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## Requirements for Electrostatic Protective Packaging Material

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### 1. SCOPE

#### 1.1. Content

This specification defines the general identification requirements for electrostatic protective packaging material used by TE Connectivity (TE). In the event of conflict between this specification and the drawing, the drawing shall take precedence.

#### 1.2. Definitions

For the purpose of understanding this document, the following terms are defined:

**Antistat, Antistatic Agent** – A chemical compound that, when impregnated in or topically applied to a primary material or substrate, renders the primary material antistatic.

**Antistatic** – A property of materials that resist triboelectric charging and produce minimal static charge when separated from themselves or other materials. A material's antistatic property is not necessarily correlated with its resistivity.

**Conductive** – A property of materials which are either metal or impregnated with metal, carbon particles or other conductive materials, or whose surface has been treated with such materials through a process of lacquering, plating, metalizing, or printing. A conductive material for static control purposes shall have a surface resistivity less than  $1 \times 10^5$  ohm/square or  $1 \times 10^3$  ohm-centimeter if volume conductive. A conductive material is not necessarily antistatic.

**Dissipative** – Material exhibiting a surface resistance of  $10^5$  through  $10^{12}$  ohms per square. Dissipative materials bleed off charges at an optimal rate, neither too fast nor too slow.

**Electrical Overstress (EOS)** – The electrical stressing of items beyond their specifications. May be due to electrostatic discharge (ESD).

**Non-Static-Generating** – A material that either naturally or due to special treatment, resists triboelectric charging. Typical materials are cotton, paper, "pink plastic," and "pink Styrofoam." [See Antistatic]

**Resistivity, Surface** – The ratio of DC voltage to the current that passes across the surface of the system. In this case, the surface consists of a square unit area. In effect, the surface resistivity is the resistance between two opposite sides of a square unit area and is independent of the size of the square or its dimensional units.

**Resistivity, Volume** – The ratio of the DC voltage per unit of thickness applied across two electrodes in contact with a specimen, to the amount of current per unit area passing through the system. Volume resistivity is generally given in ohm-centimeters.

**Shield, Electrostatic** – A barrier or enclosure that prevents the penetration of an electrostatic field. An electrostatic shield, however, may not offer much protection against the effect of electromagnetic interference (EMI). EMI shields, however, are good electrostatic shields.

**Static Dissipative Material** – A material that is a weak conductor and has a surface resistivity between  $10^5$  through  $10^{12}$  ohms per square.

**Static Retardant** – The general property of a material implying that the material resists triboelectric charging or that it favors the dissipation of charge.

**Triboelectric Charge** – An electrical charge generated by frictional movement or separation of two surfaces. The basic cause of static electricity results whenever two materials contact and separate. The rate of charge is determined by the intimacy of contact and rate of separation. Each material takes on or lets go of electrons, thereby creating a positive charge on one material and a negative charge on the other material.

## 2. REFERENCE DOCUMENTS

The following documents contain data relevant to this specification. In the event of conflict between the reference documents and this specification, this specification shall take precedence. Unless otherwise specified, the latest edition of the document applies.

### 2.1. TE Reports

502-1013: Effects of Relative Humidity on the Surface Resistivity and Static Decay of Antistatic Materials

### 2.2. Federal Standards

Federal Test Method Standard 101: Test Procedure for Packaging Materials

### 2.3. American Society for Testing and Materials (ASTM) Standards

ASTM D257: Standard Test Methods for DC Resistance or Conductance of Insulating Materials

### 2.4. Commercial Standards

ANSI/ESD S541: Packaging Materials for ESD Sensitive Items

### 2.5. Military Specifications

MIL-PRF-81705: Barrier Materials, Flexible, Electrostatic Discharge Protective, Heat-Sealable

## 3. GENERAL REQUIREMENTS

### 3.1. Classifications

Electrostatic protective packaging material is classified into three categories: electrostatic shielding material, conductive material, and antistatic material.

A. Electrostatic shielding material shall meet one or both of the following requirements:

1. Surface resistivity – Material shall have a shielding layer with a surface resistivity less than  $1 \times 10^4$  ohms per square.
  2. Volume resistivity – Material shall have a volume resistivity less than  $1 \times 10^3$  ohm-centimeter per millimeter of thickness.
- B. Conductive material shall be defined as either surface conductive or volume conductive.
1. Surface resistivity (surface conductive material) – Material shall have a surface resistivity less than  $1 \times 10^5$  ohms per square.
  2. Volume resistivity (volume conductive material) – Material shall have a volume resistivity less than  $1 \times 10^4$  ohm-centimeter.
- C. Antistatic material shall meet one or both of the following requirements. Topical coated materials shall meet surface resistivity requirements only. Topical coated material shall not be used for non-cushioning bags and pouches.
1. Surface resistivity – Material shall have a surface resistivity equal to or greater than  $1 \times 10^5$  ohms per square but less than  $1 \times 10^{12}$  ohms per square.
  2. Volume resistivity – Material shall have a volume resistivity equal to or greater than  $1 \times 10^4$  ohm-centimeter but less than  $1 \times 10^{11}$  ohm-centimeter.

### 3.2. Electrostatic Protective Characteristics Duration

Material shall maintain its electrostatic protective characteristics during storage, shipment, distribution, and application.

### 3.3. Environmental Conditions

- A. All material except rigid plastics shall maintain their electrostatic protective properties at  $12 \pm 3\%$  relative humidity and  $73 \pm 3^\circ$  Fahrenheit.
- B. The electrostatic properties of rigid plastics are relative humidity dependent. Report 502-1013 contains test data showing the surface resistivity and static decay of rigid plastics at 10%-50% relative humidity.

### 3.4. Outgassing

Material shall not outgas as to adversely affect the appearance or function of (TE) packaged products.

### 3.5. Destructive Substances

Material shall contain no substance that adversely affects the appearance or function of (TE) packaged products.

### 3.6. Static Decay for Flexible Materials

In addition to resistivity requirements, flexible materials such as bags, pouches (non-cushioning), cushioning material, carrier foam, and lead insertion foam shall have a static decay rate of less than 2 seconds from +5000 volts to +50 volts and –5000 volts to –50 volts.

### 3.7. Label Adhesion

The material shall not inhibit adhesion of labels to the surface.

## 4. BAG AND POUCH REQUIREMENTS

### 4.1. Heat Sealing

Non-cushioning bag and pouch material shall be capable of being heat sealed with conventional heat sealing equipment at 250-375° F at 30-70 PSI for 0.5-3.5 seconds duration.

### 4.2. Leakproof

Manufacturer's joints and any printed areas on non-cushioning bag and pouch material shall be leakproof. Leakage shall be detected by filling the container with water, suspending it in an upright position, and observing it at rest for a period of 15 minutes.

## 5. IDENTIFICATION REQUIREMENTS

### 5.1. Primary Package

Primary packages shall be individually identified as "ESD shielding", "Conductive" or "Antistatic" by embossing, marking, printing, labeling, color coding, or other approved means. Identification of packages shall not affect containment of contents or function of package.

### 5.2. Shipping Cartons

Cartons used to ship electrostatic protective materials shall be marked with the (TE) part number, quantity, the words "ESD Shielding", "Conductive" or "Antistatic", the manufacturer's name, and lot number or date of manufacture. Lot traceability is the responsibility of the manufacturer.

### 5.3. Date Code

If required, the date of manufacture shall be a four digit code where the first two digits correspond to the last two digits of the year and the last two digits indicate the week of the year. For example, the 33rd week of 2013 would be indicated as 1333.