

siemens.com/medium-voltage-converter

Drives for every demand

The SINAMICS family of medium voltage drives



Ingenuity for life
SIEMENS

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SINAMICS ...

2014	... introduces the first variable speed drive system		... reaches 10,000 installed worldwide	... launches HARMONY GH150 drive featuring M2C technology
2013	... revolutionizes medium voltage drive with cell-based topology		... launches Siemens first SM120 CM – high-speed drive technology for a medium-voltage VSI platform	... produces the highest-rated medium-voltage drive featuring M2C technology
2013	... pioneers the use of high-voltage IGBTs with the launch of SIMOVERT ML applications		... starts development of M2C technology for a medium-voltage VSI platform	... produces the highest-rated medium-voltage drive featuring M2C technology
2003	... integrates Advanced Cell Bypass into the HARMONY GH180 drives		... starts development of M2C technology for a medium-voltage VSI platform	... produces the highest-rated medium-voltage drive featuring M2C technology
2002	... integrates Advanced Cell Bypass into the HARMONY GH180 drives		... starts development of M2C technology for a medium-voltage VSI platform	... produces the highest-rated medium-voltage drive featuring M2C technology

Evolving to meet tomorrow's challenges today

SINAMICS evolved out of the industry's growing need for high-quality, reliable application-tailored drive options. In 1969, Siemens introduced its first variable speed, medium voltage drive with current source (CSI) technology and within a year became the global market leader in cycloconverters. It seemed that industry leadership was a natural fit for Siemens right from the start.

When SINAMICS PERFECT HARMONY was introduced in 1994, it was the world's first IGBT-based medium voltage drive. Many more firsts were still to come as the technology evolved to meet both industry demands and inevitable changes. Siemens anticipated these changes and planned ahead to address them before they arose. Which is why in 2002 Siemens began working on the development of drives featuring M2C (Modular Multilevel) technology, which has culminated in the launch of SINAMICS SM120 CM and SINAMICS PERFECT HARMONY GH150.

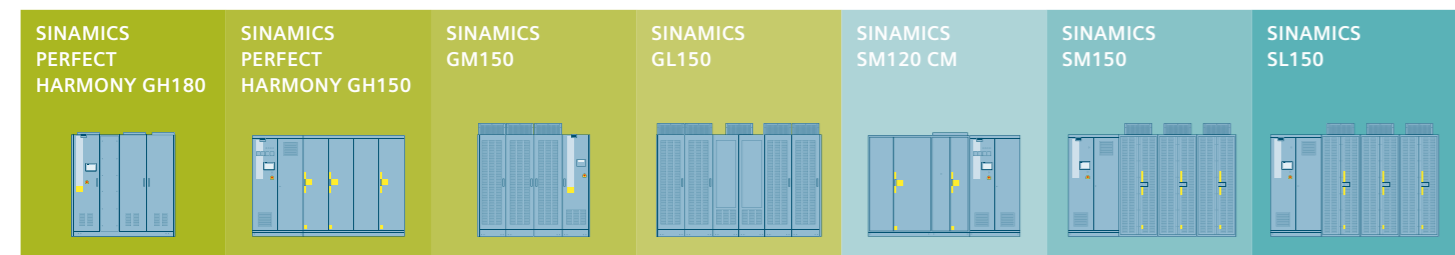
Siemens believed then, as now, that continued innovation is the only way to ensure optimal reliability for its customers' critical applications, which is why we are still working to improve all of our drive systems every day.



Proven reliability. Endless possibilities.

There's no such thing as a one-size-fits-all variable frequency drive (VFD). That's why the SINAMICS family of drives draws on the Siemens legacy of innovation to deliver reliable, high-quality power for a wide range of applications. Designed to save energy, reduce operating costs and reinforce reliability, SINAMICS VFDs are the industry's preferred choice in power conversion.

