SINAMICS G120

The modular inverter – energy-efficient, safe and rugged

Brochure · April 2010

SINAMICS Drives

Answers for industry.

SIEMENS

SINAMICS G120

The modular, safe, reliable and energy-efficient inverter system

Applications: Drives in machinery construction

SINAMICS G120 is the universal drive in the complete industrial and trades areas, in sectors such as machinery construction, automobile, textiles, printing and packaging, chemical industry as well as in higher-level applications such as in conveyor technology, in the steel, oil & gas and offshore sectors as well as in renewable energy applications.

It's a perfect fit in central architectures

For standard applications:
The SINAMICS G120 inverter has a modular design and comprises a Power Module (PM) and a Control Unit (CU).
It covers a wide power range from 0.37 kW to 250 kW.
Considering the abundance of available components every user can assemble the optimal inverter. Only combine the relevant modules, dependent on the hardware, communication or safety requirements. The G120 system continues to expand with innovative elements and possibilities:

Safety Integrated:
Fully integrated into standard automation and for lower costs in the drives. From engineering up to the operational plant or system: Integrate safety – simply benefit.
Energy efficiency:
Energy saving by innovative functions and energy recovery in generator operation.
Tough environments and endurance:
High level of ruggedness as result of a smart cooling concept.
User-optimized from installation to maintenance:
Application Wizards, plain text display, USB port, MMC memory card.

Highlights

Mechanical system

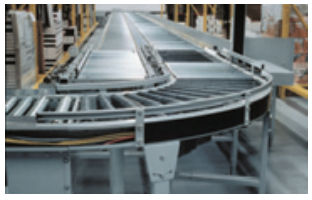
- Modular design
- Innovative cooling concept for a higher degree of ruggedness

Electronics

- Energy recovery, few line harmonics, energy-saving, no braking resistors
- Semiconductor temperature monitoring
- Safety Integrated (STO, SS1, SLS, SBC) without encoder
- Interchangeable MMC memory card

Communication

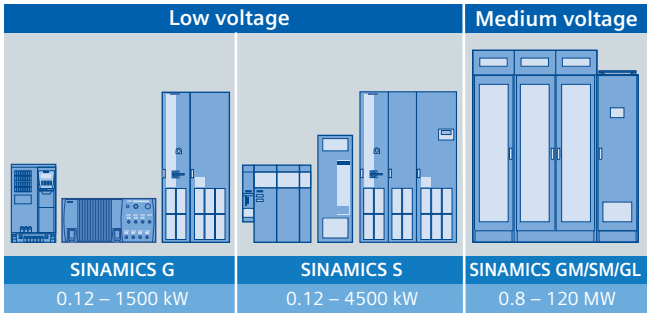
- PROFIBUS, PROFINET, PROFIsafe, Modbus RTU, CANopen, USS, BacNet, MS/TP
- Integrated in Totally Integrated Automation



SINAMICS G120 is part of the SINAMICS drive family for innovative and leading-edge drive solutions

- Wide range of power ratings from 0.12 kW to 120 MW
- Both in low-voltage as well as medium-voltage versions
- Seamless, integrated functionality by using common hardware and software platforms
- One standard engineering tool for all drives
  - SIZER for engineering
  - STARTER for parameterizing and commissioning
- High degree of flexibility and the ability to be combined

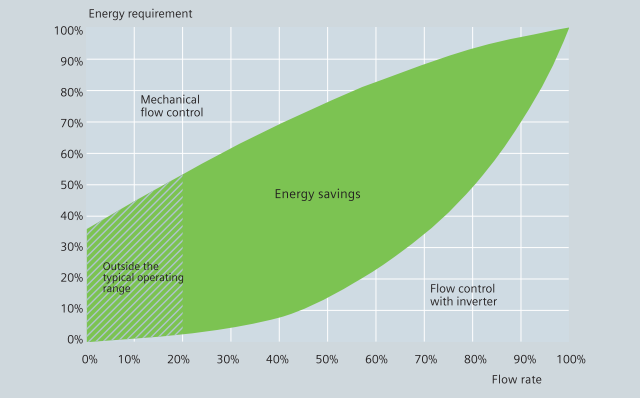
SINAMICS offers the optimum drive for every drive application – and all drives can be configured, parameterized, commissioned, and operated in a similar manner.



