported profiles include PROFIdrive, PROFIsafe, PROFIenergy
- Coupling to third-party systems via USS / Modbus RTU, BacNet MS / TP, EtherNet / IP

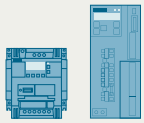
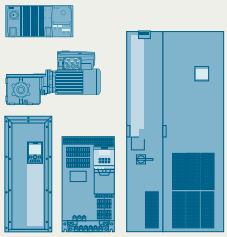
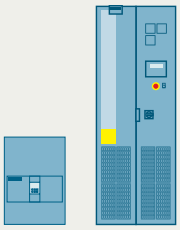
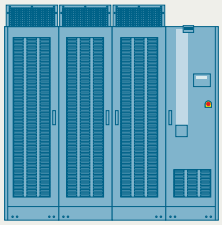
SINAMICS drives

Power and performance for every application

The modular SINAMICS G120 is suitable for the applications highlighted below.

Purpose \ Performance*	Continuous motion			Discontinuous motion		
	 Basic	 Medium	 High	 Basic	 Medium	 High
 **Pumping / ventilating / compressing**	Centrifugal pumps Radial/axial fans Compressors	**Centrifugal pumps** **Radial/axial fans** **Compressors**	Excentric screw pumps	**Hydraulic pumps** **Dosing pumps**		Descaling pumps Hydraulic pumps
 **Moving**	Conveyor belts Roll conveyors Chain conveyors	**Conveyor belts** **Roller conveyors** **Chain conveyors** **Vertical material handling** **Elevators/escalators** **Gantry cranes** **Marine drives** **Cable railways**	Elevators Container cranes Mine hoists Open-cast mine excavators Test stands	**Accelerating conveyors** **Rack feeders**	Accelerating conveyors Rack feeders Crosscutters Roll changers	Storage and retrieval machines Robotics Pick-and-place Rotary indexing machines Crosscutters Roll feeds Engaging/ disengaging function
 **Processing**	Mills Mixers Kneaders Crushers Agitators Centrifuges	**Mills** **Mixers** **Kneaders** **Crushers** **Agitators** **Centrifuges** **Extruders** **Rotary furnaces**	Extruders Winders / unwinders Leading / following drives Calenders Main press drives Printing machines	**Tubular bagging machines** **Single-axis motion control such as:** •**Positioning profiles** •**Path profiles**		Servo presses Rolling mill drives Multi-axis motion control such as: •Multi-axis positioning •Cam discs •Interpolations
 **Machining**	Main drives for Turning Milling Drilling	Main drives for Drilling Sawing	Main drives for Turning Milling Drilling Gear cutting Grinding	Axis drives for Turning Milling Drilling	Axis drives for Drilling Sawing	Axis drives for Turning Milling Drilling Laser machining Gear cutting Grinding Nibbling and punching

*) Requirements placed on the torque accuracy / speed accuracy / positioning accuracy / axis coordination / functionality

Low-voltage AC			DC-voltage DC	Medium-voltage AC
Basic performance	General performance	High-performance	DC applications	For applications with high power ratings
				
V-series	G-series	S-series	DCM	Medium-voltage series
0.05–30 kW	0.37–6,600 kW	0.55–5,700 kW	6 kW–30 MW	0.15–85 MW
When it comes to the hardware as well as the functionality, SINAMICS V drives concentrate on the essentials. This results in a high degree of ruggedness with low associated investment costs.	The functionality of SINAMICS G drives makes them the perfect choice when addressing basic and medium requirements relating to the control dynamic performance.	SINAMICS S drives are predestined for demanding single-axis and multi-axis applications in plant and machinery construction — as well as for the widest range of motion control tasks.	In addition to the highest power ratings, SINAMICS DC drives also offer the maximum degree of availability.	Our seamless and integrated range — which is unique worldwide — encompasses every dynamic response and performance level in voltage classes 2.3 to 11 kV.

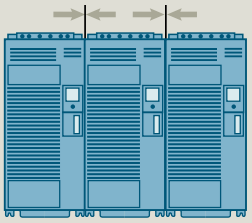


Space-saving

The well-conceived design and innovative technology make SINAMICS G120 especially compact.

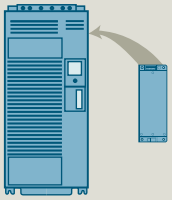
Side-by-side mounting

Cost reduction by saving space in the control cabinet



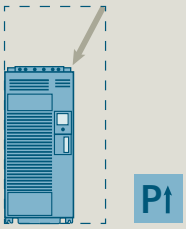
Same housing geometry for all voltages with and without filter A

Space-saving as a result of the same frame size with integrated filter



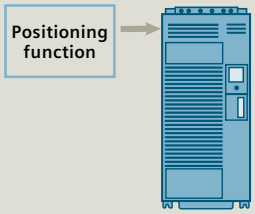
Higher power density

Space-saving as a result of a higher power rating in a smaller space



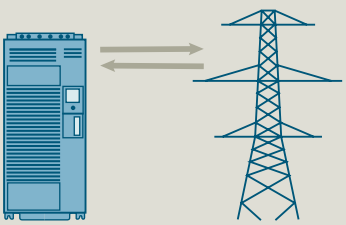
Integrated basic positioning functionality

Modules can be eliminated, such as additional positioning modules, encoder interfaces, etc.



Integrated energy recovery (Efficient Infeed Technology)

With the PM250, excess energy can be directly regenerated into the line supply





SINAMICS G120 family — frame sizes A, B, C, D, E and F

Mounting dimensions PM240/PM240-2*) without/with integrated Class A line filter			
Frame size	**W (mm)**	**H (mm)**	**D (mm)**
FSA	73	196	165
FSB	100	292	
FSC	140	355	
FSD	200	472	237
FSE	275	551	
FSF	305	708	357
FSGX	326 / –	1,533 / –	547 / –

*) Same frame size with and without filter A

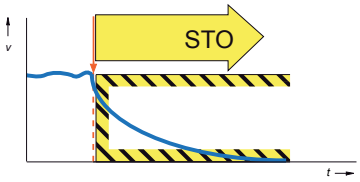
Mounting dimensions PM250 without/with integrated Class A line filter			
Frame size	**W (mm)**	**H (mm)**	**D (mm)**
FSC	– / 189	– / 334	– / 185
FSD	275	419 / 512	204
FSE		499 / 635	
FSF	350	634 / 934	316

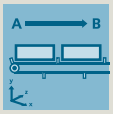
Safe

Safety functions in SINAMICS G120[1)]

Safe Torque Off (STO)

- Protects against inadvertent drive starting
- The drive is safely switched into a no-torque condition



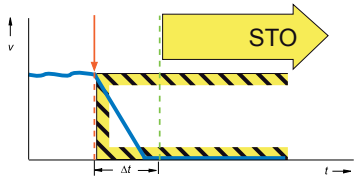


Conveyor belt

e.g. baggage handling / packet transport, feeding, removing

Safe Stop 1 (SS1)

- The drive is quickly stopped and safely monitored, especially for high moments of inertia



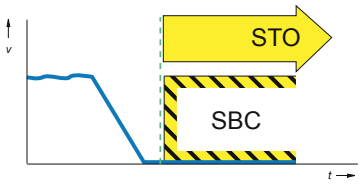


Saws

e.g. saws, unwinders, extruders, centrifuges, storage / retrieval machines

Safe Brake Control (SBC) with CU250S-2

- Safe control of holding brakes that are active in the no-current state
- Prevents sagging of suspended / pulling loads



