

SINAMICS PERFECT HARMONY

Uptime. All the time.

The SINAMICS Perfect Harmony GH180 water-cooled drive
usa.siemens.com/perfectharmony



Downtime is not an option.

When you're drilling on the well bottom with 10 feet to go, shutdowns are serious business.

When your rig is anchored 20 miles offshore without a speck of land in sight, service calls aren't simple. And when your pipeline has to pump 150,000 barrels a day to stay on schedule, uptime is everything. Operating conditions will never be perfect—but at least your drives can be.

SINAMICS Perfect Harmony fits any application

The SINAMICS Perfect Harmony GH180 water-cooled variable frequency drive (VFD) draws on decades of experience to deliver the most reliable performance for the widest range of applications yet. Once available exclusively for the most demanding applications with the largest capital expenditures, now the SINAMICS Perfect Harmony GH180 drive can be paired with any application to provide optimal versatility, efficiency and process availability.

Every element of a SINAMICS Perfect Harmony drive is engineered to maximize productivity and protect your process in a way that other drives can't. Its modularity and 50+ patented technologies allow for a scalable solution that achieves 99.99% availability, which means greater productivity and a reduced total cost of ownership over the drive's lifecycle. And now it can pack more power into a smaller footprint, resulting in a 20% smaller unit while reducing the total lifecycle cost.



SINAMICS Perfect Harmony GH180 is:

- **Highly reliable**
Provides fault tolerance via cell redundancy and Advanced Cell Bypass
- **Energy-efficient**
Increases process control to improve throughput and reduce energy waste
- **Easier to maintain**
Requires fewer repairs and spare parts, thanks to a simplified design
- **More powerful**
Offers high-horsepower options (up to 34,00 HP and 11 kV) that fit more applications
- **Ultra-compact**
Reduces space requirements by fitting into a 20% smaller footprint



The reliability behind the world's #1 selling drive.

Advanced cell bypass

In less than a quarter of a second, the SINAMICS Perfect Harmony GH180 drive can bypass multiple failed cells to maintain a balanced output voltage. With one cell in bypass, the drive still produces sufficient voltage to allow the process to continue uninterrupted, and the quality of the voltage and the waveform remain virtually unchanged.

Synchronous transfer

Synchronous transfer is used to soft-start multiple motors in a series and efficiently transfer them across the line without over-stressing the power grid. This closed-transfer approach not only increases energy efficiency, but also helps protect motors and equipment from excessive torque transients.

Process-tolerant Protection Strategy (ProToPS™)

With a proven record of 99.99% process uptime, ProToPS™ protects your process from faulty sensors or data. Unlike typical systems that simply trip the drive and automatically shut down the system due to a malfunction, ProToPS™ offers a proactive control strategy for applications where failure avoidance is critical.

Clean power input

SINAMICS Perfect Harmony drives meet the most stringent IEEE 519 requirements for harmonic distortion. An integrated sinusoidal convertor eliminates the need for harmonic filters, power factor correction capacitors or extra bus capacity, and it protects other online equipment from harmonic disturbances.

High-quality output

No drive offers a higher-quality waveform output than SINAMICS Perfect Harmony VFDs. With up to 33 levels of output voltage, it accommodates any standard motor without requiring additional output or dv/dt filters, which can reduce efficiency and reliability. In addition, it helps extend motor life by providing the lowest peak voltage to the motor windings.

