

Calculation of short-time withstand current for Air Circuit Breaker by Simulation of Multi-physical field

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Abstract: The short-time withstand current of air circuit breaker was calculated by coupling magnetic field, current field and thermal field, with which the non-uniform current distribution in parallel contacts and contact resistance varying with contact force during short-time withstand current test of low voltage air circuit breaker were under consideration. Conduction bridge between movable and static contacts whose radius was calculated by Holm formula was used to calculate the repulsion force by 3-D finite element method, and then the time-varying contact force of each parallel contact could be got by adding electric repulsion force and spring force on contact, after all the temperature rise of current-carrying conductor of circuit breaker under short circuit current was obtained by coupling current field and thermal field while the radius of conduction bridge were changed according to contact force in different instance. When the highest temperature rise in the short-circuit current was high enough to reach melting temperature of contact and conductor, this short-circuit current was considered as the short-time withstand current. Calculation results were verified by the experiments of short-time withstand current for researched air circuit breaker in this paper.

Key words: short-time withstand current; multi-physical field; contactor pressure