SINAMICS Medium Voltage Drives

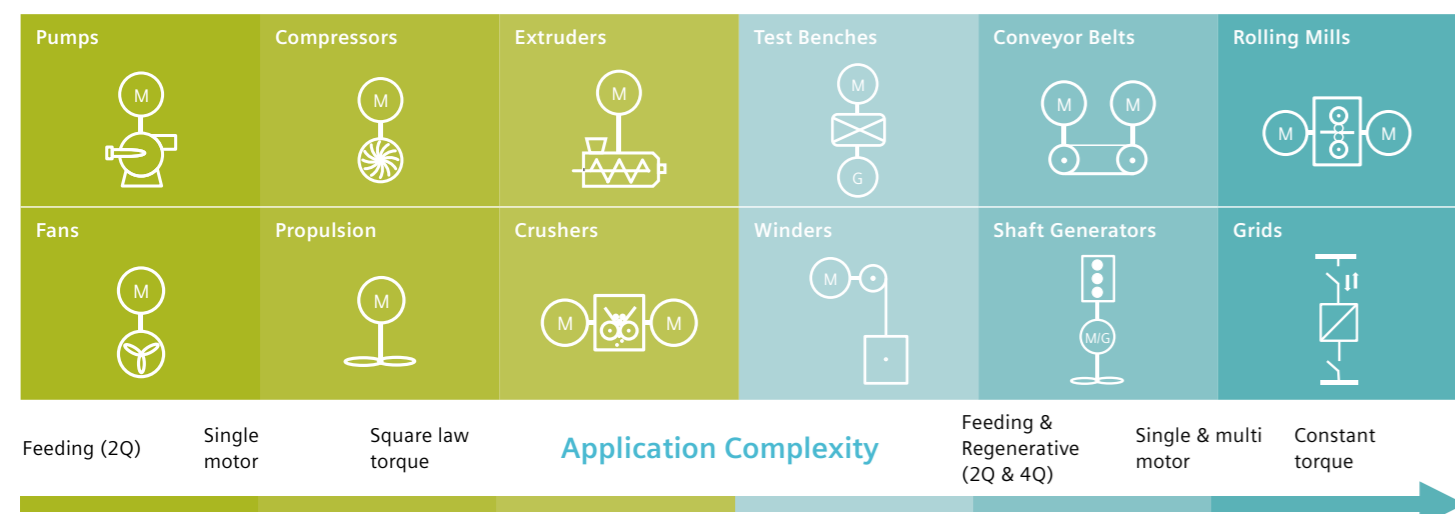


Siemens has more than four decades of experience manufacturing nearly every type of medium-voltage converter or inverter that exists today. We have chosen our portfolio of drives to meet your specific needs with the optimal solution for every type of medium-voltage application:

- Standard applications such as conveyors, pumps, fans and compressors
- Specialized applications such as rolling mills, horizontal mills, shaft generators and high-speed compressors

One single topology or drive configuration does not fit all applications. This is the reason we offer converters and inverters featuring six different technologies, motor voltage classes from 2.3 kV to 11 kV and power ratings from 150 kW to 85 MW. Plus our drive systems match perfectly with our high-voltage motors to provide you with unparalleled levels of reliability, availability, flexibility and performance.

The optimized drive for every application



Core Applications and Product Highlights

SINAMICS PERFECT HARMONY GH180

Core Applications
Single-motor and sync-transfer motor applications such as pumps, fans, compressors, mills, crushers, conveyor systems, retrofit projects, etc.

Product Highlights
Integrated and optimized drive and transformer design – Minimized plant footprint, combined cooling system and plug-and-play drive system setup.
Over 12,000 drives sold worldwide – The most trusted and proven drive on the market today with installations in every major process industry.
Extremely motor-friendly – Capable of being configured with virtually any motor thanks to an almost sinusoidal output voltage.
Cell bypass and cell redundancy – Maximize your process availability thanks to its Advanced Cell Bypass feature for maintaining a balanced output voltage without torque or speed reductions.

SINAMICS PERFECT HARMONY GH150

Core Applications
Single motor applications such as pumps, fans, compressors, conveyor systems (uphill) and retrofit projects.

Product Highlights
Transformer flexibility – Able to utilize dry type or oil-filled standard converter transformers or high primary voltages or number of pulses.
Plant layout versatility and safety – Separate transformer design and separate control cabinet placement ensure maximum flexibility and operator safety.
Extremely motor-friendly – Capable of being configured with virtually any motor thanks to an almost sinusoidal output voltage.
Cell bypass and cell redundancy – Maximize your process availability thanks to a high speed cell bypass feature for maintaining a balanced output voltage without torque or speed reductions.

SINAMICS GM150

Core Applications
Single-motor applications such as basic pump, fan and compressors applications, and mine hoists, especially in marine and offshore applications.

Product Highlights
Easy to maintain and operate safely and reliably – Fuseless, arc fault.
Optimized footprint and design – Compact, rugged; saves costs and space.
Common housing/system for IGBT and IGBT cooling principles – Freely selected based on customer needs to meet requirements.
Transformer flexibility – Able to utilize dry type or oil-filled standard converter transformers or high primary voltages or number of pulses.