Technical data at a glance

Efficiency

- Typical power converter: 99%
- Typical total drive system: 97%

Input Transformer

- Copper windings, water-cooled

Line Supply Connection

- Input voltage and voltage tolerance:
2.3 to 13.8 kV, $\pm 10\%$
- Input frequency:
50 or 60 Hz, $\pm 5\%$
- Input power factor:
 ≥ 0.95 above 10% load

Motor-Side Inverter

- Multilevel drive PWM topology
- IGBT power modules

Motor Control

- Induction motors
- Synchronous motors
- Permanent magnet motors
- Wound rotor motors

Output dv/dt

- 1,000 V/ μ s

Output Torque

- Rated torque (2Q) available from 10 to 167 Hz

Control

- Open or closed loop Vector Control

Input Current Harmonics

- $\leq 5\%$ TDD (total demand distortion)
- Meets or exceeds IEEE 519

Ride-Through

- Minimum of five cycles after loss of input MV without tripping

Regenerative Operation

- Regenerative breaking is an option

Output Frequency and Drift

- 0.5 to 330 Hz, $\pm 0.5\%$

Output Voltage Harmonics (THDi)

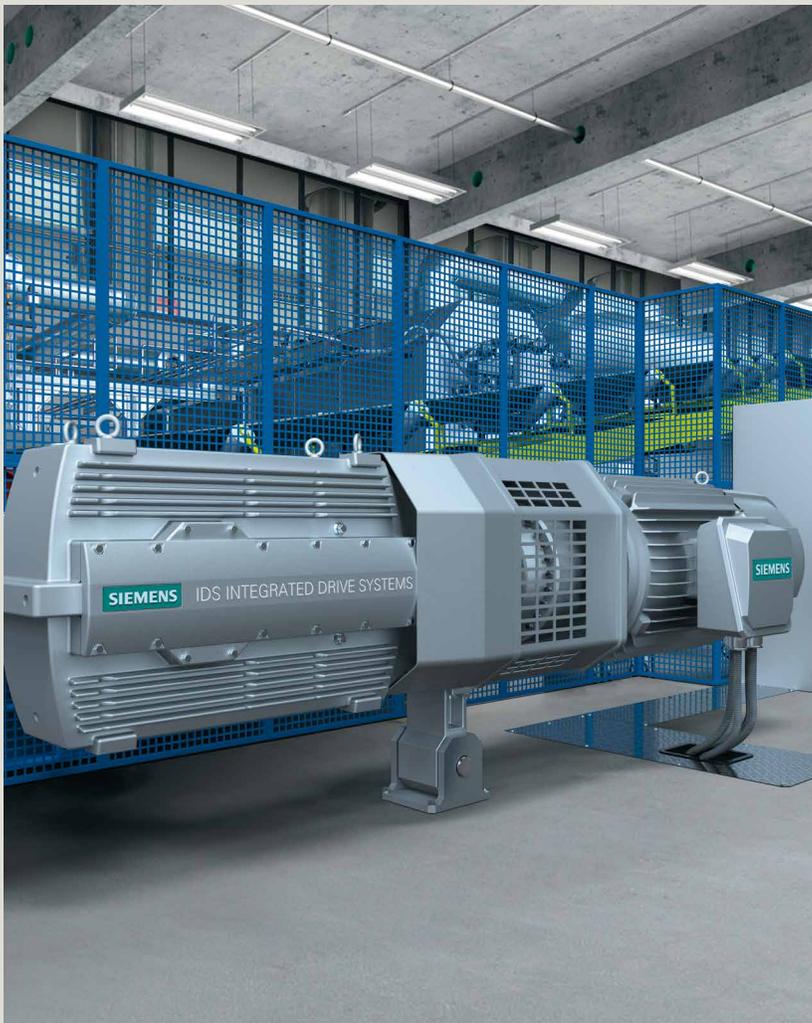
- 2.0 to 2.5%



Fully integrated solutions.

Based on the world's most comprehensive range of drive products, Siemens Integrated Drive Systems (IDS) address the increasingly complex challenges of drive technology by providing a single source for your entire drive system—drive, motor, gearbox and couplings. The integrated design not only simplifies specification, purchase, implementation, operation and maintenance, but also increases your drive system's overall reliability with integrated design efficiencies.

Each component is engineered for optimal compatibility and performance, and upon delivery the Integrated Drive System is installed directly onto the equipment—saving you a significant amount of time in project startup. Every aspect of IDS is designed to your specifications, including custom service contracts and extended warranty options that reinforce the lifetime reliability of your system.



