Safety systems and mitigation concepts for nuclear power plants, hydrogen fuelling stations and hydrogen infrastructure requires detailed data on hydrogen concentration in a case of hydrogen leakage. The objective of the present work is to develop gas monitoring system for hydrogen detection. Not only hydrogen, but oxygen, steam and other components concentrations are important for safety analyses. Hydrogen sensors should be accurate, sensitive, and specific, as well as resistant to long term drift and varying environmental conditions. Presented gas detection system consists of two parts: first for continuous monitoring of concentrations under normal ambient conditions and second for temporary monitoring under elevated ambient temperatures and pressures during possible accident. The system determines high hydrogen concentration (5-90%) under 1-5 atm. pressure, relative humidity up to 100% and ambient temperatures up to 240°C.