LARGE DRIVES APPLICATIONS

Drives for every demand

The SINAMICS family of medium voltage drives
siemens.com/medium-voltage-converter

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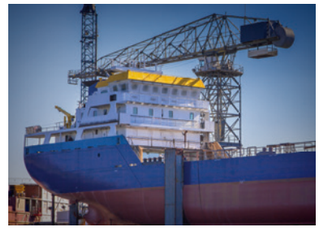
SIEMENS



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 preferred choice in power conversion.

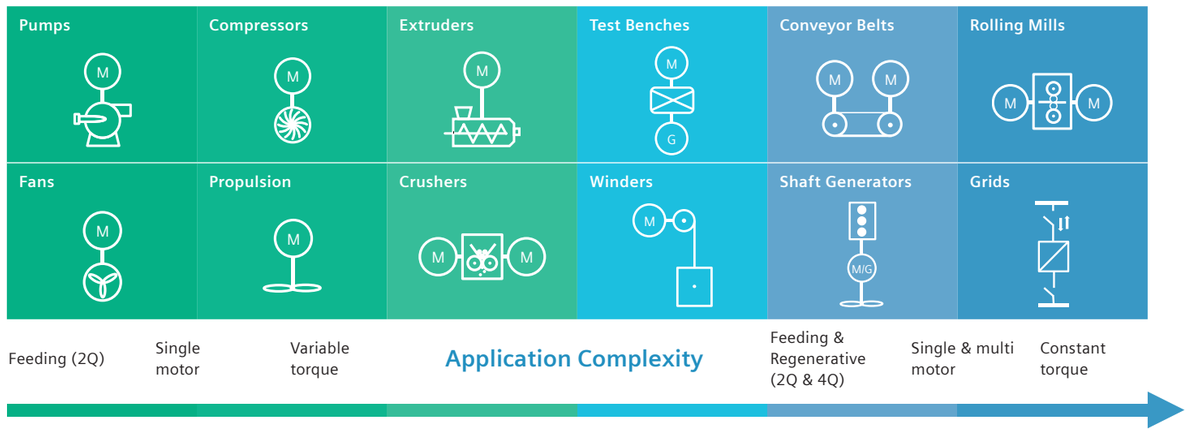
SINAMICS Medium Voltage Drives

Siemens has more than four decades of experience manufacturing nearly every type of medium-voltage converter or inverter that exists today. We have developed our portfolio of drives to meet 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 1.4 kV to 13.8 kV and power ratings from 150 kW to 85 MW. Plus, our drive systems match perfectly with our high-voltage motors to provide unparalleled levels of reliability, availability, flexibility and performance.

The optimized drive for every application



SIDRIVE IQ – our holistic solution and service to IIoT for drive systems

SIDRIVE IQ is an integral component of SINAMICS drives. SINAMICS drives are equipped with a connectivity module (SINAMICS CONNECT 500) so that they can be easily integrated into our digital, cloud-based solution.

Condition data such as drive information, historic logs, parameters and fault logs are evaluated, processed and sent to our cloud for analysis. In addition to that it can be analyzed with our digital platform SIDRIVE IQ Suite. With SIDRIVE IQ Suite users can track and visualize various drive system conditions, show trends, error messages and generate reports.

The goal of SIDRIVE IQ is to:

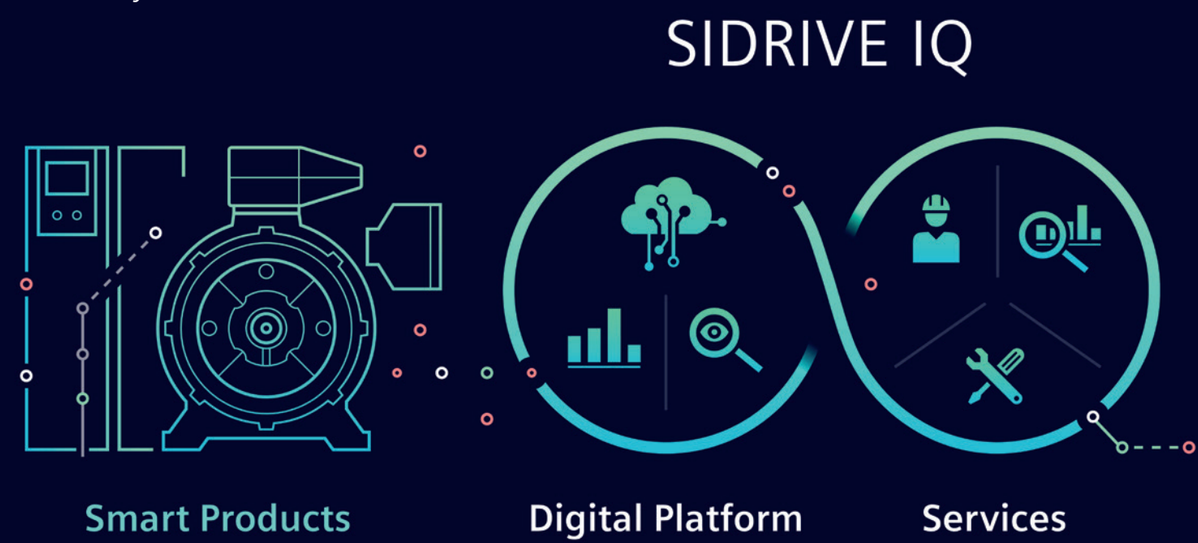
- Boost your productivity
- Reduce service and maintenance costs
- Increase availability
- Shorten unplanned downtimes