Advantages of an Integrated Drive System:

Reliability

- Improved operating times
- Faster supply of new and replacement components
- Condition monitoring
- CAPEX security

Productivity

- Higher throughput
- Reduced engineering effort
- High degree of flexibility
- Shorter time to market

Efficiency

- More energy-efficient
- Simplified maintenance
- Better environmental protection

Same technology. Smaller size.



Bigger isn't always better

Today's increasingly demanding applications require drives to be squeezed into ever-smaller sites. Whether you're mining on a mountainside or deepwater drilling, space is a constant concern. And with high real estate costs, most manufacturers can't afford to waste a single inch of real estate—nor a single minute of production time.

To support critical applications in out-of-the-way places, Siemens redesigned its SINAMICS Perfect Harmony GH180 VFDs to be 20% more compact. The new stream-lined design offers the same proven reliability and performance as before, but within a smaller footprint that makes it even more versatile and cost-efficient.

High value, low complexity

To shrink the size of its SINAMICS Perfect Harmony GH180 drives, Siemens simplified the system so that it's composed solely of a transformer cabinet, cell cabinet and cooling cabinet. There's less programming needed, and fewer components with fewer connections means maintenance time is minimized, too.

Reliability is improved by reducing the number of threaded fittings on water-cooled VFDs and replacing long hoses with stainless steel pipe. Every aspect of the drive is optimized to fit small spaces while remaining compatible with—and delivering superior reliability to—virtually every application.

Smaller size means smaller costs

In addition to saving valuable square footage, the new compact SINAMICS PERFECT HARMONY GH180 drives also help reduce your total cost of ownership. The size of the drive determines both the size of its enclosure and the power required to keep it cool. With a smaller enclosure, you spend less on cooling power.

In many cases, Siemens also provides manufacturers with an Electrical Equipment House (E-House), a plug-and-play power supply solution with a fully integrated VFD. Reducing the size of the VFD automatically reduces the size of the E-House as well.



No drive is more trusted

The SINAMICS PERFECT HARMONY GH180 drive has more than 20 years of innovation. With each advancement, it continues to evolve in ways that bring increased reliability to critical processes.

From kiln lines and vertical ball mills to mud pumps and extruders, the vast majority of applications can be paired or retrofit with a SINAMICS PERFECT HARMONY GH180 drive to optimize process improvement. It's the No. 1 selling drive in the world—with more than 21,000 drives sold—because it's the most trusted.

SINAMICS Perfect Harmony GH180 Water-Cooled VFD Features	
New Footprint	305 - 450" L
Drive Ambient	5 - 50° C
Output Voltage Rating	Up to 11 kV
Output Current Rating	Up to 1375 A
HP Rating	Up to 34,000 Hp
Customer Inlet Water	0 - 40° C
Glycol	Up to 60%
Advanced Cooling System	Optional
External W-W HEX	Optional
External W-A HEX	Single-loop configuration
Redundant Pump	Optional
Redundant W-W HEX	Optional
ProToPS™	Optional
Closed-loop Vector Control	Optional

SINAMICS Perfect Harmony GH180 Water-Cooled VFD Applications	
Variable Torque Applications: Fans, Pumps, Compressors	✓
Constant Torque Applications: Pumps and Compressors, Extruders and Pelletizers	✓
Parallel Drives (Master-Slave Configuration)	✓
High Starting Torque	✓
High-speed Applications	✓
Applications that Require Braking	✓ Optional
Test Stand	✓
High Availability/ Critical Application Requirements	✓
High Starting Torque Using Closed-Loop Vector Control	✓
High Ambient Environment > 40° C	✓

Maximum reliability. Minimal size.

Same topology, new possibilities

In an industry where downtime is measured in hundreds of thousands of dollars an hour, reliability is essential. That's why, for years, the oil and gas industry has relied on SINAMICS Perfect Harmony medium voltage VFDs. The drive's innovative cell-based topology protects against failures that would overwhelm conventional drive systems.

