

Method for simultaneous strain-gauge measurement of temperature and relative strain of high-temperature parts, according to which two sensing elements are used, which are fastened by a bonding agent to a metal plate fixed on a surface of the part under test by means of spot welding. The sensing elements are arranged one above the other and parallel to a plane of the metal plate, a main axis of one of the sensing elements coincides with a direction of strain of the part under test and is orthogonal to a main axis of the second sensing element. Each sensing element is connected by mounting conductors to a measuring device according to a four-wire potentiometric scheme in an electrical resistance measurement mode. Initial resistances of each sensing element are measured and testing of the part is carried out in several stages, according to which the part is subjected to a simultaneous mechanical load causing strain and to a thermal effect, and resistances of the sensing elements are measured. A change in the temperature of the part is determined by the formula:

$$\Delta T = \frac{\frac{R_H + R_B}{R_0} - 2}{2 \cdot (\alpha + (\alpha_{LD} - \alpha_{LTP}) \cdot K)},$$

and also a relative strain of the part is determined by the formula:

$$\varepsilon = \frac{R_H - R_B}{R_0 \cdot K \cdot (1 + \alpha \cdot \Delta T) \cdot (1 + \mu)},$$

where

ΔT - is a change in the temperature of the part;

ε - is a relative strain of the part;

R_H - is a resistance of the sensing element, the main axis of which coincides with the direction of strain of the part under test, being under the influence of strain and temperature;

R_B - is a resistance of the sensing element, the axis of which is orthogonal to the direction of strain of the part under test, being under the influence of strain and temperature;

R_0 - is an initial resistance of the sensing elements;

K is a strain sensitivity coefficient of the sensing elements;

α - is a temperature coefficient of electrical resistance of the material of the part under test;

α_{LD} - is a temperature coefficient of linear expansion of the material of the part under test;

α_{LTP} - is a temperature coefficient of linear expansion of the material of the sensing elements;

μ - is a Poisson's ratio of the material of the part.