SIDRIVE IQ – the holistic solution and service to IIoT for your drive system

siemens.com/sidrive-iq

SERENITY. SECURITY. SIDRIVE IQ

Trust every choice.



Core Applications and Product Highlights

SINAMICS PERFECT HARMONY GH180

Core Applications
Single-motor and sync-transfer (single and multiple 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 16,000 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, cell redundancy and blower redundancy –
Maximize 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 separate dry type or oil-filled standard converter transformers or high primary voltages or number of pulses.

Flexible cooling arrangement perfect for any installation requirements – Water or air cooled design, duct air outside, use integral or separate air-to-air or integral air-to-water heat exchanger, stand alone control cabinet.

Extremely motor-friendly –
Capable of being configured with virtually any motor thanks to an almost sinusoidal output voltage up to 13.8 kV.

Cell bypass and cell redundancy –
Maximize process availability thanks to a high speed cell bypass feature for maintaining a balanced output voltage without torque or speed reduction.

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, tested arc proof design.

Optimized footprint and design –
Compact, rugged; saves costs and space.

Common housing / system for IGBT and IGCT 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 propulsion, extruders and rolling mills, boiler feed pumps, wire rod mills, starting generators, pump storage and starting applications (e.g., blast furnaces).

Product Highlights
Compared to VSI drives, most cost-competitive solution for large power ratings – Power density per M2.

Mature and proven LCI topology –
With over 40 years of experience and large installed base.

Rugged and compact design for complex high-power applications –
Fault tolerant, high MTBF, utilized in marine, starting and high-power applications, most rugged thyristor technology.

Regenerative capability for energy-saving drive system solutions.

SINAMICS SH150

Core Applications
Special applications such as shaft generators on ships, onshore power supply for ships and offshore platforms, regenerating test stands, 50/60 Hz grid coupling, VAR compensation by AFE-drives.

Product Highlights
Extremely motor- and line-friendly –
Motors of literally any type – old or new – can be operated with standard winding insulation without additional stress. Transformer-less connection to local grids on request.

Active Front End (AFE) for grid applications –
Dedicated U/f droop control to create an island grid or to co-supply together with other generators. Additionally supply dynamic reactive power for voltage stabilization (STATCOM).

Active Front End (AFE) for regenerating motors –
Simultaneous 2Q or 4Q operation and grid VAR compensation with AFE and motor-side inverter. Also for rotating generators.

Robust & reliable –
Cell redundancy with automatic cell bypass for increased availability. Marine classification for ship and offshore applications.

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).

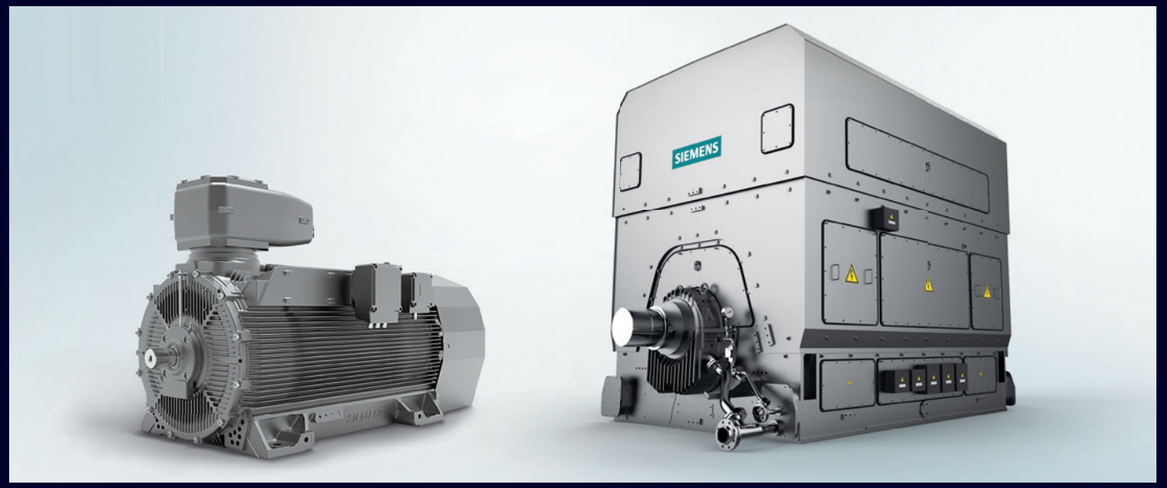
SINAMICS Medium Voltage Drives

Discover why no other drive portfolio can match the flexibility and performance of our SINAMICS medium voltage drives. With systems in motor voltage classes from 1.4 kV to 13.8 kV, and power ratings from 150 kW to 85 MW, Siemens 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.

