Experimental analysis of the instrument uncertainty of triangulation method in the problems of process control of the complex form surface profile

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In current paper the experimental research of the triangulation method accuracy characteristics during measurement of topography of complex shape surfaces like gas-turbine engine blades is discussed. Also choice and influence of the system design performance, incident and reflection angles of laser radiation, form and value of root mean square deviation of the surface roughness were analyzed. Influence of the orientation of the microstructure channels of the sample reference profile on the experimental systematic measurement uncertainty on wavelength 0.633 μm was studied. A method of digital processing of surface profile image was proposed. This method allow to minimize the measurement uncertainties of the coordinates of the energy gravity center of the laser spot illumination and select the detail sharp contours against a background of the speckle noises and the noises of electronic tract. The results of experimental research of the developed laboratory stand and its application accuracy limits in problems of process control was presented.

Keywords: *laser measuring system, triangulation method, wavefront and surface roughness, measurement uncertainty, image digital processing algorithm, gas-turbine engine blade.*

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