

**Testing of the electrostatic properties  
of plastic packaging, including IBCs and auxiliary packaging****Applicable standards and codes:**

- DIN IEC 60212 of Sep. 1995 – Standard conditions for use prior to and during the testing of solid electrical insulating materials
- DIN EN 60243 – Electrical strength of insulating materials - Test methods:  
Part 1, DIN EN 60243-1 of March 1999 (IEC 60243-1:1998)  
Part 2, DIN EN 60243-2 of October 2001 (IEC 60243-2:2001)
- DIN EN 61340-2-3 of Dec. 2000 – Electrostatics - Part 2-3: Methods of test for determining the resistance and resistivity of solid planar materials used to avoid electrostatic charge accumulation (IEC 61340-2-3:2000)
- DIN IEC 60167 of Dec. 1993 – Methods of test for insulating materials for electrical purposes; insulation resistance of solid materials (IEC 60167:1964)
- CENELEC Technical Report 50404 of June 2003 – Electrostatics – Code of practice for the avoidance of hazards due to static electricity (CLC/TR 50404:2003)
- TRBS 2153 of Febr. 2009 – Vermeidung von Zündgefahren infolge elektrostatischer Aufladungen [Avoidance of ignition hazards resulting from electrostatic charge accumulation] (formerly ZH 1/200)

**1. Purpose**

In order to verify the electrostatic properties of packaging made of plastics, the electrical properties of precursor materials, converted into packaging, are determined. The electrical conductivity of processed solid materials is determined by measurement of the electric resistance, the electrical strength of (composite-) materials is determined by measurement of the breakdown voltage.

The surface resistance of conductive materials is below  $10^4$  Ohm and for dissipative materials between  $10^4$  Ohm and  $10^{11}$  Ohm at 23 °C / 30 % r.h. (between  $10^4$  Ohm and  $10^9$  Ohm at 23 °C / 50 % r.h.). Materials with higher resistance values are referred to as electrically insulating. Materials with a surface resistance between  $10^8$  Ohm and  $10^{11}$  Ohm might be referred to as antistatic (with electrical properties minimizing electrostatic charge accumulation).

**2. Procedure**

The electric resistance is measured on surfaces of individual packaging items either according to DIN EN 61340-2-3:2000 (with ring electrodes) or according to DIN EN 60167:1993 (with strip electrodes) in order to determine a directional electric resistance orientation.

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In case the packaging is made of composite materials with an insulating layer (e.g. coextrusion films; FIBCs with inner coating), electric breakdown voltage is measured at separate packaging items according to standards DIN EN 60243-1 and 2.

The testing method (e.g. selection of measuring electrode and test voltage) as well as specified values (incl. tolerances) has to be agreed between manufacturer and customer according to the packaging specification.

Note: These test procedures are not applicable for highly insulating plastic materials, which cannot be characterized by an ohmic resistance, but however still feature antistatic properties (e.g. due to use of nanotechnology).

**3. Preparation and testing**

Notwithstanding the standards, the following is recommended:

- 3.1 As far as possible, undestroyed, unused, individual packaging items are to be tested.
- 3.2 Packaging items are to be cleaned and conditioned prior to testing, because the electrostatic behavior of materials is influenced by ambient conditions like temperature and / or relative humidity as well as surface contaminations. Preferably standard climate conditions according to DIN IEC 60212:1995, 23 °C / 30 % r.h., and additionally, if appropriate, also 23 °C / 50 % r.h., are to be applied.

Intensive surface cleaning and a conditioning may be omitted in case of random sample checks in the course of incoming goods inspections, provided that packaging items to be tested are clean and dry.

- 3.3 Surface resistance, if applicable leakage resistance, and if relevant breakdown voltage and volume resistance are determined exemplarily at the test samples with a testing voltage ranging from 100 V up to 1000 V. Additionally as a reference and in order to monitor the measuring devices, relevant resistance measurements are also carried out at electrically insulating materials under the same ambient conditions.
- 3.4 The leakage resistance of FIBCs Type C is to be measured between grounding point or lifting loops on the one hand and filling spout as well as discharge spout and all elements of the conductive/dissipative structure on the other hand.

**4. Test report**

Test reports are to be compiled following DIN EN 61340-2-3:2000. Details required e.g. under point 11d) are to be modified according to testing preparations.