Each 750 V cell includes Advanced Cell Bypass technology to help prevent interruptions in the unlikely event of a cell fault. And because the low-voltage cells are linked in series, the drive can be scaled to fit a wide range of voltage and output power needs.

Now that range has broadened further—up to 34,000 Hp and 11 kV output voltage. More critical applications than ever before can benefit from the superior reliability, availability and energy-efficiency offered by SINAMICS Perfect Harmony technology.

Streamlined for greater savings

To increase the drive's power without growing its footprint, the entire system was streamlined.

Nothing has changed within the cell topology itself; the enhanced power capabilities come from an expanded 24-cell configuration and an integral water-cooled transformer that optimizes system efficiency.

The Advanced Coolant System cools each power cell by routing water through heat sinks, and an additional water-to-air heat exchanger on top of the cabinet helps further regulate temperature. This allows for greater power output without greater HVAC requirements. Coolant levels can even be monitored remotely, and should the primary pump fail, a redundant pump ensures continuous circulation.

The result is a compact, cool-running drive, the cooling cabinet that has a maximum width of 60" (and spans only 48" wide in its smallest configuration). In addition, it is a reduction in life cycle costs. There are fewer components and connections to maintain, which means there are fewer spare parts required.

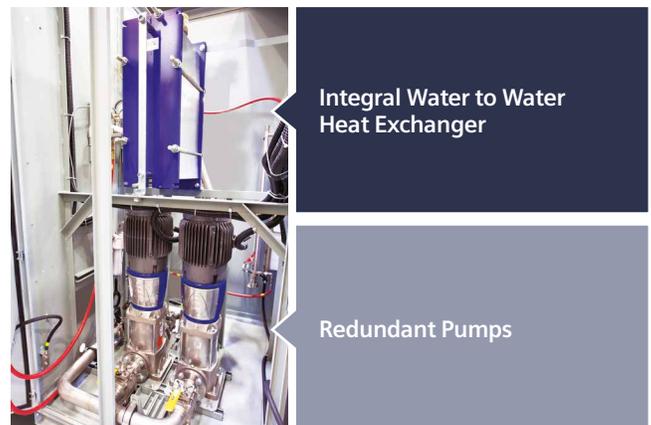
Reduced arc-fault risk

Every SINAMICS Perfect Harmony GH180 water-cooled drive includes the Arc Detection System as a standard feature. The distributed inverter section consists of power cells equipped with arc-detection sensors and the control to communicate with the drive system. This communication is supported by advanced protocol software. In the rare event of cell arcing, the advanced protocol will initiate the shutdown of the inverter within 20 ms. The drive control will issue a trip signal to an external breaker. The distributed power structure of the SINAMICS Perfect Harmony topology results in significantly reduced fault energy in the inverter section as compared to other available technologies.

More power for more applications

The SINAMICS Perfect Harmony GH180 VFD is the world's most trusted drive because when reliability matters most, it delivers. Rather than merely meeting the industry's baseline, the SINAMICS PERFECT HARMONY GH180 drive raises the bar with its integral arc-fault protection, Advanced Cooling System and streamlined design.

And now its newly increased power capabilities and smaller size make it available to an even greater number of critical applications—further enhancing reliability and energy efficiency throughout the oil and gas industry.



When uptime is everything, everything has to be perfect.