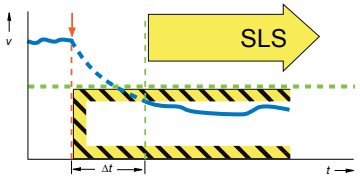


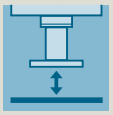
Crane

e.g. cranes, winders

Safely Limited Speed (SLS)

- Reduction and continuous monitoring of the drive speed to directly work at the machine while operational



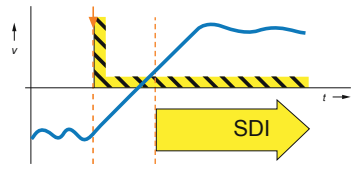


Press

e.g. presses, punches, winders, conveyor belts, grinding machines

Safe Direction (SDI)

- The function ensures that the drive can only rotate in the selected direction



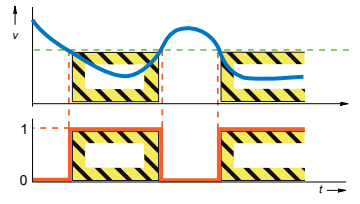


Loading gantry

e.g. storage and retrieval machines, presses, unwinders

Safe Speed Monitoring (SSM)

- The function provides a safe output signal, if the drive has fallen below the specified velocity limit





Milling tool

e.g. grinding machines, conveyor lines, drills, milling machines, packaging machines

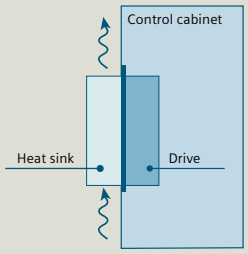
[1)] SINAMICS G120 safety functions can be implemented without encoder.

Flexible

SINAMICS G120 is the reliable system for a variety of applications.

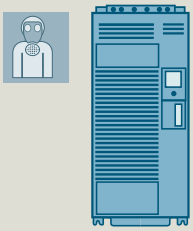
Push-through versions

- Lower temperature rise in the control cabinet
- Flexible control cabinet configurations



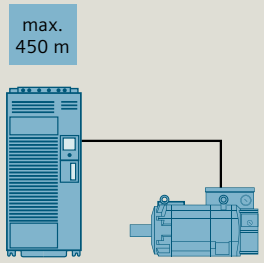
Components resistant to aggressive gases and coated modules

- Compliance with environmental class 3C2 (3C3 with SIPLUS) for frames A, B, C
- 3C3 is standard for frames D, E, F



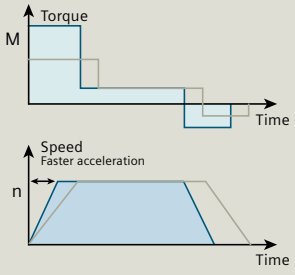
Optimized power module design

- Longer motor cables are possible:
  shielded: 300m (984 ft.)
  unshielded: 450 m (1485 ft.)
- Eliminates the need for input line and output reactor for frames D, E, F as a result of the integrated DC link choke
- Insensitive to line fluctuations



Closed-loop control

- Rugged open-loop and closed-loop control response for drives with low dynamic requirements — as well as for demanding drives with speed and torque control

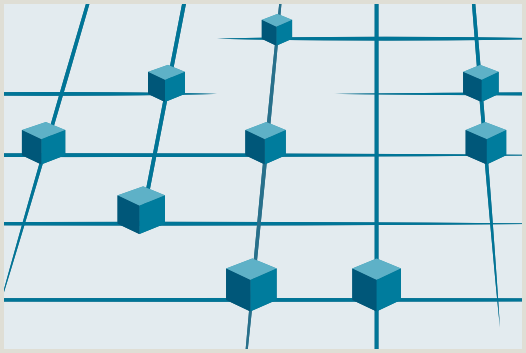


Integrated, intelligent and innovative

With SINAMICS G120, we implement a holistic approach for automation and drive technology that paves the way for improved production. We can offer you everything to help you efficiently work with our innovative products and solutions — and create the pre-conditions so that these devices can be seamlessly integrated into the automation environment.

Networked with the automation — Totally Integrated Automation





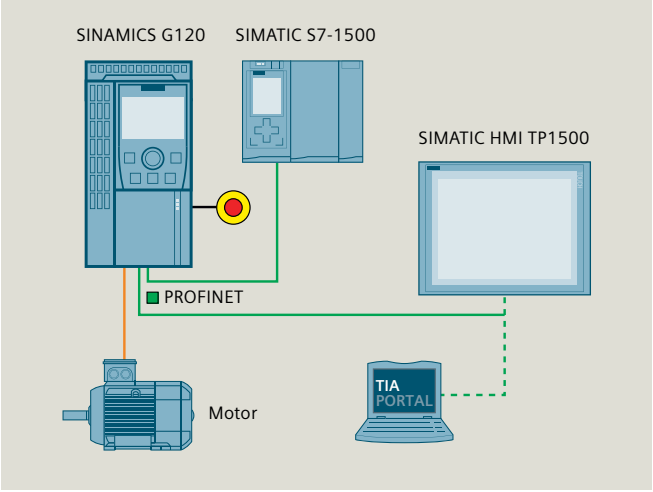
Totally Integrated Automation
Efficient interoperation of every automation component

Using the Totally Integrated Automation Portal (TIA Portal), our innovative engineering framework for all automation tasks, SINAMICS drives can be simply and efficiently integrated into any automation environment — using the SINAMICS Startdrive commissioning software, an integral component of the TIA Portal. This simplifies engineering, commissioning and diagnostics.

TIA Portal is the core of Totally Integrated Automation. The open system architecture covers the complete production process — and means that every automation component efficiently interacts with each another. This is achieved through consistent data management, global standards and unified hardware and software interfaces.

PROFINET — the leading Ethernet standard for industry

- PROFINET plays a central role within the scope of Totally Integrated Automation.
- The open Ethernet standard stands for fast and secure data exchange between all of the company hierarchic levels.
- Its flexibility, efficiency and performance create the optimum pre-condition for sustainably increasing productivity — and more competitiveness.

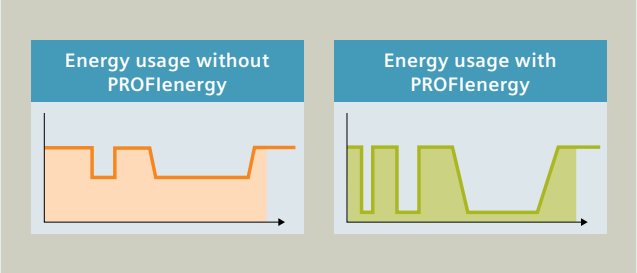


A systematic approach to higher energy efficiency

UP TO 65% ENERGY SAVING POTENTIAL

Our drives save energy through focused application-specific speed control as well as recovering braking energy up to 65% energy. Integrated energy-saving functions minimize your power costs even more.

With Efficient Infeed Technology, we offer an innovative feature, which also means that compact drives are capable of energy recovery.



SINAMICS G120 with PROFINET interface supports PROFIenergy. With the PROFINET-based profile, loads can be shut-down independent of the manufacturer and device in non-operational periods — in a coordinated fashion and centrally-controlled.