Energy efficiency

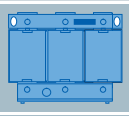
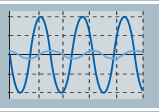
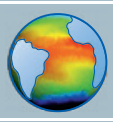
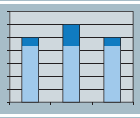
Inverter safe energy by conscious application-specific speed control.
In addition the braking energy is supplied back to the line.
Integrated energy saving functions continue to minimize power costs.

- *V/f* Eco Mode: Reduction of motor currents in the partial load operational range; energy saving up to 40 %
- Hibernation Mode: Automatic switch on and shut down of the inverter dependent on the process mode
- DC link: Reduction of the current by a high active power component



With Efficient Infeed Technology

The completely new and unique standard in the field of compact inverters: regenerative feedback capability in smaller, lighter and favorably-priced inverter units.
Applications are wherever a braking resistor is still being used today: e.g. applications with vertical motion, drives for load-carrying vehicles, machines with a high moment of inertia, centrifuges, renewable energy (hydroelectric, wind turbines).

	Standard Technology	Efficient Infeed Technology
Line reactor and braking resistor 	Required	Not required ⊕
Configuration overhead and installation costs 	Standard	Low ⊕
Generated harmonics 	Standard	Minimal ⊕
Heat generated when braking 	Yes	No ⊕
Power consumption and power infeed 	Standard	Approx. 22% less ⊕
Energy efficiency 	Standard	Good ⊕

Safety Integrated

Safety technology is increasingly playing an important role in drive and automation technology.

In its class, SINAMICS G120 offers already integrated safety functions according to EN 60204 that are unique worldwide.

Safety technology integrated in the standard drives can be used with low associated costs.
In compliance with the standards with a simultaneous increase in the productivity of the plant or system and simple to engineer, handle and maintain.

	Safe Torque Off (STO) for safe electrical shutdown	Safe, specific stopping with Safe Stop 1 (SS1)
Benefits	■ Prevents the drive from accidentally starting (no electrical isolation between the motor and inverter) ■ Drive is safely brought into a no-torque condition	■ Drive is quickly and safely stopped while being monitored ■ Independent and continuous monitoring guarantees the shortest response times when a fault develops ■ An encoder is not required
Applications	■ Baggage / package conveying, delivery, removal ■ Motion with low positioning accuracy and without axis synchronism	■ Saws, unwinders, grinding machines, centrifuges, hoisting gear, extruders, high-bay racking units, trolleys, ...
Application example	**Conveyor belt:** ■ Possibility of dynamically changing the velocity ■ The intrinsic weight of the system brakes it after an adequately short time ■ Fast restart after a fault	**Saw**: ■ Safe braking as quickly as possible ■ Increased process speed through short waiting periods ■ The safe status message "standstill reached" is sent to the control
	Safely Limited Speed (SLS)	**Safe Brake Control (SBC)**
Benefits	■ The drive speed is reduced and monitored ■ An encoder is not required	■ A connected brake is safely activated without supplementary components
Applications	■ Presses, punches, conveyor belts, grinding machines, ... ■ Directly working at the plant or system during operation, in the setting-up mode or when carrying out maintenance work	■ Industrial cranes, harbor cranes in container terminals, elevators for persons
Application example	**Press:** ■ Monitoring the velocity while the operator is in the danger zone ■ Safe setting-up operation with limited maximum velocity	**Hoisting gear:** ■ Safe stop at a position without the motor generating a torque ■ Preventing suspended loads from sagging

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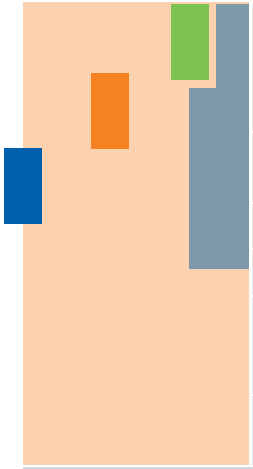
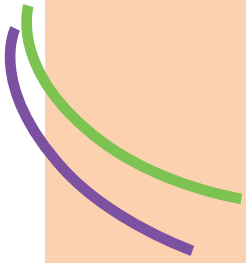
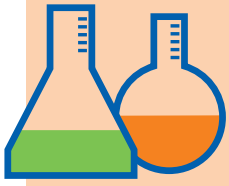
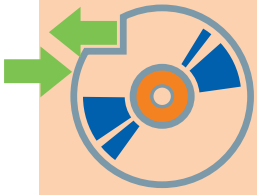
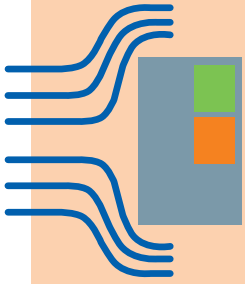
Convincing standard advantages of the system

