Siemens Hydrogen-Cooled Generators
with Water-Cooled Stator Windings
SGen-3000W Series
Over 600 MVA

Answers for energy.
Hydrogen-cooled generators with water-cooled stator windings

Siemens offers in its Siemens Generator (SGen™) product line hydrogen-cooled, two-pole generators with water-cooled stator windings. The SGen-3000W series has ratings over 600 MVA for steam turbine and single-shaft steam and gas turbine applications. Cooling performance is improved by a factor of approximately 14 through the use of hydrogen gas in place of air as the coolant for the stator winding and stator core. At the same time, frictional losses are significantly lower, thus improving the overall generator efficiency.

An increased output per unit volume of stator-winding active material is possible because of the higher thermal conductivity and specific heat of water. It is this advantage of water that makes it possible to build generators for higher ratings than is possible using air or hydrogen as the cooling medium for the stator winding components.

For over 40 years Siemens has made many detailed improvements to the design of hydrogen-cooled generators with water-cooled stator windings:
- Smaller size and therefore reduced space requirements in the turbine building
- Higher efficiency
- Totally enclosed system minimizes the risk of contamination inside the generator.

Consistent improvement in the design of hydrogen-cooled generators with water-cooled stator windings has brought about operating efficiencies of up to 99%.

A proven modular system enables the production of a wider range of generators by using rotors with different diameters as well as different active body lengths. The same design philosophies and tools are used in the design of the entire product line of air-cooled, hydrogen-cooled, and water-cooled stator winding generators. This means that customers with hydrogen-cooled with water-cooled stator winding generators benefit from the manufacturing and operational advances made to the entire product line of generators. A design requiring low maintenance in connection with our worldwide service network can result in the highest availability.

Technical data

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Model</th>
<th>Power factor</th>
<th>Apparent power</th>
<th>Efficiency</th>
<th>Terminal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz</td>
<td>SGen5-3000W</td>
<td>0.85</td>
<td>675 MVA to 940 MVA</td>
<td>up to 99%</td>
<td>15 kV to 21 kV</td>
</tr>
<tr>
<td>60 Hz</td>
<td>SGen6-3000W</td>
<td>0.85</td>
<td>600 MVA to 1,270 MVA</td>
<td>up to 99%</td>
<td>16 kV to 27 kV</td>
</tr>
</tbody>
</table>

Coolant: Hydrogen gas at 5 to 6 bar

Design: In accordance with IEC and IEEE/ANSI standards

Thermal classification: Class F insulation system

Type of enclosure: IP64 (IEC60034-5); suitable for outdoor installation

Excitation: Static or brushless

Transport dimensions: Suitable for rail transport in most countries

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

Siemens offers in its Siemens Generator (SGen™) product line hydrogen-cooled, two-pole generators with water-cooled stator windings. The SGen-3000W series has ratings over 600 MVA for steam turbine and single-shaft steam and gas turbine applications.

Cooling performance is improved by a factor of approximately 14 through the use of hydrogen gas in place of air as the coolant for the rotor winding and stator core. At the same time, frictional losses are significantly lower, thus improving the overall generator efficiency.

An increased output per unit volume of stator-winding active material is possible because of the higher thermal conductivity and specific heat of water. It is this advantage of water that makes it possible to build generators for higher ratings than is possible using air or hydrogen as the cooling medium for the stator winding components.

For over 40 years Siemens has made many detailed improvements to the design of hydrogen-cooled generators with water-cooled stator windings:
- Smaller size and therefore reduced space requirements in the turbine building
- Higher efficiency
- Totally enclosed system minimizes the risk of contamination inside the generator.

Consistent improvement in the design of hydrogen-cooled generators with water-cooled stator windings has brought about operating efficiencies of up to 99%.

A proven modular system enables the production of a wider range of generators by using rotors with different diameters as well as different active body lengths.

The same design philosophies and tools are used in the design of the entire product line of air-cooled, hydrogen-cooled, and water-cooled with water-cooled stator winding generators. This means that customers with hydrogen-cooled with water-cooled stator winding generators benefit from the manufacturing and operational advances made to the entire product line of generators.

A design requiring low maintenance in connection with our worldwide service network can result in the highest availability.

---

**Technical data**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Model</th>
<th>Power factor</th>
<th>Apparent power</th>
<th>Efficiency</th>
<th>Terminal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz</td>
<td>SGen5-3000W</td>
<td>0.85</td>
<td>675 MVA to 940 MVA</td>
<td>up to 99%</td>
<td>15 kV to 21 kV</td>
</tr>
<tr>
<td>60 Hz</td>
<td>SGen6-3000W</td>
<td>0.85</td>
<td>600 MVA to 1,270 MVA</td>
<td>up to 99%</td>
<td>16 kV to 27 kV</td>
</tr>
</tbody>
</table>

**Coolant:** Hydrogen gas at 5 to 6 bar

**Design:** In accordance with IEC and IEEE/ANSI standards

**Thermal classification:** Class F insulation system

**Type of enclosure:** IP64 (IEC60034-5); suitable for outdoor installation

**Excitation:** Static or brushless

**Transport dimensions:** Suitable for rail transport in most countries

---

**Customer benefits**

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

---

**Performance Plus™ System**

A hydrogen seal design based on carbon elements has moved the seal technology a revolutionary step forward. A carbon seal ring, which requires much less seal oil, significantly reduces the required capacity and size of the seal oil system. This technology greatly reduces seal oil contamination in the hydrogen gas and improves emergency seal operating characteristics.

---

**Four vertical independent heat exchangers**

A single multi-stage blower at the turbine end of the generator circulates the hydrogen gas for cooling of the rotor, stator core and frame components.

---

**A Performance Plus™ System**

The stator core is flexibly supported in the outer casing by spring assemblies. This prevents vibrations at double rotational frequency from impacting the outer casing and thus the foundation tablet.