Additional energy-saving functions

- ECO mode / flux reduction reduces motor currents in the partial load range
- Hibernation mode — the drive is automatically switched on and switched off depending upon the process requirements
- Display of the electrical energy used
- Cascade — drives are switched on and switched off in stages depending upon the process requirement

Ready for SIMATIC Energy Suite

SIMATIC Energy Suite as integrated option for the TIA Portal efficiently links energy management with the automation, therefore making energy usage transparent in your production environment.

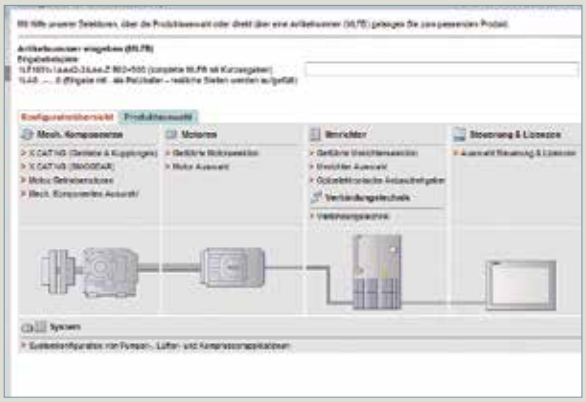
Engineering costs have been significantly reduced as it is now simpler to engineer components that measure energy, e.g. the SINAMICS G-series.

Thanks to the standardized connection to higher-level energy management systems or Cloud-based services, you can seamlessly extend the energy data acquired to create an energy management system across locations and facilities.

You can find additional information about the SIMATIC Energy Suite at www.siemens.com/energysuite

Powerful software tools — support when selecting, commissioning and operating

The SINAMICS G120 is not only easy to configure, it already offers a high degree of operator-friendliness during commissioning. Standard software tools make this possible.



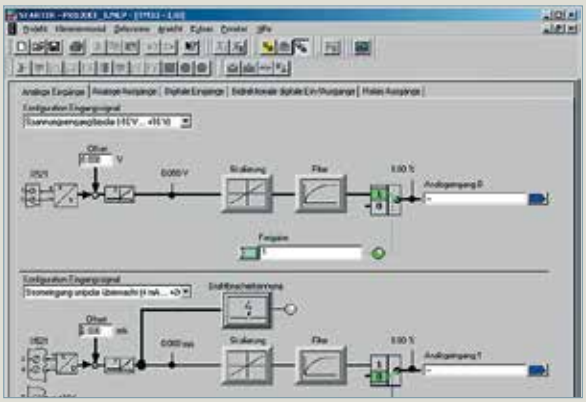
DT Configurator

- Fast product selection and ordering



SIZER

- Efficient engineering of a complete drive system



STARTER / SINAMICS Startdrive

- Configuration and commissioning in the Totally Integrated Automation (TIA) Portal

Intelligent Operator Panel and Basic Operator Panel — intuitive operation and monitoring

Two different operator panels are available for simple and efficient operation including monitoring of the SINAMICS G120 drive.



SINAMICS IOP-2
14 interface languages available



SINAMICS BOP

	IOP-2 (Intelligent Operator Panel)	BOP-2 (Basic Operator Panel)
Simple commissioning	■ SINAMICS G drives and the associated standard applications can be simply commissioned using wizards ■ Cloning function for fast series commissioning of the drives	■ Good overview as parameters and parameter values are simultaneously displayed
Operator control and visualization	■ New design — membrane keypad with central sensor control panel ■ Graphic display of status values, e.g. pressure and flow in bar-type diagrams ■ Simple, individualized local drive operation (start / stop, setpoint input, direction of rotation change) ■ Application-specific scenarios can be easily implemented, e.g. operating concepts with additional external operating devices	■ 2-line display for up to two process values with text ■ Status display of pre-defined units
Diagnostics	■ Fast diagnostics using local plain text display ■ Integrated plain text help function for local display and to remove fault messages	■ Diagnostics with menu prompting with 7-segment display
Can be flexibly used and open for expansions	■ Can be mounted directly on the Control Unit, installed in the door or as handheld terminal (depends on the drive-type) ■ 14 interface languages are available ■ IOP-2 device design, open for future expanded functionality (e.g. device functions, wizards, languages) ■ Can be simply upgraded to a new function release via the USB port	■ Can be mounted directly on the Control Unit or installed in the door (depends on the drive-type)

SINAMICS G120 — user-friendliness through modularity

Flexible combinations, high degree of operator-friendliness and standard software make the SINAMICS G120 a user-friendly solution right from the start.

Modularity offers you many advantages —

- Parts can be simply selected
- Lower costs and parts can be quickly replaced when service is required
- Fewer parts have to be stocked
- Can be simply expanded
- High reliability through integrated communication

SINAMICS G120
simply select —

1 2 3

SINAMICS selector app



Using this app, you can compile the order numbers for your SINAMICS G120 drive. It will guide you quickly and easily through the correct order numbers (MLFBs).

This is how it works

- Select SINAMICS frequency drives
- Select the rated power and device options
- Select accessories

You will be able to save and send your selection via e-mail. The pre-selection serves as the basis for an order specification with your distributor / Siemens.

Scan this QR-code to download the app free-of-charge

1



The choice is yours

You can select between two power modules* depending upon your particular requirements.

Standard braking response with braking chopper	Innovative braking response with energy recovery
PM240 / PM240-2 power modules	PM250 power modules
The PM240/ PM240-2 power modules are ideal for standard applications in general machinery construction.	The PM250 power module is ideal for applications requiring energy recovery.

2



Select your control unit

CU230P-2 control unit	CU240E-2 control unit	CU250S-2 control unit
The CU230P-2 control unit is specifically designed for pump, fan and compressor applications	The CU240E-2 is ideal for a multitude of applications in general machine building (e.g. mixers, agitators)	The CU250S-2 is ideal for high-quality applications (e.g. extruders, centrifuges)

3



Select the optional components

Additional components are available depending upon your particular requirements, for example, an operator panel (IOP-2 or BOP-2) or a blanking cover.

✓



Your SINAMICS G120 drive has now been configured

**Detailed information about the PM230 power module is provided in SINAMICS G120P documentation. Detailed information on products and options is provided in the current Catalog D31 in Chapter "SINAMICS G120 standard inverters" or in the Siemens Industry Mall (iMall).*

PM240 / PM240-2 power modules

What power is required? (LO = Low Overload; HO = High Overload) *Definition HO/LO see p.22*	Is a filtered device of Class A required?	Are additional external line filters required (for example to maintain s
PM240/PM240-2 Power Modules have an integrated braking chopper and are suitable for many applications in general machine building.	The integrated EMC filter (Class A filter) is required to maintain the cable-conducted interference voltages and the radiated disturbances for installations in compliance with EN 61800-3 Category C2.	The external EMC filter (Class B filter) is also used to maintain cable-conducted interference voltages for installations according to EN 61800-3 Category C1. An unfiltered PM240-2 must be selected when using a Class B filter.