Functions	Benefits
Modularity	
	
• Freely selectable combination of Power Module (PM) and Control Unit (CU)	• Numerous combinations of PM and CU are possible • Re-commissioning by easy plugging on the CU • Comfortable power extension • Only the functions actually required have to be purchased
• One system for support when selecting (SIZER, DT Configurator)	• Minimal learning time
• Modules can be replaced under voltage (hot swap)	• Re-commissioning is not necessary, only plug on the CU
• PM and CU can be individually replaced	• Service-friendly, a complete new installation is not required
• CU version with integrated safety function Safe Torque Off (STO)	• Favorable basic version for the most common Safety functions without additional components • Control via terminal or PROFIsafe
• Power Modules with Efficient Infeed Technology from 0.37 to 95 kW	• Advantages like energy recovery and high dynamic are available at low power
User-optimized installation and commissioning	
	
• Integrated USB port for commissioning	• Intuitive and simple commissioning
• Plug-in IOP (Intelligent Operator Panel) – incl. door mounting kit	• Quick commissioning without expert knowledge • Minimization of maintenance times
• Plug-in BOP-2 (Basic Operator Panel)	• Basic commissioning comfortable without having a parameter list • 2-line display for a clear presentation
• Remote maintenance/diagnostics and parameter assignment	• Easy, central commissioning/maintenance • Reduction of costs by shortening workflows
• MMC memory card slot	• Data backup for easy exchange
Communication (PROFIBUS, PROFINET, Modbus RTU, CANopen, USS, BacNet)	
	
• Standard network structure • Many users and network topologies	• Easy to handle • Fewer interfaces • Plant-wide engineering
• Advantages of IT technology for production (industry)	• Software updates • Wireless communication using industrial wireless LAN
• Direct integration in the inverter	• Higher performance
Application-specific modules for chemical industry	
	
• SiC technology for 690 V	• High thermal load capacity (small heat sinks) • Increased ruggedness
• Compact through an integrated sine-wave filter	• Long unshielded cables permissible
• 16 kHz pulse frequency	• Bearings do not have to be insulated
• Power unit with regenerative feedback capability • Extremely low bearing current	• All the advantages of regenerative feedback are available

Functions	Benefits
Application-specific modules for pumps, fans, compressors	
	
• Operator Panel and software STARTER with application-specific Wizards	• Easy commissioning based on process values, in a user-friendly language, applies also to complex applications, e.g. cooling towers or levels
• 4 integrated, freely programmable PID controllers	• Distributed system for motor-independent process control without PLC
• 3 freely programmable digital time switches	• Control of user-defined daily or weekly programs
• Isolated digital inputs with own potential group • Isolated analog inputs	• Avoiding potential transfer • Design according to the standards of EMC and process industry without additional components
• Temperature sensor interface NI1000/PT1000	• Direct connection of temperature sensors without external interfaces
• 230 V AC relay	• Direct cotntrol of auxiliary units, e.g. reactor or valve actuators
• Linear and parabolic load curve for centrifugal and positive displacement engines	• Application-specific coordinated control behavior
• Direct connection of 3 pressure/level sensors	• Connection of application-relevant actors without additional components
Integrated software functions	
	
• PLC functions for local control • PID controllers, freely parameterizable (mini-PLC functionality)	• Flexibility of integrated functions - Economy of additional external components
• Automatic restart after mains failure • Flying restart • Kinetic buffering (Vdc_min control) • Energy saving by hibernation mode (sleep mode) • Load torque monitoring for belt failure detection, flow/no flow detection	• Software functionality for flexible applications
Cooling concept for increased ruggedness	
	
• Push-through version of selected Power Modules	• Heat dissipation to the outside, space saving arrangement in cabinet unit
• Heat loss is dissipated using an external heat sink • Electronic modules not located in air duct • Naturally cooled electronics • Standard convection cooling of Control Unit • The air only flows through the heat sink • Electronic modules are especially rugged (coated)	• Significant increase in the ruggedness • Increased reliability • Ensures independence of environmental effects • Significant increase in the service lifetime and usage time • Can even be used under high climatic stress

SINAMICS G120

User-friendly operation: Intelligent and Basic Operator Panel

The SINAMICS Operator Panels IOP (Intelligent Operator Panel) and BOP-2 (Basic Operator Panel) support commissioning and maintenance personnel as well as drive experts.