Delivering reliability to the nuclear industry

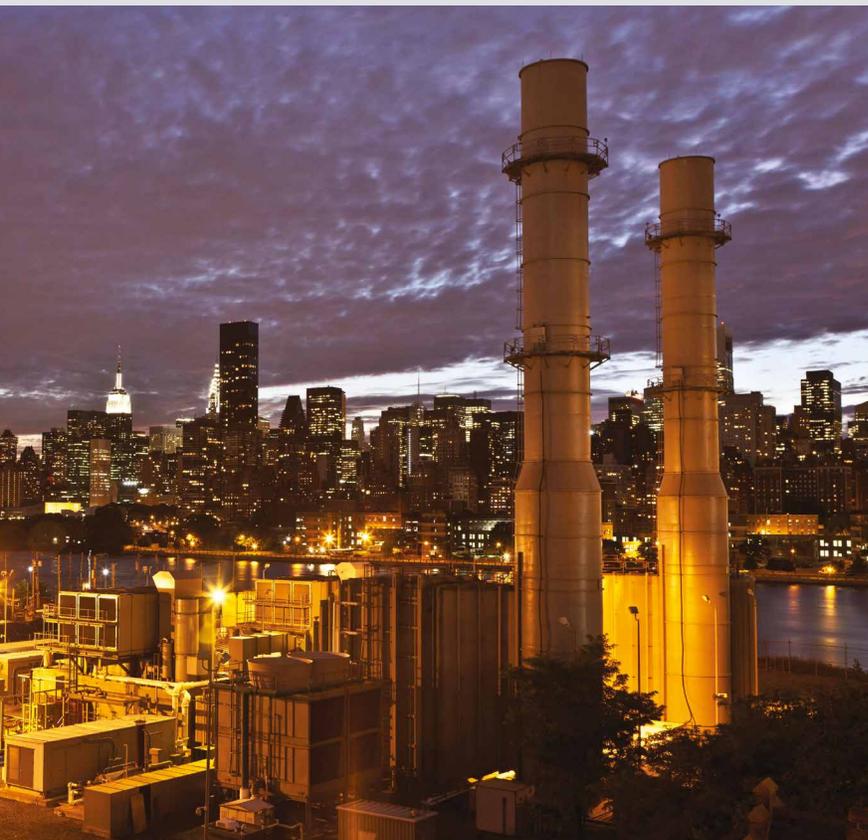
Nuclear plants have traditionally used motor-generator (MG) sets to drive their reactor circulating pumps, a method of control that is difficult and imprecise.

In 2000, the nuclear power industry turned to Siemens for a more reliable solution, and six SINAMICS PERFECT HARMONY VFDs were installed at the Browns Ferry Nuclear Plant.

The drives were able to predictably and accurately control the nuclear plant's circulating pump speed to within 1 rpm of the desired speed command, allowing the plant to operate closer to the reactor's allowed thermal power limit and generate additional electricity.

At full load and full speed, Siemens VFDs achieve 97% efficiency. By improving energy efficiency and enabling power plants to generate additional electricity, VFDs deliver a significant return on investment.

Even more importantly, they feature Advanced Cell Bypass, which ensures continuous operation even in the event of a power cell failure. This level of reliability is essential for the nuclear power industry.



Any variable frequency drive will improve control over your process, but only SINAMICS Perfect Harmony GH180 drives will optimize the control you have. With 50+ patented technologies proven to increase reliability and reduce energy consumption, the SINAMICS Perfect Harmony GH180 water-cooled VFD is designed to fit more applications, more spaces and more budgets.

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.

