Appendix 7

Hand tools

1 Scope

This appendix defines measurement methods for the ESD protective properties of hand tools including solder irons and possible equipment which is a part of the tool or solder iron.

The appendix also defines requirements of the same parameters for the "ESD-approval".

2 Application

Methods and requirements specified in this appendix are applicable for hand tools, including solder irons intended to be used for electronics manufacturing in an EPA.

The requirements for "ESD-approval" corresponds to requirements specified in IEC 61340-5-1 (ref [2] of the main document), which states:
- A hand tool "shall not generate or hold an electrostatic charge" and states an upper limit for the resistance. This stated upper limit is reduced to 109 Ω in this document.
- A solder iron tip shall be connected to ground.

It should be noted that, if the resistance of the handle of the tool is zero, the discharge of a charged ESDS occurs to the capacitance of the operator, which may be magnitudes higher than the capacitance of the ESDS. This high current may damage the ESDS and the use of a hand tool with a resistance of the handle lower than 10^3 Ω should be avoided. If the conductive (metallic) part of the tool is large (high capacitance to ground) this could also mean a (minor) threat to a charged ESDS even if its handle has a resistance of $>10^3$ Ω.

3 References

See references of the main document (SP-Method 2472).

4 Definitions

All expressions used in this appendix correspond to definitions in the main document SP-Method 2472.

5 Environmental parameters

All requirements are valid at an environment of
Temperature: 23 °C +/- 2 °C.
Humidity: 12 %RH +/- 3 %RH.

All measurements of properties are performed in the same environment.

6 Sampling and test sample preparation

At least 3 test samples are required. If the product is manufactured in a series of different variants but with the same type of material of the handles, the chosen test samples shall be representative of the series.

The test samples shall be conditioned in measurement environment, during at least 72 h.

7 Measurement method

7.1 Description

The resistance of the test sample is measured in a practical test set-up, where the test person holds the tool in its intended way and the resistance from the tip of the tool to the operators wrist band is measured.

A measurement of resistance to the protective earth is performed from the tip to the mains connection plug, to verify that the tip has a direct connection to ground.

The measurement is performed as a regular V/A-measurement.

7.2 Measurement procedure

7.2.1 Apparatus

- V/A-meter, e g Keithley type 487 alternatively (for low resistance values) multimeters for current and voltage measurements with uncertainties better than +/-0.2 % (voltage) and +/-0,8 % (current).
- Wrist band.

7.2.2 Test set up

A test set up in accordace with figure 1 is arranged.

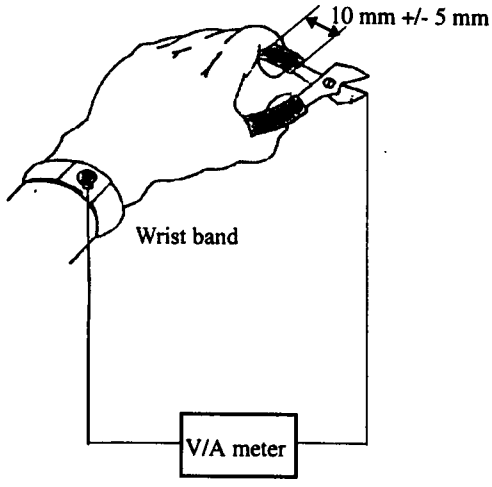

Figure 1.

7.2.3 Resistance measurement

The resistance is measured at a voltage of 10 V DC +/- 0.1 V DC if the resistance is up to 10^5 Ω, and 100 V DC +/- 1 V DC if the resistance is higher than 10^5 Ω.

7.3 Measurement procedures for solder tip resistance

The resistance from solder tip to the protective earth at the mains connection plug is performed using the same apparatus as in 7.2.1 (no wrist band).

7.4 Measurement methods for auxiliary equipment

These methods depend on the construction and application of the equipment. The general properties as defined in the main document, SP-Method 2472, p 7.3 shall be verified.

7.5 Results

The obtained result for each single measurement is recorded. Each measured resistance value is reduced with the resistance of the wrist band.

7.6 Uncertainty

The uncertainty of the measurement of the handle resistance depends on the contact of the operator to the wrist band and to the hand tool. Experience has shown a repeatability of better than +/- 5 %.

The uncertainty of the resistance of the solder tip to ground is not critical as the intention of the measurement is to check the connection. The requirement is set accordingly.

7.7 Report

Max and min resistance of the handles of the test samples shall be stated in the report. It shall further state that the general requirements and the requirements regarding grounding of the solder tip are fulfilled.

8 Requirement

To be "ESD-approved"
- the resistance for each test sample shall be less than 10^9 Ω.
- the resistance, solder tip to protective earth at the mains connection plug, shall be less than 5 Ω.
- The general properties as defined in the main document, SP-Method 2472, p 7.3 shall be fulfilled.

9 ESD-approval certificate

The certificate shall state the lowest measured resistance value.

As an additional information the certificate shall state:
The ESD-approval does not include any requirements on electrical safety properties. If work will be performed close to live voltages, requirements according to The Swedish National Electrical Safety Board's Regulations on Power Current shall be obeyed. For other countries corresponding regulations are applicable.