Due to complex project requirements, it is always recommended that users contact their local Siemens representative for more advanced assistance in selecting the correct drive for the application.

	SINAMICS PERFECT HARMONY GH180	SINAMICS PERFECT HARMONY GH150	SINAMICS GM150	SINAMICS GL150	SINAMICS SH150	SINAMICS SM150	SINAMICS SL150
Technical Specifications							
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)	Multi-cell voltage source inverter with active front end (AFE) featuring M2C tech-nology (M2C VSI)	Voltage source inverter with 3-level NPC and Active Front End (AFE-VSI)	Cycloconverter (CC)
Converter cooling	Air (A), water (W)	Air (A) incl. optional integral A/W and A/A-HEX, 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 17 MVA W: up to 34 MVA	A: 4-35 MVA W: 4-47.6 MVA	A: 1-10.1 MVA W: 2-24 MVA	A: 1.4-30 MVA W: 6-85 MVA (higher on request)	W: 4-16 MVA Higher on request	A: 3.4-5.8 MVA W: 4.6-31.5 MVA	A: 2.9-18.8 MVA W: 12-40 MVA
Transformer	Integrated transformer	Separate transformer	Separate transformer	Separate transformer	Separate transformer	Separate transformer	Separate transformer
Input section	A: 4Q (AFE) W: 2Q (DFE) and w/ partial recharge	2Q (DFE)	2Q (DFE)	4Q	2Q (DFE) or 4Q (AFE)	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	A: 4.16 to 13.8 kV W: 4.16 to 11 kV	2.3 to 4.16 kV	1.4 to 10.3 kV	3.3 to 11 kV	3.3 kV, 4.16 (IGBT only)	1.5 to 4 kV
Degree of protection	IP42 W: IP54	IP43, IP44, IP54	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	IEC, CE, EN, EAC, CSA	IEC, CE, EAC, CSA	IEC, CE, EAC, CSA	IEC, EN, CE, EAC, CSA
Long cable capabilities	2300 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 SH150	SINAMICS SM150	SINAMICS SL150
Differentiating Features	✚ Highest flexibility ✚ Cell redundancy ✚ Motor friendly	✚ Separate transformer ✚ Cell redundancy ✚ Motor friendly	✚ Separate transformer ✚ Marine & offshore duty ✚ Small footprint (water-cooled)	✚ Highest power ratings ✚ Control redundancy ✚ Almost maintenance-free	✚ Highest flexibility ✚ Line friendly ✚ Grid applications	✚ High dynamic ✚ High overload ✚ Multi-motor dc-bus	✚ Low speed ✚ Highest overload capability ✚ Highest efficiency
Cell bypass	●	●			●		
Cell redundancy	●	●			●		
ProToPS™ warning system	●	On request					
Separate control cabinet design		●		●	●		●
Multi-axis						●	
Dynamic braking		On request	●		●	●	
Marine certification	Air-cooled only	On request	●	●	●	●	
Arc-fault-tested design	At certain ratings	●	●	●	●	●	●
Semiconductor technology	IGBT	IGBT	IGBT, IGCT	Thyristor	IGBT	IGBT, IGCT	Thyristor
Control system	Sensorless vector control (optionally with sensor), automatic motor identification, automatic startup	Closed-loop vector control	Closed-loop vector control	Closed-loop vector control	Closed-loop vector control, active front end (AFE) control, droop control for grid supply	Closed-loop vector control	Closed-loop vector control
Communication profiles	EtherNet IP, Modbus RTU, Modbus Ethernet, DeviceNet, ControlNet, PROFIBUS DP, PROFINET, Ethernet/IP	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	SH150: 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	●	●	●	●			
Fuseless		●	●	●	●	●	●
Multi-motor starting/sync transfer	●	●	●	●	●	●	



Motor Compatibility

No drive or motor is perfect for every application or challenge. In addition to our medium voltage drives portfolio, Siemens also offers the most extensive portfolio of high voltage 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 preference of drive technology. This table provides a basic view of which drives and motors are compatible in the majority of circumstances.