SINAMICS GL150

Core Applications
Mainly used in large high-power and high-speed applications such as pumps, fans, compressors, main marine drives, extruders and rolling mills, shaft generators, boiler feed pumps, wire rod mills, starting generators, pump storage and starting applications (e.g., blast furnaces).

Product Highlights
Customized solution for maximum versatility – Line- and motor-side flexibility and friendliness.
Capable of supporting any application with special requirements – Featuring performance characteristics such as 4Q, dynamic performance, and single and multimotor configurations.
Extremely motor-friendly – Capable of being configured with virtually any motor thanks to an almost sinusoidal output voltage.
Marine certified – Proven design for onshore and offshore applications.
Increased protection – For harsh environmental conditions available with IP44 protection type and air-water heat exchanger.

SINAMICS SM120 CM

Core Applications
Single- and multi-motor applications such as shaft generators, ship drives, mills, crushers, conveyor belts, test stands, mine hoists, rolling mill drives, grid applications and retrofits.

Product Highlights
Customized solution for maximum versatility – Line- and motor-side flexibility and friendliness.
Capable of supporting any application with special requirements – Featuring performance characteristics such as 4Q, dynamic performance, and single and multimotor configurations.
Extremely motor-friendly – Capable of being configured with virtually any motor thanks to an almost sinusoidal output voltage.
Marine certified – Proven design for onshore and offshore applications.
Increased protection – For harsh environmental conditions available with IP44 protection type and air-water heat exchanger.

SINAMICS SM150

Core Applications
Single- and multi-motor applications such as mills, crushers, conveyor belts, test stands, rolling mills and mine hoists.

Product Highlights
4-quadrant operation – Regenerative capability for energy-saving drive system solutions.
Single- and Multi-motor capability – Utilizing a common DC link.
Optimized footprint and design – Compact, rugged; saves costs and space.
High dynamic performance

SINAMICS SL150

Core Applications
Perfect for complex high-torque and low-speed applications such as rolling mills, mine hoists, mine winders, ore and cement crushers, excavators and conveyors.

Product Highlights
Fewest drive components for any given power rating – Low component variety to reduce capital investment and associated costs for storage and logistics.
Compact and rugged design for extreme environments – high altitudes, temperatures and air quality, plus service friendliness for remote areas.
Optimal configuration and operation – Integrated test routines, feedback and self-diagnostics, including thyristors, improved commissioning and tuning.
Use of standard HV cable due to the typical low switching speed of thyristors (no screened or armored cables required).

SINAMICS Medium Voltage Drives

Discover why no other drive portfolio can match the dynamics and performance of our SINAMICS medium voltage drives. With systems in motor voltage classes from 2.3 kV to 11 kV, and power ratings from 150 kW to 85 MW, our drives are built to provide the reliability, longevity and quality that modern applications demand – because in today's competitive market, downtime is not an option.

The following tables are provided to help you better identify potential products that might meet your basic requirements. Due to your complex project requirements, it is always recommended that you contact your local Siemens representative for more advanced assistance in selecting the correct drive for your application.



