The hydrogen-cooled SGen-2000H generator series

with ratings from 310 MVA up to 600 MVA

SGen5-2000H at Otahuhu Combined Cycle Power Plant (New Zealand)

The SGen-2000H series of hydrogen-cooled, two-pole generators is part of Siemens Generator (SGen™) product line, with ratings up to 600 MVA for steam, gas and combined-cycle applications.

Cooling performance is greatly enhanced through the use of hydrogen as cooling medium. Due to advanced material technologies and resulting heat transfer benefits, the generator components have been designed to achieve optimal performance while providing safe operation and reliability. In addition, frictional losses are significantly lower than those with air, thus improving the overall generator efficiency and performance.

Our innovative design philosophy strives to continually improve world-class generators in order to meet our customers varying requirements and provide utmost reliability and efficiency.

Innovative design for world-class performance in power generation: The SGen-2000H generator series

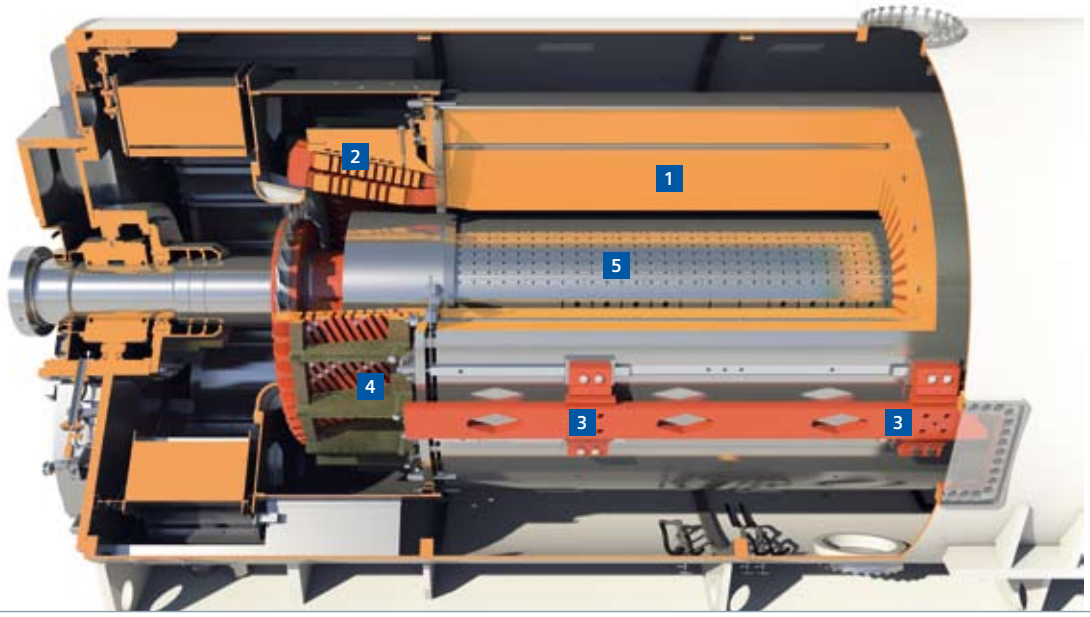
1 **Thin laminations** of high-grade, low-loss silicon steel are consolidated to form the stator core. Each lamination is electrically insulated with high-temperature capability material. The laminations are stacked to form the stator core with finger-plates and heavy end-plates at each end. Key bars and insulated through-bolts are used to maintain core integrity and tightness. The resultant stator core assembly features long lasting tightness, mechanical robustness, and excellent heat transfer characteristics.

2 The **generator stator winding** assembly is manufactured with Vacuum Pressure Impregnation (VPI) technology or Global Vacuum Pressure Impregnation (GVPI). (G)VPI features advanced epoxy-mica insulation systems to ensure insulation integrity, to reduce the possibility of loose end-winding components and to reduce moisture and surface contamination, resulting in stator winding with high voltage endurance.

3 A **patented core spring mounting system** is used to reduce the noise level and transient forces. The design isolates the double operating frequency core vibration and reduces electrical transient forces on the generator frame and foundation.

4 The **patented RIGI-FLEX™ end-winding support system** has been in successful operation since the 1980s. This well proven bracing system provides rigidity to withstand transient fault loads combined with flexibility to withstand normal operation cyclic thermal expansion and contraction which occurs during start-ups and load changes.

5 An **optimized rotor slot design** provides uniform cooling flow through the rotor while also improving overall dynamic stability. A single-stage blower at each end of the generator results in a uniform thermal load in the generator rotor.



