

**The driving force**  
for special machines  
up to 100 MW



superlarge machines



**SIEMENS**

# Tame forces – unleash forces.

## We can handle both

Large electrical machines demand reliable solutions. Individual solutions. Innovative solutions. We are your partner when it comes to electric drive systems for applications up to 100 MW. We master the widest range of drive tasks in industry and the infrastructure – motors or generators connected to the line supply or fed from converters. We offer sustainable performance. And you always benefit.

### Industry sector competence in all areas

Our solutions are based on decades of experience and the skill sets of our personnel at the Siemens Berlin facility in the Nonnendammallee – better known as the Dynamowerk. Here, we develop and produce large electrical machines for use throughout the world. This didn't just happen by chance. We have gained extensive industry sector know-how through our extensive technical knowledge about drives up to 100 MW – for example in such areas as pumping oil and gas, marine engineering, mining, pulp and paper, water, chemical, power generation and steel production. We are critical about our own knowledge and experience in order to optimize the cost-effectiveness of your plant or system and to secure this over the long term. This philosophy ensures that we will always be able to implement new innovative solutions and in turn continue to underline our technological leadership when it comes to large electrical machines.

### Perfect interaction

In order to achieve the highest degree of perfection from the very beginning, our philosophy completely focuses on teamwork and integrated processes. For instance, our development and engineering departments work hand-in-hand with the departments responsible for planning and production logistics, production and quality management up to service. This is how we achieve the quality that you demand: Innovative concepts, reliable administration and products and systems with the highest degree of availability.





### **System competence for variable-speed drives**

We not only have full confidence in our product and industry sector competence. We are also enhancing our level of system competence at the same time because variable-speed drive solutions are becoming increasingly significant. We optimally harmonize our large electrical machines with our drive converters during the development, design and production. The result – the highest degree of efficiency and reliable drive solutions.

The time that elapses between the original system concept and implementation is decisively shortened thanks to the closely intermeshed procedures between the various departments. This means the following for you as customer:

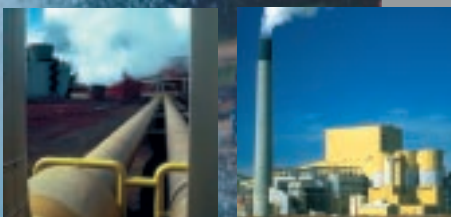
- Smooth project management
- Short delivery times
- Fast commissioning
- Service concepts with the lowest costs



### **Force of innovation for large electrical machines**

We are continually pushing the progress in the area of large electric machines with our solutions. This is confirmed by just taking a quick glance at several highlights of our portfolio. We have:

- With 65 MW, the largest 2-pole synchronous motors worldwide as gas liquefaction-compressor drives
- Permanent-magnet 3-MW wind turbine generators
- Permanent-magnet gondola drives for ships with the highest power rating



# If you want to reach the top, then you require a solid basis.

## This is our portfolio

### **H-modyn Series – up to 50 MW with a standard platform**

We have created a standard platform that is used as basis to easily create high-voltage induction- and -synchronous machines in the power range between 6 and 50 MW:

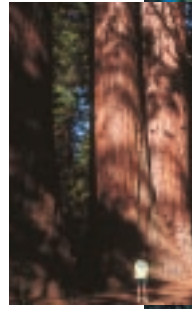
- Squirrel-cage induction machines with between 2 and 16 poles
- Synchronous salient pole rotor machines with 4 or 6 poles
- Synchronous machines with solid cylindrical rotor with 2 poles
- Synchronous machines with laminated cylindrical rotor with 2 to 8 poles

Our industry sector and application-specific solutions are based on this common platform.

