

## 1 Megohm Resistor

IEC 61340-5-2:

### Paragraph 5.1.1 General

A nominal 1 megohm resistor is commonly used in wrist straps and to ground work surfaces. In the event of an operator touching an energized conductor, for the normal mains electricity supplies this resistor will limit the current flowing through the person to less than 0,5 mA. Current limiting or cut-off devices should also be considered and in some areas may be demanded by legislation.

IEC 61340-5-1

### Paragraph 5.2.7 Wrist strap

The cord shall have a termination compatible with the EBP and shall incorporate at least one insulated current-limiting resistor. The end-to-end resistance shall be in accordance with table 1. For cords with one resistor, the resistor shall be incorporated into the identified wrist end of the cord.

Where the cord is likely to be used in an EPA which contains exposed conductors with potentials in excess of 250 V a.c. or 500 V d.c., the maximum rated potential shall be identified on the cord.

IEC 61340-5-2

### Paragraph 5.2.7 Wrist Strap

The resistor style should be such that in the event of a failure of the resistor, the failure mode is to open circuit.

IEC 61340-5-1

### Paragraph 5.3.4 EPA ground cords

Where a single resistor is used in the EPA ground cord, this shall be located near the groundable point. Where more than one resistor is used, a resistor of a minimum resistance value of one half the total resistance shall be located near the groundable point.

IEC 61340-5-1

Figure A.4 - NOTE - A safety resistor or equivalent to limit the current to 0,5 mA (a.c.) or 2 mA (d.c.) should be included.

This is consistent with ESD Association requirements for a 1 Meg Ohm Resistor in Wrist Straps and Foot Grounders.

Per ESD-S1.1-1998 Paragraph 7.1 Construction Guidelines Current-Limiting Resistance

"A resistance of sufficient resistance to limit current to less than 0.0005 amps (0.5mA), at the highest voltage that may be encountered, should be incorporated into the wrist strap.

Nominally, 800,000 ohms (800 Kilohms) are sufficient for voltages of up to 240VAC. The value of 1 Megohms is specified because it is a standard value discrete resistor.

Discrete current-limiting resistors should be located near the connection between the ground cord and the cuff."

ESD Ground cords serve one purpose, to connect a conducting surface to the same potential as ground.

A "soft ground" is a ground cord with a built-in series resistance, typically 1 Megohm, designed solely to limit any potential current the operator may come in contact with when exposed to 110 VAC and up to 250 VAC maximum. Underwriters Laboratories recommends that the electrical current that the operator be exposed to be limited to 0.25 milliamp. At 250 volts, the 1 megohm resistor does this.

The formula used is Ohms law  $E = IR$ , so 250 volts = 0.25milliamps times 1,000,000 ohms and/or 500 volts = 0.50 milliamps times 1,000,000 ohms.