

The Influence of Different Atmospheres on Arc Width, Arc Mobility, and Contact Welding investigated for Low Power Switches

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Abstract:

Although the arc root mobility is a well known effect e.g. at circuit breakers with arc lengths in the mm range, the effect and its consequences for low power switches (in the range of 16 A) with bounce heights in the μm range, is not known. Consequently, a previously developed model switch was used to investigate the influence of different atmospheres on the arc width and the mobility (speed) of the arc, both strongly affecting the contact welding behavior at make. Fine grain silver contacts were used for the investigations under ambient air, nitrogen, argon, and helium. The bounce pattern chosen yielded bounce durations in the range of about 1.5 ms. A load voltage of 27 VDC was chosen to guarantee stable burning arcs for this fundamental work. Depending on the atmosphere, the arc width increased in the following order: helium \rightarrow ambient air and nitrogen \rightarrow argon while the arc speed increased in the order: helium \rightarrow ambient air \rightarrow nitrogen \rightarrow argon. Altogether, under the prevailing conditions of the surrounding atmosphere, the 98% weld force values of experiments carried out under argon and helium yielded more than twice the weld force values measured under ambient air and nitrogen.

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