### **An unbeatable concept**

H-modyn is a modular concept that simply offers you more:

- More possibilities when it comes to engineering, development and production
- Higher degree of flexibility for your applications
- High reliability through the well-proven platform
- Low machine height thanks to the horizontally located cooler
- Shorter machine length thanks to the center-flanged sleeve bearings
- High load capability as the force is directly transmitted into the foundation
- Extensive diagnostic and monitoring concepts
- Low maintenance costs, simple spare parts stocking



Squirrel-cage induction rotor, 2- to 16-pole



Synchronous salient pole rotor, 4- to 6-pole



Synchronous cylindrical rotor, 2-pole





H-modyn is the first choice when it involves achieving the highest goals. This is because a good investment always has a payback.

For example, in these industry sectors:

### **Oil and gas**

Large machines with Siemens drive converters often play a decisive role where crude oil or natural gas has to be reliably supplied. H-modyn motors drive pumps and compressors up to the highest power ranges to pump, transport and process raw materials.

Our turbo-generators installed on offshore platforms – as is the case in the Gulf of Mexico – ensure that the drilling rig is reliably supplied with energy.

H-modyn also shows its strength as starter-helper motor for large gas liquefaction compressors. For applications such as these, motors with ratings of between 10 and 20 MW accelerate the gas turbines that are not self-starting. This compensates for power dips during operation.

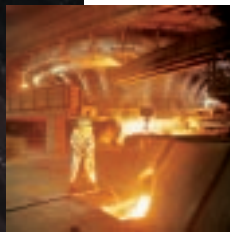


### **Pulp and paper**

In the pulp and paper industry, our drives ensure that the pulp stock, can be reliably processed in the refiner systems in the grinding room. The H-modyn motors, that are used for refiner operation, are generally in the form of synchronous motors – with ratings of between 8 and 35 MW.

### **Steel**

In modern blast furnaces, blowers provide air flow rates of close to 500 000 m<sup>3</sup>/h at approx. 4 bar. These are huge quantities that can only be propelled using extremely high drive power ratings. With H-modyn – no problem: We fulfill these high requirements using our synchronous motors with solid cylindrical rotor as blower drive – with power ratings that in some cases extend to above 40 MW.



### **Many other fields of application**

No matter which drive application you have that requires large machines, with H-modyn, we can provide you with the optimum solution – for instance, as large extruder in the chemical industry, compressors in air separation plants, mills in the basic materials industry or large pumps for water/wastewater applications.

# Our driving forces that are always reliable. And that move a lot

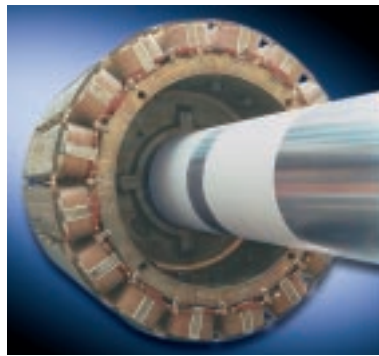
## The multi-talent: The Siemens-Schottel Propulsor (SSP)

Minimum fuel consumption, low noise, optimum space utilization and a high degree of maneuverability – these are all decisive factors in achieving the highest performance in marine engineering – for ferries, luxury cruise ships, tankers and all sorts of other vessels.

Our solution: The Siemens-Schottel Propulsor (SSP™) – a joint project involving Schottel and Siemens. The SSP is a gondola drive that is mounted beneath the ship's stern. It has two propellers and can be rotated as required around its vertical axis (360 degrees). This means that it is both a ship's drive as well as an active control rudder. Therefore, ships equipped with an SSP are significantly more maneuverable. The SSP also has a lower fuel consumption compared to conventional diesel-mechanical systems: Thanks to the permanent-magnet motors used and the narrow profile gondola, the fuel consumption is reduced by up to 11%!