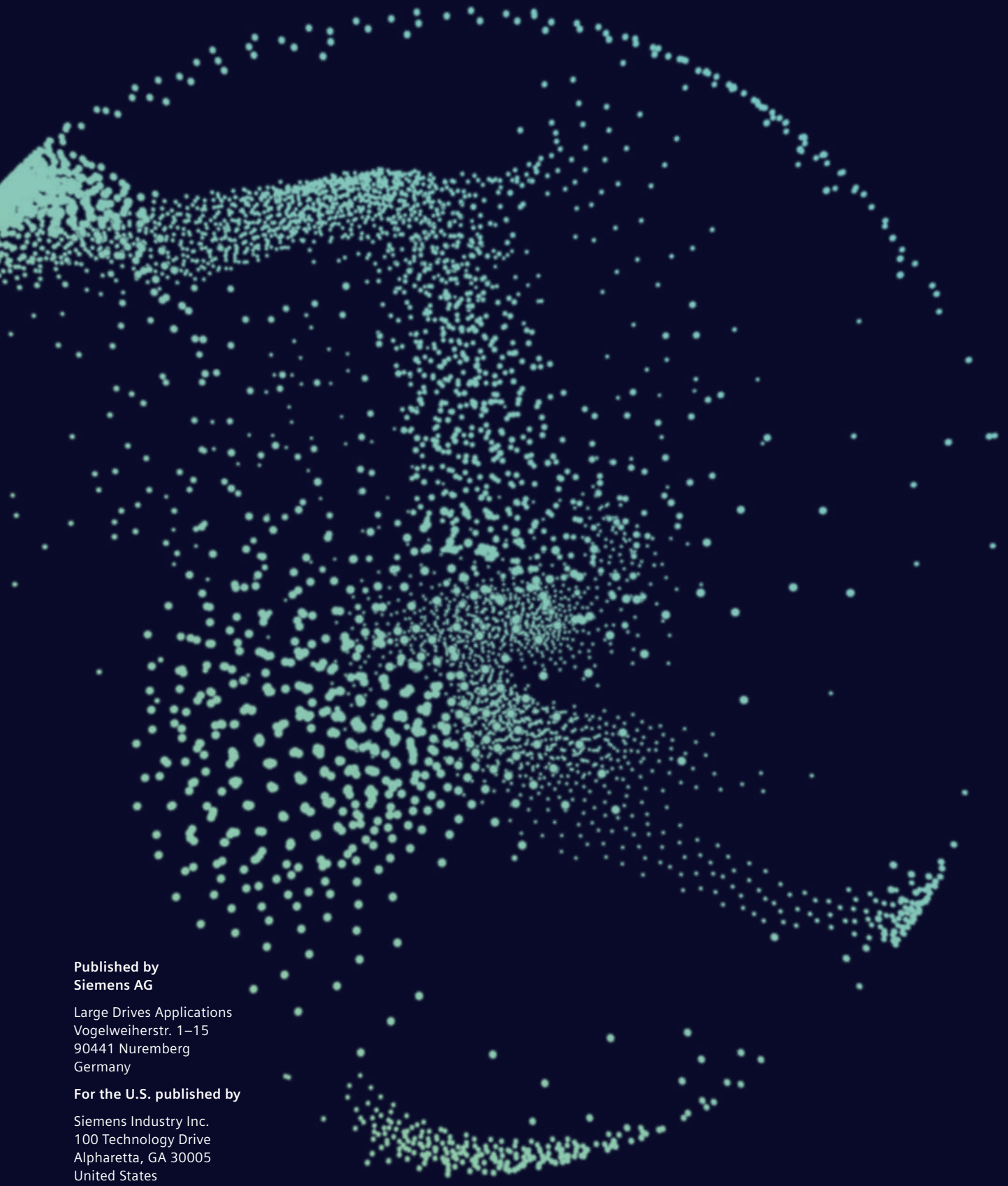
SIMOTICS High-Voltage Series Motors	SINAMICS PERFECT HARMONY GH180	SINAMICS PERFECT HARMONY GH150	SINAMICS GM150	SINAMICS GL150	SINAMICS SH150	SINAMICS SM150	SINAMICS SL150
SIMOTICS HV C	●		●			●	
SIMOTICS HV M	●	●	●		●	●	
SIMOTICS HV Series H-compact	●		●				
SIMOTICS HV series A-compact PLUS	●						
SIMOTICS HV ANEMA	●	●	●		●		
SIMOTICS HV HP	●	●	●	●	●	●	●
SIMOTICS high-speed	●	●		●	●		
SIMOTICS HV Series Metals			●			●	●
Simotics ring motors							●
SIMOTICS HV Series Mining						●	●
SIMOTICS HV Series Ship			●	●	●	●	
SIMOTICS HV Series Injection Pump	●	●			●		

Application Compatibility

Below is a table detailing our most commonly supported applications. Siemens is 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 SH150	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)	●	●		●	●		



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