1AC / 3AC PM240-2 / 200V–240V +/–10 %

Rated power LO (kW)	Rated power (hp)	Output current LO (A) I_N	Output current HO (A) I_{CH}	Frame size	Unfiltered power modules (part number)	Integrated Class A filter power modules (part number)		Class A filter	Class B line filter
1AC / 3 AC 200V ... 240V									
0.55	0.75	3.2	2.3	FSA	6SL3210-1PB13-0UL0	6SL3210-1PB13-0AL0	The **PM240-2** 230V has now been completely selected.	integrated	–
0.75	1	4.2	3.2	FSA	6SL321□-1PB13-8UL0	6SL321□-1PB13-8AL0		integrated	–
1.1	1.5	6	4.2	FSB	6SL3210-1PB15-5UL0	6SL3210-1PB15-5AL0		integrated	–
1.5	2	7.4	6	FSB	6SL3210-1PB17-4UL0	6SL3210-1PB17-4AL0		integrated	–
2.2	3	10.4	7.4	FSB	6SL321□-1PB21-0UL0	6SL321□-1PB21-0AL0		integrated	–
3	4	13.6	10.4	FSC	6SL3210-1PB21-4UL0	6SL3210-1PB21-4AL0		integrated	–
4	5	17.5	13.6	FSC	6SL321□-1PB21-8UL0	6SL321□-1PB21-8AL0		integrated	–
3AC 200V ... 240V									
5.5	7.5	22	17.5	FSC	6SL3210-1PC22-2UL0	6SL3210-1PC22-2AL0	The **PM240-2** 200V has now been completely selected.	integrated	–
7.5	10	28	22	FSC	6SL3210-1PC22-8UL0	6SL3210-1PC22-8AL0		integrated	–
11	15	42	35	FSD	6SL3210-1PC24-2UL0	–		–	–
15	20	54	42	FSD	6SL3210-1PC25-4UL0	–		–	–
18.5	25	68	54	FSD	6SL3210-1PC26-8UL0	–		–	–
22	30	80	68	FSE	6SL3210-1PC28-0UL0	–		–	–
30	40	104	80	FSE	6SL3210-1PC31-1UL0	–		–	–
37	50	130	104	FSF	6SL3210-1PC31-3UL0	–		–	–
45	60	154	130	FSF	6SL3210-1PC31-6UL0	–		–	–
55	60	178	154	FSF	6SL3210-1PC31-8UL0	–		–	–

3AC PM240 / PM240-2 / 380V–480V +/–10 %

Rated power LO (kW)	Rated power (hp)	Output current LO (A)	Output current HO (A)	Frame size	Unfiltered power modules (part number)	Power modules with integrated Class A filter (part number)		Class A filter is already integrated in the filter device up to 132 kW (part number)	Class B line filter (sub-assembly)[3] (part number)
0.55	0.75	1.7	1.3	FSA	6SL3210-1PE11-8UL1	6SL3210-1PE11-8AL1	The **PM240 / PM240-2** 480V has now been completely selected.	integrated	6SL3203-0BE17-7BA0
0.75	1	2.2	1.7	FSA	6SL3210-1PE12-3UL1	6SL3210-1PE12-3AL1		integrated	6SL3203-0BE17-7BA0
1.1	1.5	3.1	2.2	FSA	6SL3210-1PE13-2UL1	6SL3210-1PE13-2AL1		integrated	6SL3203-0BE17-7BA0
1.5	2	4.1	3.1	FSA	6SL3210-1PE14-3UL1	6SL3210-1PE14-3AL1		integrated	6SL3203-0BE17-7BA0
2.2	3	5.9	4.1	FSA	6SL3210-1PE16-1UL1	6SL3210-1PE16-1AL1		integrated	6SL3203-0BE17-7BA0
3	4	7.7	5.9	FSA	6SL3210-1PE18-0UL1	6SL321□-1PE18-0AL1		integrated	6SL3203-0BE17-7BA0
4	5	10.2	7.7	FSB	6SL321□-1PE21-1UL0	6SL3210-1PE21-1AL0		integrated	6SL3203-0BE21-8BA0
5.5	7.5	13.2	10.2	FSB	6SL3210-1PE21-4UL0	6SL3210-1PE21-4AL0		integrated	6SL3203-0BE21-8BA0
7.5	10	18	13.7	FSB	6SL321□-1PE21-8UL0	6SL321□-1PE21-8AL0		integrated	6SL3203-0BE21-8BA0
11	15	26	18	FSC	6SL3210-1PE22-7UL0	6SL3210-1PE22-7AL0		integrated	6SL3203-0BE23-8BA0
15	20	32	26	FSC	6SL321□-1PE23-3UL0	6SL321□-1PE23-3AL0		integrated	6SL3203-0BE23-8BA0
18.5	25	38	32	FSD	6SL3210-1PE23-8UL0	6SL3210-1PE23-8AL0		integrated	–
22	30	45	38	FSD	6SL3210-1PE24-5UL0	6SL3210-1PE24-5AL0		integrated	–
30	40	60	45	FSD	6SL3210-1PE26-0UL0	6SL3210-1PE26-0AL0		integrated	–
37	50	75	60	FSD	6SL3210-1PE27-5UL0	6SL3210-1PE27-5AL0		integrated	–
45	60	90	75	FSE	6SL3210-1PE28-8UL0	6SL3210-1PE28-8AL0		integrated	–
55	75	110	90	FSE	6SL3210-1PE31-1UL0	6SL3210-1PE31-1AL0		integrated	–
75	100	145	110	FSF	6SL3210-1PE31-5UL0	6SL3210-1PE31-5AL0		integrated	–
90	125	178	145	FSF	6SL3210-1PE31-8UL0	6SL3210-1PE31-8AL0		integrated	–
110	150	205	178	FSF	6SL3210-1PE32-1UL0	6SL3210-1PE32-1AL0		integrated	–
132	200	250	205	FSF	6SL3210-1PE32-5UL0	6SL3210-1PE32-5AL0		integrated	–
160	250	302	250	FSGX[2]	6SL3224-0XE41-3UA0	–		6SL3000-0BE34-4AA0	–
200	300	370	302	FSGX[2]	6SL3224-0XE41-6UA0	–		6SL3000-0BE34-4AA0	–
250	400	477	370	FSGX[2]	6SL3224-0XE42-0UA0	–		6SL3000-0BE36-0AA0	–

Heat sink version Standard 0
Push-through 1

[1] Frame size FSD–FSF — supplementary condition: only rated frequency — or less than the permissible max. output frequency 150 Hz

[2] A braking module is additionally required for frame size FSGX: 6SL3300-1AE32-5AA0

specific EMC values)?	Is a braking resistor required as a result of the application?	Should an output filter be used, for instance to be able to use long motor cables? [5]	Is a shield plate required for the power module?
Line reactors: to smooth voltage peaks, buffer commutation dips and reduce the effects of harmonics on the drive and line supply.	Excess energy in the DC link is dissipated using a braking resistor. Frame sizes FSA to FSF already include an integrated braking chopper (electronic switch).	Output reactors reduce the voltage stress on the motor winding. The cable lengths between the drive and motor can be extended.	The shield connection kit simplifies connecting the shields of supply and control cables, offers mechanical strain relief and guarantees an optimum EMC behavior.