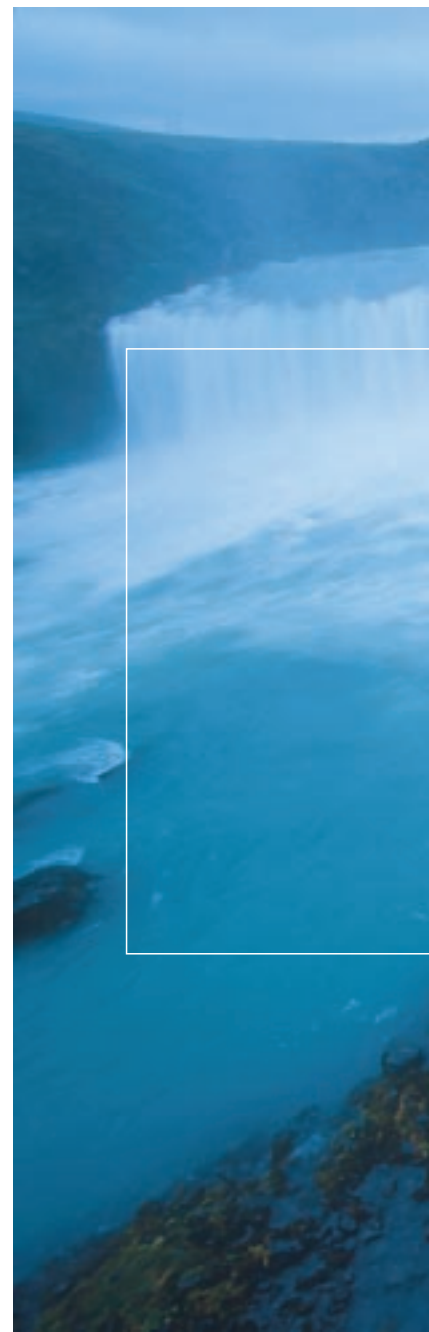
## Compact helper with high power: Booster motors

Container ships are becoming larger and larger. As a result, the main diesel engines are slowly but surely reaching their power limits. The booster motor resolves this problem. It is installed on the existing propeller shaft – between the diesel engine and the ship's propeller. This increases the drive power and allows vessels to steam faster. Further, in coastal areas, the booster can be used as an environmentally friendly main drive. And a great spin-off: The maintenance costs for the main engine are reduced thanks to the booster operation.



## Perfect interaction: Permasyn submarine drives

Extremely compact design, maximum efficiency, extremely quiet, extremely low vibration levels and high shock strength make Permasyn™ permanent-magnet synchronous motors the ideal drive for submarines. The converter is integrated inside the motor itself.





**Maximum energy yield:  
Permanent-magnet wind turbine generators**

It pays off, especially for wind turbine systems that are difficult to access, if gearbox maintenance can be eliminated all together. Wind turbine parks and especially offshore systems can be operated with a significantly higher reliability without having wearing parts that are not only prone to faults and failure, but that also require intensive maintenance. The solution: Permanent-magnet synchronous generators. Compared with separately excited synchronous motors, these distinguish themselves as a result of their straightforward and rugged design and their extremely low rotor losses. Our generators are also extremely resistant to the ambient climatic conditions. Even in extreme salt-laden humid climates, the magnets cannot corrode. The complete generator is protected against the elements using a paint system that is free of any solvent.

**Safety for sensitive locations: Motors for main cooling-medium pumps in power stations**

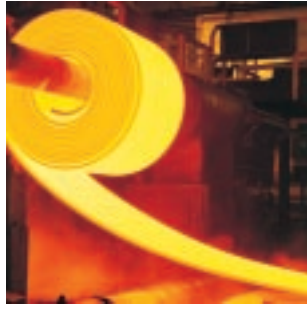
Special motors to drive cooling-medium pumps in power stations must fulfill the most stringent requirements – regarding reliability, availability and quality. You are certainly on the safe side with our motors. Our 4- to 6-pole squirrel-cage induction motors up to 10 MW in a vertical type of construction generally run with a fixed speed.





Even for extreme requirements:  
**We will find a unique solution for you.**





**Exemplary when it comes to smooth running characteristics and dynamic response:**

**Main rolling mill drives**

In steel mills, it is especially important that the processes run uninterrupted and the quality of the rolled steel. It is quite clear that for applications such as these, drive technology plays an essential role. With their extremely high smooth running characteristics and dynamic performance, our main drives play a decisive role in being able to achieve maximum product quality – even at high power ratings.