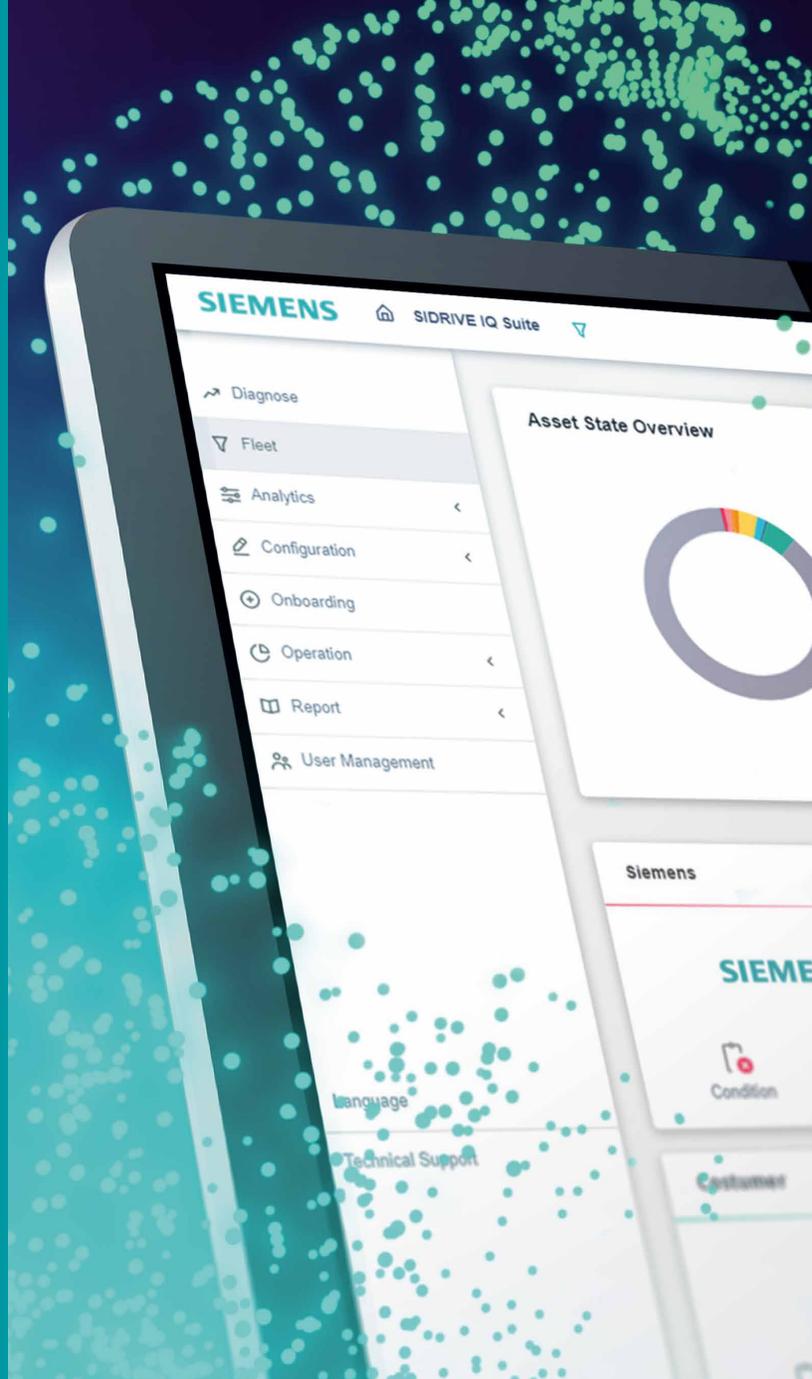
Condition data such as drive information, historic logs, parameters and fault logs are evaluated, processed and sent to our cloud for analysis. In addition to that, it can be analyzed with our digital platform SIDRIVE IQ Suite. With SIDRIVE IQ Suite, users can track and visualize various drive system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

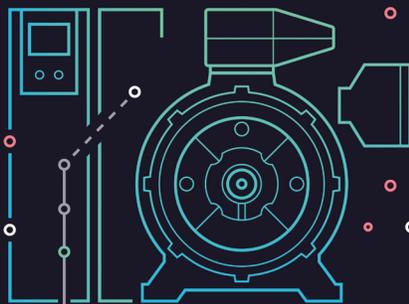
[Siemens.com/sidrive-iq](https://www.siemens.com/sidrive-iq)



SERENITY, SECURITY, SIDRIVE IQ

Trust every choice.

