

NON-CONTACT THERMOMETER FOR AIR TEMPERATURE MEASUREMENTS

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A compact thermometer for air temperature based on the measurement of the speed of sound was developed at INRIM. This paper focuses on the comparison of this instrument with platinum resistance thermometers in a climatic chamber over a temperature range ($-30 \div +55$) °C, relative humidity ($10 \div 90$)%rh, and irradiation (>1 kW/m²) values similar to those of surface atmospheric conditions. Overall uncertainty values of 0.2 °C over the range from -30 °C to $+30$ °C, and from 0.6 °C to $+55$ °C, were found.

The main advantages of the presented system are that it is immune to irradiation errors and that a temperature calibration is not needed, since the traceability of the measurement is given by a mechanical measurement, exploiting its long-term stability. Furthermore, because of the absence of thermal inertia, it has a faster response than contact thermometers.

With some changes in the structure, the interval can be extended to higher and lower temperatures in order to include the Earth's near-surface atmospheric temperatures and extreme conditions.