3AC line reactor side-mounted [4] (part number)	Braking resistors side-mounted (part number)	Output reactor side-mounted [1] (part number)	Shield plate for the power modules
6SL3203-0CE13-2AA0	JJY:023146720008	6SL3202-0AE16-1CA0	included
6SL3203-0CE13-2AA0	JJY:023146720008	6SL3202-0AE16-1CA0	included
6SL3203-0CE21-0AA0	JJY:023151720007	6SL3202-0AE16-1CA0	included
6SL3203-0CE21-0AA0	JJY:023151720007	6SL3202-0AE18-8CA0	included
6SL3203-0CE21-0AA0	JJY:023151720007	6SL3202-0AE21-8CA0	included
6SL3203-0CE21-8AA0	JJY:023163720018	6SL3202-0AE21-8CA0	included
6SL3203-0CE21-8AA0	JJY:023163720018	6SL3202-0AE21-8CA0	included
6SL3203-0CE23-8AA0	JJY:023433720001	6SL3202-0AE23-8CA0	included
6SL3203-0CE23-8AA0	JJY:023433720001	6SL3202-0AE23-8CA0	included
integrated	JJY:023422620002	6SE6400-3TC07-5ED0	included
integrated	JJY:023422620002	6SE6400-3TC07-5ED0	included
integrated	JJY:023422620002	6SE6400-3TC07-5ED0	included
integrated	JJY:023423320001	6SE6400-3TC14-5FD0	included
integrated	JJY:023423320001	6SE6400-3TC14-5FD0	included
integrated	JJY:023434020003	6SE6400-3TC14-5FD0	included
integrated	JJY:023434020003	6SE6400-3TC14-5FD0	included
integrated	JJY:023434020003	6SE6400-3TC14-5FD0	included

3AC line reactor side-mounted up to FSC [4]; integrated for FSD–FSF (part number)	Braking resistors side-mounted (part number)	Output reactor side-mounted [1] (part number)	Shield plate for the power modules (part number)
6SL3203-0CE13-2AA0	6SL3201-0BE14-3AA0	6SL3202-0AE16-1CA0	included
6SL3203-0CE13-2AA0	6SL3201-0BE14-3AA0	6SL3202-0AE16-1CA0	included
6SL3203-0CE13-2AA0	6SL3201-0BE14-3AA0	6SL3202-0AE16-1CA0	included
6SL3203-0CE21-0AA0	6SL3201-0BE14-3AA0	6SL3202-0AE16-1CA0	included
6SL3203-0CE21-0AA0	6SL3201-0BE21-0AA0	6SL3202-0AE16-1CA0	included
6SL3203-0CE21-0AA0	6SL3201-0BE21-0AA0	6SL3202-0AE18-8CA0	included
6SL3203-0CE21-8AA0	6SL3201-0BE21-8AA0	6SL3202-0AE21-8CA0	included
6SL3203-0CE21-8AA0	6SL3201-0BE21-8AA0	6SL3202-0AE21-8CA0	included
6SL3203-0CE21-8AA0	6SL3201-0BE21-8AA0	6SL3202-0AE21-8CA0	included
6SL3203-0CE23-8AA0	6SL3201-0BE23-8AA0	6SL3202-0AE23-8CA0	included
6SL3203-0CE23-8AA0	6SL3201-0BE23-8AA0	6SL3202-0AE23-8CA0	included
integrated	JJY:023422620001	6SE6400-3TC07-5ED0	included
integrated	JJY:023422620001	6SE6400-3TC07-5ED0	included
integrated	JJY:023424020001	6SE6400-3TC07-5ED0	included
integrated	JJY:023424020001	6SE6400-3TC07-5ED0	included
integrated	JJY:023434020001	6SE6400-3TC14-5FD0	included
integrated	JJY:023434020001	6SE6400-3TC14-5FD0	included
integrated	JJY:023454020001	6SE6400-3TC14-5FD0	included
integrated	JJY:023454020001	6SE6400-3TC14-5FD0	included
integrated	JJY:023464020001	6SL3000-2BE32-1AA0	included
integrated	JJY:023464020001	6SL3000-2BE32-6AA0	included
6SL3000-0CE33-3AA0	6SL3000-1BE31-3AA0 [2]	6SL3000-2BE33-2AA0	–
6SL3000-0CE35-1AA0	6SL3000-1BE32-5AA0 [2]	6SL3000-2BE33-8AA0	–
6SL3000-0CE35-1AA0	6SL3000-1BE32-5AA0 [2]	6SL3000-2BE35-0AA0	–

[3] An unfiltered power module is required to use the external Class B filter

4) For frame sizes FSA–FSC, the line reactor to extend the service life can be omitted if a power module one power stage higher is selected. More detailed information is provided in the catalog.

[5] Supplementary products, for instance filters and braking resistors, are available through our selected "Product partners":

Please find more information: www.siemens.com/drives-options-partner

3AC PM240-2 / 500V–690V +/–10 %

What power is required? (LO = Low Overload; HO = High Overload)					Is a filtered device of Class A required?			Are additional external line filters required (for example to maintain spec	
PM240-2 power modules have an integrated braking chopper and are suitable for many applications in general machinery construction.					The integrated EMC filter (Class A filter) is required to maintain the cable-conducted interference voltages and the radiated disturbances for installations in compliance with EN 61800-3 Category C2.				
Rated power LO (kW)	**Rated power (hp)**	**Output current LO (A)**	**Output current HO (A)**	**Frame size**	**Unfiltered power modules (part number)**	**Power modules with integrated Class A filter (part number)**		**Class A filter is already integrated**	**Class B line filter**
11	10	14	11	**FSD**	6SL3210-1PH21-4UL0	6SL3210-1PH21-4AL0	The PM240-2 690V has now been completely selected	integrated	–
15	15	19	14	**FSD**	6SL3210-1PH22-0UL0	6SL3210-1PH22-0AL0		integrated	–
18.5	20	23	19	**FSD**	6SL3210-1PH22-3UL0	6SL3210-1PH22-3AL0		integrated	–
22	25	27	23	**FSD**	6SL3210-1PH22-7UL0	6SL3210-1PH22-7AL0		integrated	–
30	30	35	27	**FSD**	6SL3210-1PH23-5UL0	6SL3210-1PH23-5AL0		integrated	–
37	40	42	35	**FSD**	6SL3210-1PH24-2UL0	6SL3210-1PH24-2AL0		integrated	–
45	50	52	42	**FSE**	6SL3210-1PH25-2UL0	6SL3210-1PH25-2AL0		integrated	–
55	60	62	52	**FSE**	6SL3210-1PH26-2UL0	6SL3210-1PH26-2AL0		integrated	–
75	75	80	62	**FSF**	6SL3210-1PH28-0UL0	6SL3210-1PH28-0AL0		integrated	–
90	100	100	80	**FSF**	6SL3210-1PH31-0UL0	6SL3210-1PH31-0AL0		integrated	–
110	100	115	100	**FSF**	6SL3210-1PH31-2UL0	6SL3210-1PH31-2AL0		integrated	–
132	125	142	115	**FSF**	6SL3210-1PH31-4UL0	6SL3210-1PH31-4AL0		integrated	–

