

Evaluation of Gauge Coefficients for Modelling Piezoresistive Properties of Thick-Film Resistors

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The piezoresistive properties of thick-film resistors have been utilized for strain gauges and related sensor applications for many years. In spite of the accumulated knowledge of the phenomenon and the wide experience in designing various sensor structures, it is still a challenge to build a numerical model that provides good agreement between numerical simulations and experimental results. The main problem with numerical modelling is not only the proper formulation of the effect in terms of the material parameters relating to the electrical field and the strain components in the deformed resistor body but, primarily, the experimental evaluation of those parameters for the selected thick-film resistor material. In this paper, we present an experimental and mathematical procedure for evaluating thick-film piezoresistor model parameters and discuss the results obtained for two commercial thick-film resistor materials printed and fired on different ceramic substrates. As a validation, the results of the simulations were compared with measurements of specially designed test patterns that were not used for the evaluation of the gauge coefficients.

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