The highest rating rolling mill motors in the world are synchronous motors with solid cylindrical rotors. These cover a power range of between 500 kW and 12 MW. The speed varies between 50 and 1500 RPM.

The reason for the high availability is the rugged motor design and the gearless concept without any mechanical parts or components between the motor and mill.

This means that gearbox damage, losses, maintenance and the use of oil are a thing of the past – as it is also true for the resulting plant downtimes.

We offer gearless ring motors with power ratings up to 30 MW – with stator diameters up to 44 ft (approx. 14 m). The typical speed is 10 RPM.

We are actively innovating this technology: We are continually optimizing our ring motors so that we can offer you the version that perfectly fits your individual requirements.

The latest example: Ball mills with Siemens ring motors whose dimensions have been further reduced – and at the same time, the efficiency increased.

**For safety underground:  
Integrated drives for mine winder**

Technology must be absolutely reliable and dependable, especially underground. You are certainly on the safe side if you select our integrated drives for mine winder.

This is because we have perfectly adapted our motors to the conditions that prevail in a mine shaft.

Our motors are completely integrated in the cable drum and have some impressive performance data: For example, a cable drum with 4.5-m diameter with integrated 1.2-MW motor can raise a working load of 12 tons at 51 RPM!



**Proven technology in mining:  
Gearless ring motors for ore mills**

What is mined in the earth must then be rationally processed in various refining systems – for example in ore mills. The fact that the widest range of materials with changing characteristics must be transported places extremely high demands on the performance of a mill. The optimum controllability is absolutely essential. Our ring motors fulfill these requirements and distinguish themselves by having an availability of over 99 %. They operate extremely reliably even under extreme conditions – for example in the Chilean Andes at an altitude above 3000 m. Extreme temperature fluctuations as well as several meters of snow in the winter represent a huge challenge.



# We develop perfect solutions.

## For all ambient conditions

### **Faster oil retrieval: Injection pumps**

Water can move a lot. For instance, when it is pumped under high pressure into oil storage underground using injection pumps. This increases the pumping pressure – and in turn the cost-effectiveness. We supply the matching motors for injection pump drives: Two-pole squirrel-cage induction motors in a vertical type of construction – with power ratings of between 3 and 9 MW.



### **Lower maintenance than conventional gas turbines: Our compressor drives above 50 MW**

Completely electric compressor drives make gas liquefaction plants significantly more flexible and with a higher availability than has been possible up until now using conventional compressor systems. With respect to gas turbines, a completely electric drive concept offers many advantages:

- Highest availability of the complete gas liquefying system thanks to low maintenance costs and higher reliability
- More simple spare parts stocking
- Improved controllability
- The throughput of the gas liquefying system can be flexibly and quickly adapted
- The system can be run-up and shutdown more quickly and more easily





**Maximum Speed without gearbox:  
High-speed compressor drives**

Also for directly driven compressors with extremely high speeds, our special motors are the right choice. They are precisely harmonized to your specific applications. This is because we offer these high-speed motors both with oil-lubricated sleeve bearings and also with active magnetic bearings. The latter bearing type allows an extremely wide speed control range to be realized. Customers are demanding increasingly faster drives – which, in turn, is driving us to implement increasingly new and efficient solutions, for example 23-MW two-pole synchronous motors with a speed control range of between 600 and 6300 RPM.

**Development continues – challenge us!**

**Your Siemens partner worldwide**  
can be found in the Internet under the  
following address:  
[www.siemens.com/automation/partners](http://www.siemens.com/automation/partners)



**Siemens AG**

Automation and Drives  
Large Drives Special Machines  
Nonnendammallee 72  
13629 Berlin, Germany  
[www.siemens.com/large-drives](http://www.siemens.com/large-drives)

*The information provided in this brochure contains merely general descriptions or characteristics of performance which in case of actual use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.*