Operator Panel	IOP	BOP-2
Description	 The standard drives can be simply commissioned thanks to their large plain text display, the menu prompting and the Application Wizards. Integrated Application Wizards navigate users interactively through the commissioning of important applications, e.g. pumps, fans, compressors or conveyor systems.	 The standard drives can be simply commissioned thanks to the menu prompting and the 2-line display. By simultaneous displaying parameters, parameter values and the parameter filtering, a drive can be essentially commissioned without having to use a printed parameter list.
Flexible use	• It is either directly mounted on the Control Unit, mounted in the door or used as handheld device (dependent on the inverter type) • Handheld device can be used with a wide range of inverters • 6 languages available	• It is either directly mounted on the Control Unit or mounted in the door (dependent on the inverter type)
Quick commissioning without expert knowledge	• Standard commissioning using the clone function • User-defined parameter list with a reduced number of self-selected parameters	
	• Simple commissioning of standard applications using application-specific Wizards, it is not necessary to know the parameter structure • Simple local commissioning on-site using the handheld version • Commissioning usually without documentation	
High degree of operator friendliness and intuitive handling	• Direct manual operation of the drive – simple to toggle between the automatic and manual modes	
	• Intuitive navigation using the rotary knob control – just like in everyday life	
	• Graphic display to show status values such as pressure, flow in bar-type diagrams	• 2-line display for presentation of up to 2 process values with text
	• Status display with freely selectable units to specify physical values	• Status display of defined units
Minimization of maintenance times	• Diagnostics using plain text display, without documentation and can be used locally on-site • Simple update of languages, Wizards and firmware via USB	• Diagnostics using the menu prompting with 7-segment display

Usability	Directly mounted on the drive	Door mounting with door mounting kit	IOP handheld
SINAMICS G120 CU230P-2 SINAMICS G120 CU240B-2/ SINAMICS G120 CU240E-2	IOP, BOP-2	IOP, BOP-2	IOP
SINAMICS G120 CU240S	–	–	IOP
SINAMICS G120P	IOP, BOP-2	IOP, BOP-2	– (possible)
SINAMICS G110D*)/ SINAMICS G120D*)	–	–	IOP
SIMATIC ET 200S FC/200pro FC*)	–	–	IOP

*) An optical cable is additionally required.