3AC PM250 / 380V– 480V +/–10 %

What power is required? (LO = Low Overload; HO = High Overload)					Is a filtered device of Class A required?			Are additional external line filters required (for example to maintain spec	
PM250 power modules have integrated energy recovery. This means that any braking energy is directly fed back into the line supply. Four-quadrant applications — a braking chopper is not required.					The integrated EMC filter (Class A filter) is required to maintain the cable-conducted interference voltages and the radiated disturbances for installations in compliance with EN 61800-3 Category C2.			The additional EMC filter (Class B filter) is also used to maintain cable-conducted interference voltages for installations according to EN 61800-3 Category C1.	
Rated power LO (kW)	**Rated power (hp)**	**Output current LO (A)**	**Output current HO (A)**	**Frame size**	**Unfiltered power modules (part number)**	**Power Modules with integrated Class A filter (part number)**		**Class A filter is integrated in the filter device up to 90 kW**	**Class B line filter (sub-assembly)[3] (part number)**
7.5	10	18	13.2	**FSC**	–	6SL3225-0BE25-5AA1	The PM250 has now been completely selected	integrated	6SL3203-0BD23-8SA0
11	15	25	19	**FSC**	–	6SL3225-0BE27-5AA1		integrated	6SL3203-0BD23-8SA0
15	20	32	26	**FSC**	–	6SL3225-0BE31-1AA1		integrated	6SL3203-0BD23-8SA0
18.5	25	38	32	**FSD**	6SL3225-0BE31-5UA0	6SL3225-0BE31-5AA0		integrated	–
22	30	45	38	**FSD**	6SL3225-0BE31-8UA0	6SL3225-0BE31-8AA0		integrated	–
30	40	60	45	**FSD**	6SL3225-0BE32-2UA0	6SL3225-0BE32-2AA0		integrated	–
37	50	75	60	**FSE**	6SL3225-0BE33-0UA0	6SL3225-0BE33-0AA0		integrated	–
45	60	90	75	**FSE**	6SL3225-0BE33-7UA0	6SL3225-0BE33-7AA0		integrated	–
55	75	110	90	**FSF**	6SL3225-0BE34-5UA0	6SL3225-0BE34-5AA0		integrated	–
75	100	145	110	**FSF**	6SL3225-0BE35-5UA0	6SL3225-0BE35-5AA0		integrated	–
90	125	178	145	**FSF**	6SL3225-0BE37-5UA0	6SL3225-0BE37-5AA0		integrated	–

Missing options such as sine-wave filter, sub-chassis braking resistors, etc., can be supplied from audited drive option suppliers.
More detailed information is provided at www.siemens.com/sinamics-G120

[3] An unfiltered power module is required to use the external Class B filter

tific EMC values)?	Is a braking resistor required as a result of the application?	Should an output filter be used, for example, in order to be able to use longer motor cables?		Is a shield plate required for the power module?
Line reactors: to smooth voltage peaks, buffer commutation dips and reduce the effects of harmonics on the drive and line supply.	Excess energy in the DC link is dissipated using a braking resistor. Frame sizes FSA to FSF already include an integrated braking chopper (electronic switch).	Output reactors reduce the voltage stress on the motor winding. The cable lengths between the drive and motor can be extended.	The du/dt filter plus Voltage Peak Limiter limits the voltage rate of rise and typical voltage peaks	The shield connection kit simplifies connecting the shields of supply and control cables, offers mechanical strain relief and guarantees an optimum EMC behavior.
Line reactor	**Braking resistors (part number)**	**Output reactor**	**du/dt filter plus VPL (part number)**	**Shield plate for the power modules**
integrated	JJY:023424020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023424020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023424020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023424020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023424020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023424020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023434020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023434020002	not necessary	6SL3000-2DH31-0AA0	included
integrated	JJY:023464020002	6SL3000-2AH31-0AA0	6SL3000-2DH31-0AA0	included
integrated	JJY:023464020002	6SL3000-2AH31-0AA0	6SL3000-2DH31-0AA0	included
integrated	JJY:023464020002	6SL3000-2AH31-5AA0	6SL3000-2DH31-5AA0	included
integrated	JJY:023464020002	6SL3000-2AH31-5AA0	6SL3000-2DH31-5AA0	included

tific EMC values)?	Is a braking resistor required as a result of the application?	Should an output filter be used, for example, in order to be able to use longer motor cables?		Is a shield plate required for the Power Module?
In conjunction with the PM250, a line reactor is not required, and it is also not permissible that one is used.	The PM250 is capable of energy recovery. A braking resistor is not used, and it is also not permissible that one is used.	Output reactors reduce the voltage stress on the motor winding. The cable lengths between the drive and motor can be extended.	Sine-wave filters limit the voltage rate of rise and the capacitive recharging currents. An output reactor is not required.	The shield connection kit simplifies connecting the shields of supply and control cables, offers mechanical strain relief and guarantees an optimum EMC behavior.
	PM250 with energy recovery. As a result, it is not permissible that a braking resistor is used.	**Sub-chassis output reactor (part number)**	**Sine-wave filter FSC subchassis, from FSD, side-mounted (part number)**	**Shield plate for the power modules (part number)**
–	is not required	6SL3202-0AJ23-2CA0	6SL3202-0AE22-0SA0	6SL3262-1AC00-0DA0
–	is not required	6SL3202-0AJ23-2CA0	6SL3202-0AE23-3SA0	6SL3262-1AC00-0DA0
–	is not required	6SL3202-0AJ23-2CA0	6SL3202-0AE23-3SA0	6SL3262-1AC00-0DA0
–	is not required	6SE6400-3TC05-4DD0	6SL3202-0AE24-6SA0	6SL3262-1AD00-0DA0
–	is not required	6SE6400-3TC03-8DD0	6SL3202-0AE24-6SA0	6SL3262-1AD00-0DA0
–	is not required	6SE6400-3TC05-4DD0	6SL3202-0AE26-2SA0	6SL3262-1AD00-0DA0
–	is not required	6SE6400-3TC08-0ED0	6SL3202-0AE28-8SA0	6SL3262-1AD00-0DA0
–	is not required	6SE6400-3TC07-5ED0	6SL3202-0AE28-8SA0	6SL3262-1AD00-0DA0
–	is not required	6SE6400-3TC14-5FD0	6SL3202-0AE31-5SA0	6SL3262-1AF00-0DA0
–	is not required	6SE6400-3TC15-4FD0	6SL3202-0AE31-5SA0	6SL3262-1AF00-0DA0
–	is not required	6SE6400-3TC14-5FD0	6SL3202-0AE31-8SA0	6SL3262-1AF00-0DA0

[6] Selected supplementary products, for example filters or braking resistors are available through our selected "Product partners". Here, select "Solution Partner Finder" as technology "Drive Object": siemens.com/partnerfinder



CU250S-2 control unit

Is an encoder used for signal feedback? Is integrated positioning capability required?			
no			yes *(EPos positioning functionality through Extended Function license)*
CU230P-2	**CU240E-2**	**CU240E-2 Failsafe**	**CU250S-2**

Is integrated safety technology required?			
no	yes		
	STO (Safe Torque Off)	STO (Safe Torque Off) SS1 (Safe Stop 1) SLS (Safely Limited Speed) SSM (Safe Speed Monitor) SDI (Safe Direction)	STO (Safe Torque Off) SS1 (Safe Stop 1) SBC (Safe Brake Control)[1] SLS (Safely Limited Speed)[2] SSM (Safe Speed Monitor)[2] SDI (Safe Direction)[2] [1] A Safe Brake Relay is required for the SBC function [2] With Safety license
CU230P-2	**CU240E-2**	**CU240E-2 Failsafe**	**CU250S-2**