Customer Benefits

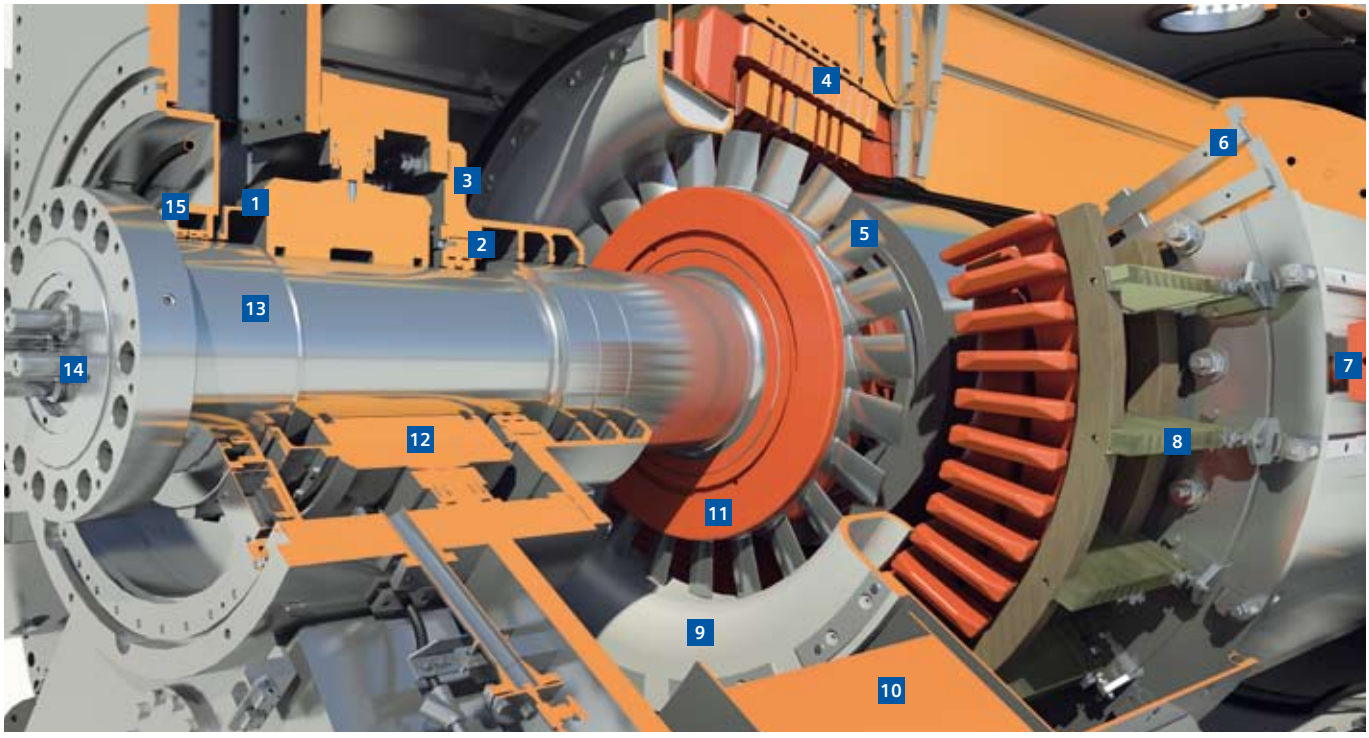
- Efficiency of up to 99 %
- Hydrogen seal with carbon elements requires minimal seal oil and has improved emergency operating characteristics
- Uniform temperature profile promotes reliability
- Simplified installation
- Transport dimensions suitable for rail transport in most countries
- Design based on field-proven generator component designs

For over 60 years, Siemens has made many detailed improvements to the design of hydrogen-cooled generators.

Additional improvements include:

- Advanced Performance Plus™ seal system
- Totally enclosed system minimizes the risk of contamination inside the generator
- Integrated & Compact Omega™ Coolers

1 Bearing Oil Catcher
2 Carbon Seal
3 Carbon Seal Bracket
4 Stator Windings
5 Rotating Blades
6 Finger Plates
7 Patented Core Spring Mounted System
8 Winding Brace
9 Blower Shroud
10 Omega Cooler
11 Blower Hub
12 Bearing
13 Rotor Shaft
14 Excitation End
15 Outer (Oil) Seal



Technical Data					
Model	**Frequency**	**Power Factor**	**Apparent Power**	**Efficiency**	**Terminal Voltage**
SGen5-2000H	50 Hz	0.85	350 MVA to ~600 MVA	up to 99 %	16.5 kV to 22 kV
SGen6-2000H	60 Hz	0.85	310 MVA to ~600 MVA	up to 99 %	19 kV to 23 kV

Coolant	Hydrogen at 4 to 5 bar
Design	In accordance with IEC and ANSI standards and EU Directives
Thermal Classification	Class F insulation system
Type of enclosure	IP64 (IEC34-5); suitable for outdoor installation
Excitation	Static
Transport dimensions	Suitable for rail transport in most countries

The hydrogen-cooled SGen-2000H generator series: References

Our hydrogen-cooled two-pole generator series exceeds an availability of 99.5% and counts with more than 100,000 operating hours which have earned Siemens a flawless reputation in the filed of reliable power generation steam and gas turbine applications. Therefore, the following references are only a few examples to illustrate the vast potentials of the SGen-2000H generator series.

	Hamm-Uentrop, Germany Combined Cycle Power Plant	New Taweelah B, Dubai Combined Cycle Power Plant	Baosteel, Shanghai Steam Power Plant
			
Performance			
Net plant output:	840 MW	1170 MW	350 MW
Commercial operation:	2007	2008	2009
Major components			
Generator:	2x SGen5-2000H	1x SGen5-2000H 3x SGen5-1000A	1x SGen5-2000H
Steam turbine:	2x SST5-3000	Special solution	1 x SST5-5000
Gas turbine:	2x SGT5-4000F	3x SGT5-4000F	

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