



SIEMENS

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Generator Service

Hydrogen Unit for Gas-Cooled Generators

Implementation of the European directives for explosion protection, known as the ATEX Directives, includes the requirement for explosion-protected auxiliaries for hydrogen-cooled and water-cooled generators. Responsibility for implementation of the explosion protection measures in all operating plants is borne by their operators.

The so-called ATEX conformity of operating plants must be checked and established if necessary. It may be necessary to replace all auxiliaries which are not in compliance with the current explosion protection requirements with new explosion-protected systems in order to establish ATEX conformity.

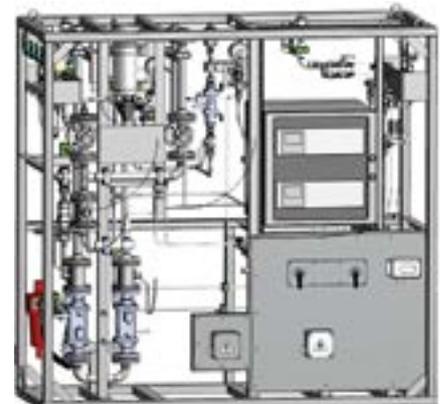
Siemens offers a comprehensive package of explosion-protected generator auxiliaries to support operators in establishing ATEX conformity in their plants, from plant-specific planning through installation and commissioning.

Our solution

The auxiliaries also include the H₂ unit for gas-cooled generators. Replacement of the existing H₂ unit without explosion protection with an explosion-protected unit increases the H₂ safety of hydrogen-cooled generators, thus decreasing the risk of potential personal injury or damage to equipment. The H₂ unit can be installed in an area in which a potentially explosive atmosphere normally does not occur or only occurs briefly in normal operation of the generator. A potentially explosive atmosphere can consist of a mixture of air and combustible gases, vapors or mists. The H₂ unit can only be installed during a plant outage, such as during an inspection. Additional measures can also be implemented to increase H₂ safety and explosion protection in the auxiliaries.

Features

The H₂ unit serves as a central operating and monitoring system within the gas system. The system is designed in compliance with the applicable explosion protection standards and guidelines and accounts for the special properties of hydrogen. The safety integrity level (SIL) criteria for functional safety are also applied. All of the components which are necessary for safe and reliable operation, including the H₂ filling and removal processes, are configured on the H₂ unit. In addition to the nameplates in accordance with the power plant identification system, a schematic with the positions of the most important valves in the various operating conditions is mounted on the H₂ unit to simplify operation.



H₂ unit

Hydrogen connections

As a standard, connections are provided on the H₂ unit for a gas cylinder supply and/or a central H₂ supply system.

H₂ pressure reduction

The hydrogen gas at intermediate pressure from the H₂ cylinder battery or the central H₂ supply system is routed to a pressure regulator, depressurized to the requisite frame pressure and supplied to the generator.

Frame pressure measurement

Pressure sensors for remote transmission and a pressure gauge for local measurement are installed in the H₂ unit for measurement and checking of the positive gas pressure in the generator.

Remote-control solenoid valves (fire protection valves)

Solenoid valves are installed on the H₂ unit with which the hydrogen gas can be safely blown out from the generator to the atmosphere by remote control in the event of a fire. Supplemental controls ensure additional safety in the event of a drop in generator frame pressure or failure of the seal oil supply.

Gas analyzers

The two gas analyzers incorporated in the H₂ unit are designed with explosion protection. The analyzers operate based on the thermal conductivity method. They enable determination of the H₂ concentration in the cooling gas in the generator and the composition of the gas mixtures (inert gas/air or hydrogen/inert gas) on gas filling and removal and during generator operation.



Calomat 6 gas analyzer

Weight (equipment unit)	770 kg
Allowable ambient temperature	+5 °C to +50 °C
Dimensions	
Length	2100 mm
Width	850 mm
Height	2000 mm

Technical data (examples; products can be adapted as necessary)

Gas analysis

Provisions are also made for sampling for chemical analysis of the gas in the generator.

Compressed air connection

A compressed air connection with a compressed air filter is available for blowing out the inert gas from the generator. This is connected to the general compressed air supply of the power plant for purging. The compressed air hose installed in the H₂ unit is disconnected on one end in all operating conditions other than blowing out of inert gas. This visible disconnecting line, which is specified in accordance with standard IEC 60034-3 "Rotating electrical machines – Part 3: Specific requirements for synchronous generators driven by steam turbines or combustion gas turbines", ensures that no air can be filled into the generator filled with hydrogen.

Scope of supply

The scope of supply includes an explosion-protected, prefabricated, tested compact H₂ unit with defined interfaces. Two fire protection valves are included on the unit, and as an option, the solenoid valves for automatic inerting with argon. The redundant Calomat 6 gas analyzer as well as the pressure control for generator frame pressure are also provided. Instrumentation is also included in the form of pressure transducers, pressure gauges, flowmeters and dew point sensors for determining the dew point in the generator cooling gas. As a standard, the H₂ unit is implemented in compliance with SIL criteria.

The explosion-protected design of the H₂ unit includes integration in the instrumentation and control (I&C) and the corresponding design of the electrical lines, which are also offered by Siemens.

Your benefits

- Explosion protection design of the unit
- Current state of the art in compliance with currently applicable guidelines and procedures
- H₂ unit ready to connect
- Reduced risk of potential personal injury or damage in the plant
- Reduced risk of unscheduled outages
- Defined interfaces
- Compact design
- Adaptation for automatic inerting possible

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