

WS85

In-Situ Containment Atmosphere Hydrogen Monitoring System Qualified for Loss-of-Coolant Accident and Fuel Pool Events

The Hydrogen Monitoring System WS85 provides in-situ measurement of containment atmosphere hydrogen concentration even in harsh environmental conditions.

Challenge

Hydrogen generation and the risk of hydrogen combustion during a severe accident pose a complex safety issue in relation to accident management. The mitigation of hydrogen hazards in such events may depend directly on knowledge of the hydrogen concentration inside the containment.

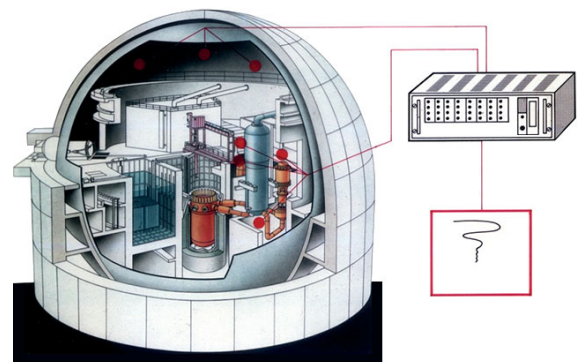
Solution

The Hydrogen Monitoring System WS85 measures the local hydrogen concentrations at different locations in the containment during normal operation and after an accident. Thus, it is possible to continuously and simultaneously monitor the local distribution and time history of hydrogen concentrations after an accident.

WS85 consists of hydrogen sensors (inside containment), a signal processing unit (outside containment) and accident-proof cables connecting each hydrogen sensor to the signal processing unit.

The system can be installed in all types of reactors: the areas to be monitored and the locations of the sensors are assessed individually for each nuclear power plant layout. Because of its classification as a post-accident monitoring system and the required reliability, all components which are located inside compartments subject to accident conditions (hydrogen sensors and instrument cables) successfully passed an extensive type test program including all specified loads during normal operation and loss-of-coolant accidents.

If required, the sensor system can be delivered with an uninterrupted power supply and a calibration trolley.



In-situ sensor assembly inside containment

Customer benefits

- In-situ measurement provides live information on containment gas composition
- Easy and effective to retrofit, no containment penetrations for piping are needed
- Reliable and accurate measurement ensured by functional testing of the sensors during online periodic inspections
- Easy and fast periodic testing using mobile unit anticipated in design
- Small demand for battery capacity or emergency diesel power because of low electrical power consumption

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Technical information

Hydrogen Sensor WS85

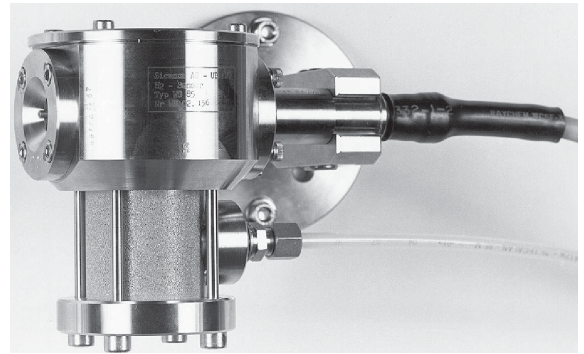
- Ambient temperature: up to 160 °C
- Ambient pressure: up to 5 bar_g
- Ambient humidity: up to 100% (relative humidity)
- Radiation load: up to 1750 kGy
- Measuring principle: thermal effect of catalytic oxidation
- Measuring principle (optional): resistance temperature detector – Pt100
- Seismic load: up to 5.2 g
- Dimensions: diameter 110 mm height 154 mm (without cable connection)
- Weight: 4.4 kg

Sensor Electronics

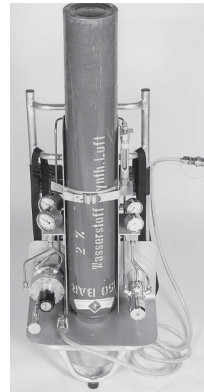
- Ambient temperature: up to 55 °C
- Ambient pressure: atmospheric
- Ambient humidity: up to 100% (relative humidity)
- Seismic load: up to 5.2 g

Performance

- H₂ measuring range 0 ... 10 vol.-%
- Accuracy 0 ... 4 vol.-% H₂ ±0.25 vol.-%
- Accuracy 4 ... 10 vol.-% H₂ ±0.50 vol.-%
- Temperature measuring range 0 ... 160 °C
- Temperature accuracy ±3 K



WS85 sensor with calibration connection and accident-proof cable



Periodic testing unit



Calibration trolley unit

Key figures

Installed and licensed in more than **50** nuclear power plants (BWR and PWR) worldwide.

Sensors are IEEE nuclear-qualified.

References

- Germany: 11 – PWRs, BWRs and laboratories
- Spain: 7 PWRs
- Switzerland: 3 PWRs
- Argentina: 1 PHWR
- Finland: 3 – PWRs and VVERs
- India: 1 PWR
- Sweden: 3 PWRs
- Czech Republic: 4 VVERs
- Slovakia: 2 VVERs
- Ukraine: 6 VVERs
- Bulgaria: 4 VVERs
- China: 4 VVERs
- Japan: 8 BWRs

PWR: pressurized water reactor

BWR: boiling water reactor

VVER: water-water power reactor

PHWR: pressurized heavy water reactor

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