How many inputs and outputs are required?				
Digital inputs (DI)	6	6	6	11
Failsafe DI	–	1 (opt. for 2 DI)	3 (opt. for 2 DI)	3 (opt. for 2 DI)
Digital outputs (DO)	3	3	3	3 (opt. 1 F-DO)
Fast DI/DO	–	–	–	4
Analog inputs	4	2	2	2
Analog outputs	2	2	2	2
	CU230P-2	**CU240E-2**	**CU240E-2 Failsafe**	**CU250S-2**

What type of communication/bus system is required?				
USS, Modbus RTU	CU230P-2 HVAC	CU240E-2	CU240E-2 F	CU250S-2
	6SL3243-0BB30-1HA3	6SL3244-0BB12-1BA1	6SL3244-0BB13-1BA1	6SL3246-0BA22-1BA0
BACnet MS/TP	CU230P-2 HVAC	–	–	–
	6SL3243-0BB30-1HA3			
PROFIBUS DP	CU230P-2 DP	CU240E-2 DP	CU240E-2 DP-F	CU250S-2 DP
	6SL3243-0BB30-1PA3	6SL3244-0BB12-1PA1	6SL3244-0BB13-1PA1	6SL3246-0BA22-1PA0
PROFINET/EtherNet/IP	CU230P-2 PN	CU240E-2 PN	CU240E-2 PN-F	CU250S-2 PN
	6SL3243-0BB30-1FA0	6SL3244-0BB12-1FA0	6SL3244-0BB13-1FA0	6SL3246-0BA22-1FA0

Permissible combinations with power modules				
PM240*	yes	yes	yes	yes
PM240-2	yes	yes	yes	yes
PM250	yes	yes	yes	yes

Which optional shield connection kit is required for the particular control unit?				
Shield connection kit 1 6SL3264-1EA00-0FA0	HVAC, PROFIBUS	–	–	–
Shield connection kit 2 6SL3264-1EA00-0HA0	–	USS, Modbus RTU, PROFIBUS	USS, Modbus RTU, PROFIBUS	–
Shield connection kit 3 6SL3264-1EA00-0HB0	PROFINET	PROFINET	PROFINET	–
Shield connection kit 4 6SL3264-1EA00-0LA0	–	–	–	All versions

**The PM240 power modules, frame size FSGX (i.e. from 160 kW and higher) have only been released for the basic safety funtions (STO, SS1 and SBC)*

Optional additional components	
Description	**Part number**
IOP-2 Intelligent Operator Panel with 14 interface languages: German, English, French, Italian, Spanish, Portuguese, Dutch, Swedish, Russian, Czech, Polish, Turkish, Finnish, Chinese)	6SL3255-0AA00-4JA2
IOP-2 mobile hand-held device connection through a cable includes: IOP-2 (6SL3255-0AA00-4JA2), hand-held housing, rechargeable batteries (4 x AA), charging unit (international), RS232 connecting cable (3 m), USB cable (1 m)	6SL3255-0AA00-4HA1
Basic Operator Panel (BOP-2)	6SL3255-0AA00-4CA1
Door mounting kit for BOP-2/IOP for installation in cabinet doors with sheet steel thicknesses of 1–3 mm. Includes seal, installation materials and connecting cable (5 m)	6SL3256-0AP00-0JA0
SINAMICS memory card (SD card)	6SL3054-4AG00-2AA0
SINAMICS G120 multi-card (SD card) plus license V4.7 SP6	6SL3054-7TD00-2BA0
Additional licenses for CU250S-2	
SD card + license extended functions safety (SLS, SSM, SDI)	6SL3054-4AG00-2AA0-Z F01
SD card + license extended functions basic positioning (EPos)	6SL3054-4AG00-2AA0-Z E01
SD card + license extended safety + basic positioning	6SL3054-4AG00-2AA0-Z F01+E01
License extended functions safety for CU250S-2	6SL3074-0AA10-0AA0
License extended functions basic positioning (EPos)	6SL3074-7AA04-0AA0
Additional licenses for CU250S-2 plus firmware V4.7 SP6	
SD card + license extended functions safety (SLS, SSM, SDI) + FW V4.7 SP6	6SL3054-7EH00-2BA0-Z F01
SD card + license extended functions basic positioning (EPos) + FW V4.7 SP6	6SL3054-7EH00-2BA0-Z E01
SD card + license extended functions safety + basic positioning + FW V4.7 SP6	6SL3054-7EH00-2BA0-Z F01+E01
PC connection kit 2 (for CU230P-2, CU240B-2, CU240E-2, CU250S-2)	6SL3255-0AA00-2CA0
Brake relay (for direct activation of a motor brake by the CU)	6SL3252-0BB00-0AA0
Safe brake relay (safety version)	6SL3252-0BB01-0AA0
SINAMICS G120/G120C connector plug	6SL3200-0ST05-0AA0
SINAMICS G120/G120C fan unit	6SL3200-0SF12-0AA0
Push-through mounting frame for PM240-2 push-through power modules	
frame size FSA	6SL3260-6AA00-0DA0
frame size FSB	6SL3260-6AB00-0DA0
frame size FSC	6SL3260-6AC00-0DA0

Software for engineering and commissioning	
Description	**Part number**
STARTER commissioning tool on DVD	6SL3072-0AA00-0AG0
SINAMICS Startdrive commissioning tool on DVD	6SL3072-4DA02-0XG0
SIZER for Siemens drives engineering tool	6SL3070-0AA00-0AG0
CAD Creator	6SL3075-0AA00-0AG0

Detailed information about the products and options can be found in the current Catalog D31, chapter "SINAMICS G120 standard inverters" or in the Industry Mall: www.siemens.com/industrymall