Technical Specifications

	SINAMICS PERFECT HARMONY GH180	SINAMICS PERFECT HARMONY GH150	SINAMICS GM150	SINAMICS GL150	SINAMICS SM120 CM	SINAMICS SM150	SINAMICS SL150
Type of converter	Multi-cell voltage source inverter featuring SINAMICS PERFECT HARMONY technology (PH VSI)	Multi-cell voltage source inverter featuring M2C technology (M2C VSI) [Modular multilevel converter (M2C)]	Voltage source inverter with 3-level NPC and Diode Front End (DFE-VSI)	Current Source inverter with load-commutated inverter technology (LCI)	Customizable modular voltage source system (VSI) featuring M2C, 3L-NPC and DFE [Modular multilevel converter (M2C)]	Voltage source inverter with 3-level NPC and Active Front End (AFE-VSI)	Cycloconverter (CC)
Converter cooling	Air (A), water (W)	Water (W)	Air (A), water (W)	Air (A), water (W)	Water (W)	Air (A), water (W)	Air (A), water (W)
Power range	A: up to 10 MVA W: up to 24.4 MVA	W: 4-47MVA	A: 1-10.1 MVA W: 2-24 MVA	A: 1-19.4 MVA W: 6-85 MVA (higher on request)	W: 4-13.3 MVA	A: 2-5.8 MVA W: 4-31,5 MVA	A: 3-18.8 MVA W: 3-40 MVA
Transformer	Integrated transformer	Separate transformer	Separate transformer	Separate transformer	Separate transformer	Separate transformer	Separate transformer
Input section	A: 2Q (DFE) W: 2Q (DFE) and w/partial recharge	2Q (DFE)	2Q (DFE)	4Q	2Q (DFE) or 4Q (AFE)	2Q (DFE) or 4Q (AFE)	4Q
Type of motor	IM, SYN, PEM, WRIM	IM, SYN	IM, SYN, PEM	SYN	IM, SYN, PEM	IM, SYN, PEM	IM, SYN, PEM
Output voltage	A: 2.3 to 11 kV W: 4.0 to 11 kV	4.0 to 11 kV	2.3 to 4.16 kV 6.6 kV (tandem)	1.4 to 10.3 kV	3.3 to 7.2 kV	IGBT: 3.3 to 4.16 kV IGCT: 3.3 kV	A: up to 3.3 kV W: up to 4.0 kV
Degree of protection	A: IP21 or IP42 (optional) W: IP54	IP43 IP44	A: IP22 or IP42 (optional) W: IP43 or IP54 (optional)	A: IP20, IP32, IP42 (on request) W: IP41, IP44	IP44	A: IP22 or IP42 (optional) W: IP43 or IP54 (optional)	A: IP20 (CoM: IP41) W: IP00
Standards	EN, IEC, CE, EAC, CSA, ANSI, UL, NEMA	EN, IEC, CE, EAC, CSA, ANSI, UL, NEMA	IEC, CE, EAC, CSA (on request)	IEC, CE, EN, EAC, CSA (on request)	IEC, CE, EAC, CSA (on request)	IEC, CE, EAC, CSA (on request)	IEC, EN, CE, EAC, CSA (on request)
Long cable capabilities	1000 m; longer distances on request	1000 m; longer distances on request	Option L08: up to 1000 m	Option L05: up to 1000 m	1000 m; longer distances on request	Option L10: up to 1000 m	

Features

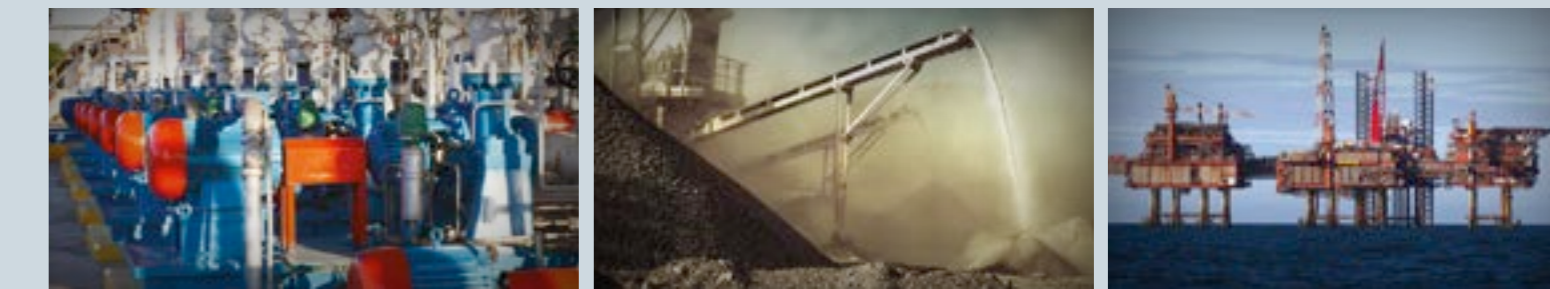
	SINAMICS PERFECT HARMONY GH180	SINAMICS PERFECT HARMONY GH150	SINAMICS GM150	SINAMICS GL150	SINAMICS SM120 CM	SINAMICS SM150	SINAMICS SL150
Differentiating Features	<ul style="list-style-type: none"> Only 3 cables in & out Cell redundancy Motor friendly 	<ul style="list-style-type: none"> Separate transformer Cell redundancy Motor friendly 	<ul style="list-style-type: none"> Separate transformer Marine & offshore duty Small footprint (water-cooled) 	<ul style="list-style-type: none"> Highest power ratings Control redundancy Almost maintenance-free 	<ul style="list-style-type: none"> Highest flexibility Line friendly Modular topology combinations 	<ul style="list-style-type: none"> High dynamic High overload Multi-motor dc-bus 	<ul style="list-style-type: none"> Low speed High overload Highest efficiency
Cell bypass	●	●			●		
Cell redundancy	●	●			●		
ProTOPS™ warning system	●	On request					
Separate control cabinet design		●			●		
Multi-axis					●	●	
Dynamic braking		●	●		●	●	
Marine certification	Air-cooled only	●	●	●		●	
Arc-fault-tested design	At certain ratings	●	●	●	●	●	●
Semiconductor technology	LV IGBT	LV IGBT	HV IGBT, IGCT	Thyristor	MV IGBT LV IGBT (with M2C module)	HV IGBT, IGCT	Thyristor
Control system	Sensorless vector control (optionally with sensor), communication with all current BUS systems, automatic motor identification, automatic startup	Closed-loop vector control	Closed-loop vector control	Closed-loop vector control	Closed-loop vector control	Closed-loop vector control	Closed-loop vector control
Communication profiles	EtherNet IP, Modbus RTU, Modbus Ethernet, DeviceNet ControlNet PROFIBUS DP	PROFINET (standard); optional: PROFIBUS DP, CAN-bus, Modbus Plus, Modbus RTU, Modbus TCP, DeviceNet, ControlNet	PROFIBUS DP, PROFINET (further profiles available on request)	PROFIBUS DP (standard); optional: PROFINET, CAN-bus, Modbus, DeviceNet	SM120: PROFINET (standard); optional: PROFIBUS DP, CAN-bus, Modbus Plus, Modbus RTU, Modbus TCP, DeviceNet, ControlNet	PROFIBUS DP, PROFINET (further profiles available on request)	PROFIBUS DP, PROFINET (further profiles available on request)
Reactive power compensation					●	●	
Synchronous bypass to grid	●	On request	●	●	On request		
Fuseless		●	●	●	●	●	●
Multi-motor starting/sync transfer	●	On request	●	●	●	●	

