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.
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.

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.