Technical data



Control Units	CU230P-2	CU240B-2 CU240E-2	CU240S CU240S DP CU240S DP-F CU240S PN CU240S PN-F
Mounting dimensions (W x H x D) in mm	73 x 199 x 58.4 (2.87 x 7.83 x 2.3 in)	73 x 199 x 46 (2.87 x 7.83 x 1.81 in)	73 x 177 x 63.4 (2.87 x 7.0 x 2.5 in)
Communication functions			
PROFIBUS	CU230P-2 DP	CU240B-2 DP, CU240E-2 DP, CU240E-2 DP-F	CU240S DP, CU240S DP-F
PROFINET	–	–	CU240S PN, CU240S PN-F
RS 485 serial interfaces with USS protocol	CU230P-2 HVAC (USS, Modbus RTU)	CU240B-2, CU240E-2, CU240E-2-F	CU240S
RS 232 serial interfaces	✔ (+ USB)	✔ (+ USB)	✔
Safety functions according to Category 3 of EN 954-1 or according to SIL2 of IEC 61508			
Integrated safety functions (STO), (SS1), (SLS)	–	• CU240E-2 (STO only) • CU240E-2-F • CU240E-2 DP-F	• CU240S DP-F • CU240S PN-F
Electrical data			
Supply voltage	24 V DC (via Power Module or external)	24 V DC	24 V DC
Digital inputs parameterizable, isolated	• 6, PNP/NPN corresponding to the wiring	• CU240B-2, CU240B-2 DP: 4 • CU240E-2, CU240E-2 DP, CU240E-2 DP-F: 6	• CU240S, CU240S DP, CU240S PN: 9 • CU240S DP-F, CU240S PN-F: 6
Fail-safe digital inputs parameterizable, isolated	–	• CU240E-2, CU240E-2 DP: 1 • CU240E-2 DP-F: 3	• CU240S DP-F, CU240S PN F: 2
Analog inputs parameterizable	• 2, switchable between -10 to 10 V and 0/4 to 20 mA, can be used as digital inputs • 1, switchable between 0/4 to 20 mA and NI1000/ PT1000 • 1, NI1000/PT1000	• CU240B-2, CU240B-2 DP: 1 0 to 10 V, 0 to 20 mA and switchable from -10 to +10 V • Others: 2 0 to 10 V, 0 to 20 mA and switchable from -10 to +10 V, 0 to 10 V and 0 to 20 mA • All can be used as additional digital inputs	
Relay outputs parameterizable, isolated	• 2, 230 V AC, 2 A • 1, 30 V DC, 0.5 A	• 3, 30 V DC, 0.5 A	
Analog outputs parameterizable	• 2, switchable between 0 to 10 V and 0/4 to 20 mA	• 2 (AO0: 0 to 10 V and 0 to 20 mA, AO1: 0 mA to 20 mA)	• 2 (AO0: 0 V to 10 V and 0 mA to 20 mA, AO1: 0 mA to 20 mA) • CU240S PN-F: 2 (0/4 to 20 mA, 0/2 to 10 V with 500 W)
Functions			
Frequency range that can be skipped	4, programmable		
Fixed frequencies	16, programmable		
Open-loop/closed-loop control technique	• Vector (SLVC), *V/f* (linear, square-law, free, FCC, ECO)	• Vector (SLVC), *V/f* (linear, square-law, free, FCC), torque control	• Vector (VC, SLVC) with/without encoder, *V/f* (linear, square-law, free, FCC), torque control
Operating functions	• PID controller, hibernation, 3x freely programmable digital time switches, automatic restart, flying restart, slip compensation, jog operation, kinetic buffering (only in conjunction with the PM240 Power Modules) and many more.	• Positioning down ramp, automatic restart, flying restart, slip compensation, jog operation, kinetic buffering, motor temperature monitoring, and many more.	
Protective functions	• Motor temperature monitoring with and without temperature sensor • Load duty cycle monitoring, Power Module monitoring, plant/system protective functions		
Mechanical data			
Degree of protection	IP20		
Software			
STARTER	✔	✔	✔
Accessories			
	• IOP, BOP-2 • Shield connection plate • PC Connection Kit-2 • Memory card (MMC card)	• BOP-2 • IOP • PC Connection Kit-2 • Memory card (MMC card)	• BOP • IOP handheld • PC Connection Kit • Memory card (MMC card)