Motor Compatibility

No drive or motor is perfect for every application or challenge. In addition to our MV drives portfolio, Siemens also offers you the most extensive portfolio of LV and HV motors that have been crafted to work seamlessly with our medium voltage drives.

A different drive may be required for each motor depending on the operational requirements, motor type selected and any preference of drive technology. This table should provide you with a basic view of which drives and motors are compatible in the majority of circumstances.

SIMOTICS High-Voltage Series Motors	SINAMICS PERFECT HARMONY GH180	SINAMICS PERFECT HARMONY GH150	SINAMICS GM150	SINAMICS GL150	SINAMICS SM120 CM	SINAMICS SM150	SINAMICS SL150
SIMOTICS HV C	●		●		●	●	
SIMOTICS HV M	●	●	●		●	●	
SIMOTICS A-compact PLUS	●						
SIMOTICS HS-modyn	●				●	●	
ANEMA	●	●	●		●		
SIMOTICS high-speed	●	●		●	●		
SIMOTICS HV Series Metals			●		●	●	●
SIMOTICS ring							●
SIMOTICS HV Series Mining					●	●	●
SIMOTICS HV Series Ship			●	●	●	●	
SIMOTICS HV Series Injection Pump	●	●			●		



Application Compatibility

Below you will find many of our most commonly supported applications, but we are experienced and able to support numerous other medium-voltage applications that are not listed here.

Drive capabilities can differ based on their configurations and the options selected so there may be exceptions to the suitability of the drive assignments listed here.

	SINAMICS PERFECT HARMONY GH180	SINAMICS PERFECT HARMONY GH150	SINAMICS GM150	SINAMICS GL150	SINAMICS SM120 CM	SINAMICS SM150	SINAMICS SL150
Pumps	●	●	●	●	●		
Fans	●	●	●	●	●		
Conveyors (downhill)					●	●	●
Conveyors (uphill)	●	●	●		●		●
Crushers			●		●		
Extruders	●	●	●	●			
Mixers	●	●	●				
Compressors	●	●	●	●			
Excavators			●				●
Kilns							
High-pressure grinders	●				●		
Vertical mills	●		●		●		
Horizontal mills (geared)	●		●			●	●
Horizontal mills (gearless)							●
Existing line motors	●	●	●	●	●		
Blast furnace blowers	●	●	●				
Pump storage				●			
Rolling mills				●		●	●
Propulsion		●		●	●		
Thrusters			●				
Mine winders					●	●	●
Boiler feed pumps	●	●	●				
Starting generators				●			
Starting blast furnace blowers				●			
Onshore power supply					●		
Test stands	●	●	●	●		●	
Shaft generators				●			
Shaft generator / booster				●			
LNG start/helper (all-electric)	●	●		●			