

Evaluation of Methods for Risk Assessment of Electrostatic Discharges to Human Beings

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Abstract:

Anyone knows that electrostatic discharges can be painful. The exposure of human beings to electrostatic discharges must be assessed in terms of safety. High-energy discharges can cause muscle cramps and have the potential for serious effects, such as ventricular fibrillation. Weaker discharges above the perception threshold value can lead to psychological stress. Shock or muscle cramps can lead to injuries or falls. Charges and possibly discharges occur when a human being or object is not earthed and a potential difference builds up due to a charging process. Devices such as electrostatic application systems build up a potential difference to earth during operation.

Threshold values of 50 μC for charge and 350 mJ for energy are given in relevant literature, technical specifications and standards. However, some references describe that unpleasant shocks can be expected at energies as low as 1 mJ, while electric fence devices are allowed to emit energy pulses of up to 5 J. The deviation from the literature threshold value of 350 mJ by an order of magnitude both up and down demonstrates the lack of in-depth knowledge. Research into the origin of the threshold values by the German Social Accident Insurance Institutions BG RCI, BG HM and BG ETEM, the Physikalisch-Technische Bundesanstalt (PTB) and other experts in electrostatics did not provide a valid explanation for the derivation of the values.

A new risk assessment method was proposed for electrostatic application systems, which requires the measurement of the body current and the impulse duration of the electrostatic discharge. This risk assessment method will be further investigated in this project using laboratory set-ups as well as real systems and devices. The following questions will be addressed in this project:

- What threshold values are known and can these be validated?
- Can a dangerous discharge originate from human beings?
- Can the threshold values and assessment methods be brought into a context?

The aim is to define standardized threshold values and a simple measurement method for the risk assessment. This work is funded by the German Social Accident Insurance Institutions BG RCI, BG HM and BG ETEM.

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