Revised Standardized Equation for Hydrogen Gas Densities for Fuel Consumptions Applications

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An equation for the density of hydrogen gas has been developed that agrees with the current standard to within 0.01 % from 220 K to 1000 K with pressures up to 70 MPa, to within 0.01 % from 255 K to 1000 K with pressures to 120 MPa, and to within 0.1 % from 200 K to 1000 K up to 200 MPa. The equation is a truncated virial-type equation based on pressure and temperature dependent terms. The density uncertainty for this equation is the same as the current standard and is estimated to be 0.04 % (combined uncertainty with a coverage factor of 2) between 250 K and 450 K for all pressures, and 0.1 % for lower temperatures. Comparisons are presented with experimental data and with the full equation of state.