Power Modules	PM240 Brake with braking resistor	PM250/PM250-2 Brake with energy recovery	PM260 Energy recovery, long cable lengths
Line supply voltage	380 ... 480 V 3 AC ± 10 %		660 ... 690 V 3 AC ± 10 % [1]
Power HO = High Overload LO = Low Overload	Unfiltered: 0.37 ... 200 kW (0.5 ... 268.2 HP) (HO) 0.37 ... 250 kW (0.5 ... 335.3 HP) (LO) Filtered: 2.2 ... 75 kW (3.0 ... 100.6 HP) (HO) 2.2 ... 90 kW (3.0 ... 120.7 HP) (LO)	Unfiltered: 0.37 ... 5.5 and 15 ... 75 kW (HO) (0.5 ... 7.4 and 20.1 ... 100.6 HP) 0.55 ... 7.5 and 18.5 ... 90 kW (LO) (0.7 ... 10.1 and 24.8 ... 120.7 HP) Filtered: 0.37 ... 75 kW (0.5 ... 100.6 HP) (HO) 0.55 ... 90 kW (0.7 ... 120.7 HP) (LO)	7.5 ... 37 kW (10.1 ... 49.6 HP) (HO) 11 ... 55 kW (14.8 ... 73.8 HP) (LO)
Push-through technology		FS A: 2.2 kW (3.0 HP) / 3.0 kW (4.0 HP) FS B: 5.5 kW (7.4 HP) / 7.5 kW (10.1 HP) (HO)/(LO)	
Rated input current (dependent on the motor load and line impedance)	PM240 FS A-GX (400 V) unfiltered: 1.7 ... 442 A PM240 FS B-F (400 V) filtered: 7.6 ... 204 A	2.6 ... 145 A	12 ... 46 A
Rated output current (derating for ambient temperatures > 40 °C (LO) or > 50 °C (HO))	PM240 FS A-GX (400 V) unfiltered: 1.3 ... 370 A (HO) 1.3 ... 477 A (LO) PM240 FS B-F (400 V) filtered: 1.3 ... 145 A (HO) 1.3 ... 178 A (LO)	1.3 ... 145 A (HO) 1.7 ... 178 A (LO)	10 ... 42 A (HO) 14 ... 62 A (LO)
Mounting dimensions (W x H x D) in mm	A: 73 x 173 x 210 (2.9 x 6.8 x 8.3 in) (only PM240 FS A-F (400 V) unfiltered) filtered/unfiltered: B: 153 x 270 x 230 (6.0 x 10.6 x 9.1 in) C: 189 x 334 x 250 (7.4 x 13.2 x 9.8 in) PM240 FS A-F (400 V) unfiltered: D: 275 x 419 x 260 (10.8 x 16.5 x 10.2 in) E: 275 x 499 x 260 (10.8 x 19.7 x 10.2 in) F: 350 x 634 x 372 (13.8 x 25.0 x 14.7 in) PM240 FS B-F (400 V) filtered: D: 275 x 512 x 260 (10.8 x 20.2 x 10.2 in) E: 275 x 635 x 260 (10.8 x 25.0 x 10.2 in) F: 350 x 934 x 372 (13.8 x 36.8 x 14.7 in) GX: 326 x 1533 x 545 (12.8 x 60.4 x 21.5 in)	A: 73 x 196 x 165 (2.9 x 7.7 x 6.5 in) B: 100 x 292 x 165 (3.9 x 11.5 x 6.5 in) C: 189 x 334 x 250 (7.4 x 13.2 x 9.8 in) D: 275 x 512 x 260 (10.8 x 20.2 x 10.2 in) E: 275 x 635 x 260 (10.8 x 25.0 x 10.2 in) F: 350 x 934 x 372 (13.8 x 36.8 x 14.7 in)	A: – B: – C: – D: 275 x 512 x 260 (10.8 x 20.2 x 10.2 in) E: – F: 350 x 634 x 372 (13.8 x 25.0 x 14.7 in)
Safety functions			
Integrated safety functions	Safe Brake Control (SBC) according to Category 3 of EN 954-1 or SIL2 of IEC 61508		
Electrical data			
Line frequency	47 ... 63 Hz		
Overload capability (for High Overload)	1.5 x rated current for 1 min within 5 min 2 x rated current for 3 s within 5 min [2]		
Overload capability (for Low Overload)	1.1 x rated current for 1 min within 5 min 1.5 x rated current for 3 s within 5 min [3]		
Output frequency	0 ... 650 Hz (*V/f* and FCC control types) 0 ... 200 Hz (vector control)		0 ... 200 Hz
Pulse frequency	4 kHz (standard) or 4 ... 16 kHz (derating)	4 kHz (standard) or 4 kHz ... 16 kHz (derating) FS F: 4 kHz (standard) or 4 kHz ... 8 kHz (derating)	16 kHz (standard)
Inverter efficiency	96 ... 97 %	95 ... 97 %	95 ... 97 %
Functions			
Braking functions	Dynamic brake, DC brake, motor holding brake, electronic brake, compound brake	Regenerative feedback in generating operation	
Motors that can be connected	Three-phase induction and three-phase synchronous motors		
Degree of protection	IP20		

1) 500 ... 600 V is possible when derated
2) 90 ... 200 kW (120 ... 266.7 HP) - deviations, refer to Catalog D 11.1
3) 110 ... 250 kW (146.7 ... 333.3 HP) - deviations, refer to Catalog D 11.1

All CUs and PMs in conformance with the standard: CE (Low Voltage Directive 72/23), UL, cUL, c-tick, ISO 9001, Safety Integrated, environmental conditions according to IEC 721-3-2

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