Power modules	PM240 / PM240-2 IP20		PM250 IP20	
	General machine building; Braking with a braking resistor		General machine building; Braking with energy recovery	
Line voltage	1AC / 3AC 200 ... 240V +/–10 % 3AC 380V ... 480V +/–10 % 3AC 500V ... 690V +/–10 %		3AC 380V ... 480V +/–10 %	
Power **HO = High Overload** **LO = Low Overload**	**HO** **200 ... 240V** 1AC 0.37 ... 3 kW (.5–4 hp) 3AC 0.37 ... 45 kW (.5–5 hp) **380 ... 480V** 3AC 0.37 ... 200 kW (.5–250 hp) **500 ... 690V** 3AC 7.5 ... 110 kW (10–150 hp)	**LO** **200 ... 240V** 1AC 0.55 ... 4 kW (.75–5 hp) 3AC 0.55 ... 55 kW (.75–75 hp) **380 ... 480V** 3AC 0.55–250 kW (.75–400 hp) **500 ... 690V** 3AC 11 ... 132 kW (15–200 hp)	**HO** **Unfiltered** 15 ... 75 kW (20–100 hp) **Filtered** 5.5 ... 75 kW (7.5–125 hp)	**LO** **Unfiltered** 18.5 ... 90 kW (25–125 hp) **Filtered** 7.5 ... 90 kW (10–125 hp)
Rated input current **(dependent upon the motor load and line impedance)**	**HO** **200 ... 240V** 1AC 6.6 ... 37.5 A 3AC 3.8 ... 164 A **380 ... 480V** 3AC 2.0 ... 354[1]/442 A **500 ... 690V** 3AC 11 ... 122 A	**LO** **200 ... 240V** 1AC 7.5 ... 43 A 3AC 4.3 ... 172 A **380 ... 480V** 3AC 2.3 ... 354[1]/442 A **500 ... 690V** 3AC 14 ... 137A	**HO** 13.2 ... 135 A	**LO** 18 ... 166 A
Rated output current **(derating for ambient temperatures) > 40 °C (LO) or > 50 °C (HO)**	**HO** **200 ... 240V** 1AC 2.3 ... 13.6 A 3AC 2.3 ... 154A **380 ... 480V** 3AC 1.3 ... 370 A **500 ... 690V** 3AC 11 ... 115 A	**LO** **200 ... 240V** 1AC 3.2 ... 17.5 A 3AC 3.2 ... 178 **380 ... 480V** 3AC 1.7 ... 477 A **500 ... 690V** 3AC 14 ... 142 A	**HO** 1.3 ... 145 A	**LO** 1.7 ... 178 A
Conformance with standards	UL, cUL, CE, C-Tick, SEMI F47		UL, cUL, CE, C-Tick	
CE marking	According to the Low-Voltage Directive 2006/95/EC			
Electrical information				
Line frequency	47 ... 63 Hz			
Low Overload	Generally used for applications demanding a low level of dynamic performance (continuous operation), square-law torque characteristic with low breakaway torque and low-speed precision. For example: centrifugal pumps, radial/axial fans, reciprocating blowers, radial compressors, vacuum pumps, agitators, ...			
Overload capability (for Low Overload)	150% for 3 seconds: 110% for 57 seconds			
High Overload	Generally used for applications demanding a higher dynamic performance (cyclic duty), as well as constant torque characteristics with a high breakaway torque. For example: conveyor belts, geared pumps, excentric worm pumps, mills, mixers, crushers, vertical conveying equipment, centrifuges, ...			
Overload capability (for High Overload)	200% for 3 seconds: 150% for 57 seconds			
Overload capability (LO/HO)	When using the overload capability, the continuous output current is not reduced			
Output frequency	0 ... 550 Hz (control modes V/f and FCC), 200 Hz SLVC			
Pulse frequency	4 kHz (standard) or 4 ... 16 kHz (derating)		4 kHz (standard) or 4 kHz ... 16 kHz (derating) FSF: 4 kHz (standard) or 4 kHz ... 8 kHz (derating)	
Functions				
Brake functions	Dynamic braking, DC braking, motor holding brake, compound brake		Energy recovery in regenerative operation	
Motors that can be connected	Three-phase induction motors and synchronous reluctance motors[2]			
Protection functions	Under-voltage, over-voltage, over-modulation/overload. Ground fault, short circuit, stall protection, motor blocked protection, motor over-temperature, drive over-temperature, parameter inter-locking			

[1] *with line reactor*

[2] *depending upon the respective Control Unit*

Control units	CU230P-2	CU240E-2	CU250S-2
	Optimized for pumps, fans, compressors	Optimized for general applications in machine building, such as conveyor belts and mixers	For demanding applications in the standard drives domain, for example extruders, centrifuges
Architecture	Application-optimized number of I/O	Standard number of I/O, integrated safety technology	Higher number of I/O, integrated safety technology and basic positioning function
Mounting dimensions [WxHxD]	73 x 199 x 65.5 mm (2.9 x 7.8 x 2.6 in.)	73 x 199 x 46 mm (2.9 x 7.8 x 1.8 in.)	73 x 199 x 46 mm (2.9 x 7.8 x 1.8 in.)
Communication functions			
PROFINET	CU230P-2 PN	CU240E-2 PN, CU240E-2 PN-F	CU250S-2 PN
PROFIBUS DP	CU230P-2 DP	CU240E-2 DP, CU240E-2 DP-F	CU250S-2 DP
EtherNet/IP	CU230P-2 PN	CU240E-2 PN, CU240E-2 PN-F	CU250S-2 PN
Modbus RTU and USS	CU230P-2 HVAC	CU240E-2, CU240E-2 F	CU250S-2
BACnet MS/TP	CU230P-2 HVAC	–	–
USB interface	1	1	1
Safety functions according to Category 3 of EN 954-1 or acc. to SIL2 of IEC 61508			
Integrated safety function: STO	–	CU240E-2, DP, PN	–
STO, SS1, SLS, SDI, SSM	–	CU240E-2 F, DP-F, PN-F	–
STO, SBC, SS1	–	–	CU250S-2, DP, PN
STO, SBC, SS1, SLS, SSM, SDI	–	–	CU250S-2, DP, PN (SLS, SSM, SDI with safety license)
Electrical information			
Supply voltage	24V DC (via power modules or externally)		
Digital inputs	6	6	11
Digital inputs failsafe	–	CU240E-2, CU240E-2 DP: 1 CU240E-2 DP-F: 3	3
Analog inputs, parameterizable	2 x (–10 to +10V, 0/4 to 20 mA) 1 x (0/4 to 20 mA, Pt1000/LG-Ni1000) 1 x (Pt1000/LG-Ni1000)	2 x (–10 to +10V, 0/4 to 20 mA)	2 x (–10 to +10V, 0/4 to 20 mA)
Digital outputs	2 x (relay NO/NC, 250V AC, 2 A, 30V DC, 5 A)[1)] 1 x (relay NO, 30V DC, 0.5 A)	1 x (transistor, 30V DC, 0.5 A) 2 x (relay NO/NC, 30V DC, 0.5 A)	4 x (transistor, 30V DC, 0.5 A) can be optionally used as digital inputs 1 x relay: NO: 30V DC, 0.5 A 2 x relay: NO/NC: 30V DC, 0.5 A
Analog outputs	2 x (0 to 10V, 0/4 to 20 mA)	1 x (0 to 10V, 0/4 to 20 mA) 1 x (0 to 10V, 0 to 20 mA)	2 x (0 to 10V, 0/4 to 20 mA)
Functions			
Open-loop/closed-loop control techniques	V/f (linear, square law, free, FFC, ECO), field-oriented control of speed and torque without encoder		
			Field-oriented control of speed and torque with encoder
Setpoints	**Setpoint selection:** analog value, fixed setpoints (max. 16), motorized potentiometer, communication interface, PID controller for process quantities		
	Setpoint channel: minimum speed, maximum speed, ramp-function generator with rounding, 4 skip frequencies		
Protection	**Drives:** over-voltage and under-voltage, as well as phase failure, over-current protection, overload I2t, over-temperature of the control module and power unit, wire breakage of analog signals, evaluation of 3 external faults/alarms		
	Motor: temperature monitoring with and without temperature sensor, over-speed, locked rotor and stall protection		
	Drive: torque monitoring for dry running protection, belt monitoring		
	Communication: telegram failure, bus interruption		
	Fault message memory: buffer for 8 fault cases, each with 8 faults and fault value and time, buffer for 56 alarms with alarm value and instant in time		
Mechanical information			
Degree of protection	IP20		
Software			
STARTER, SIZER, DT Configurator, SINAMICS Startdrive	x		x	x
Accessories			
	IOP-2, BOP-2, shield connection kit, PC inverter connection kit 2, SINAMICS memory card (SD card)		

[1)] *For plants and systems corresponding to UL, the following applies: via terminals 18/20 (DO 0 NC) and 23/25 (DO 2 NC) max. 3A, 30V DC or 2A, 250V AC*

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