

DETERMINATION OF PENETRATION CONTACT ELECTRICAL APPARATUS MADE FROM ENVIRONMENTALLY FRIENDLY MATERIALS

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All electrical power W , which is released in switching devices during switching, transforming into heat Q . Part of it (Q_1) spent on heating the metal mass contact details of real and personal to the melting point and melting metal part on the work surface for contact details; the other part (Q_2) - mass for heating the molten metal to the boiling point and the evaporation of the metal.

The purpose of research - the determination of the penetration depth of erosion and contact details of electromagnetic actuators at once considering switching current thermal characteristics and estimated melting and boiling contact materials.

Materials and methods of research. The load current is selected based on the nominal operating current: 4; 6.3; 10 A.

Mathematical calculations were performed using the program «MathCAD 7 Professional».

Results. The shape of most contact details starters made circular cross section with a flat or spherical working surface. Therefore, when a single switching contact details, we assume that the heat transfer is carried out on the opposite side of the working surface (by attaching to kontaktotrymacha) in the environment, and the side surfaces no heat and that heat to the contact details of incoming pulses during the time t_0 , through his entire working surface area S . Heat is perpendicular to the surface and thermal conductivity in all directions - the same. The duration of heat pulses Q_1 is time burning electric arc between the electrodes t_0 (\approx time, single-circuit or disconnection contact details). The amount of heat Q_1 - heat is required for heating the contact details to the melting point.

Boundary conditions:

- $T(x, 0) = 0$ (temperature drop contact details and Environment at the initial time is zero);

- $T(l, t) = 0$ (temperature points opposite side parts at $x = l$ is also temperature environment and is a constant).

The difference calculation ($h_l=7,673 \cdot 10^{-5}$ m at $t_0=30$ mc) and experimental data is 4,1 %. Thus, given that the calculation of the thermal regime of electrodes made once, match results and experimental data is satisfactory.

Findings

1. Under certain assumptions heat in the process of switching electric current in the actuators results of calculation of thermal conditions and the depth of penetration of the electrodes fairly good agreement with experimental data penetration depth (different for 4 ... 5%).

2. The depth of penetration is determined by the thermophysical characteristics of the contact material, the design temperature melting, boiling, evaporation of contact material.

3. The value erosion directly proportional to the current dial 4; 6.3; 10A.