SIDRIVE IQ



Smart Products



Digital Platform

Services

SINAMICS Perfect Harmony GH180 water-cooled drive specifications

No. of Cells	Motor Voltage	Dimensions ²									Order No. (MLFB) ¹
		Shaft Output ³		Motor Current ³	Width	Height	Depth	Width	Height	Depth	
		Hp	kW								
9	3.3	4000	2984	623							6SR327()-0D44-0()()0
9	3.3	6000	4476	935							6SR327()-0D46-0()()0
9	3.3	8000	5968	1246							6SR327()-0C48-0()()0
9	3.3	8500	6341	1324							6SR327()-0E48-5()()0
9	4.16	4000	2984	494	305	115	70	7747	2921	1778	6SR327()-0D44-0()()0
9	4.16	6000	4476	742							6SR327()-0D46-0()()0
9	4.16	8000	5968	989							6SR327()-0C48-0()()0
9	4.16	10000	7460	1236							6SR327()-0C52-0()()0
9	4.16	11000	8206	1359							6SR327()-0E52-2()()0
12	4.8	4000	2984	428							6SR327()-1D44-0()()0
12	4.8	6000	4476	643							6SR327()-1D46-0()()0
12	4.8	8000	5968	857	331	115	70	8359	2921	1778	6SR327()-1D48-0()()0
12	4.8	10000	7460	1071							6SR327()-1C52-0()()0
12	4.8	12000	8952	1285							6SR327()-1E52-4()()0
15	6.6	6000	4476	467							6SR327()-2D46-0()()0
15	6.6	8000	5968	623							6SR327()-2D48-0()()0
15	6.6	10000	7460	779							6SR327()-2D52-0()()0
15	6.6	12000	8952	935							6SR327()-2D52-4()()0
15	6.6	14000	10444	1091							6SR327()-2C52-8()()0
15	6.6	16000	11936	1246							6SR327()-2C53-0()()0
15	6.6	18000	13428	1402	356	115	70	9043	2921	1778	6SR327()-2E53-6()()0
15	6.9	8000	5968	596							6SR327()-2D48-0()()0
15	6.9	10000	7460	745							6SR327()-2D52-0()()0
15	6.9	12000	8952	894							6SR327()-2D52-4()()0
15	6.9	14000	10444	1043							6SR327()-2C52-8()()0
15	6.9	18000	13428	1341							6SR327()-2E53-6()()0
18	7.2	8000	5968	571	382	115	70	9690	2921	1778	6SR327()-3D48-0()()0
18	7.2	12000	8952	857							6SR327()-3D52-4()()0
18	7.2	14000	10444	1000	386	125	76	9536	3175	1930	6SR327()-3D52-8()()0
18	7.2	16000	11936	1142							6SR327()-3C53-2()()0
18	7.2	18000	13428	1285	394	140	84	9995	3556	2134	6SR327()-3E53-6()()0
24	10	10000	7460	514	437	125	76	11100	3175	1931	6SR327()-5D52-0()()0
24	10	15000	11190	771	445	140	84	11303	3556	2134	6SR327()-5D53-0()()0
24	10	20000	14920	1028							6SR327()-5C54-0()()0
24	10	25000	18650	1285	450	154	90	11430	3912	2286	6SR327()-5E55-0()()0
24	10	30000	22380	1332							6SR327()-5E56-0()()0
24	11	15000	11190	701	445	140	84	11303	3556	2134	6SR327()-5D53-0()()0
24	11	20000	14920	935							6SR327()-5C54-0()()0
24	11	25000	18650	1168							6SR327()-5E55-0()()0
24	11	30000	22380	1211	450	154	90	11430	3912	2286	6SR327()-5E56-0()()0
24	11	34000	25364	1372							6SR327()-5E56-8()()0

1) Brackets denote additional digits to be determined based on order details

2) Certain options will change drive dimensions

3) The specifications for typical motor current and the shaft power are approximate values only, these have been calculated for operation with induction motors and a typical power factor $\cos \phi$ of 88% and motor efficiency of 95.2%, power above 25,000 HP is calculated for synchronous motor with a typical power factor $\cos \phi$ of 100% and motor efficiency of 97%.

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Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit <https://www.siemens.com/industrialsecurity>.

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