



Determination of the Specific Volume Resistance of Elastomers, Plastics, and Adhesives

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. Determination of the specific volume resistance of elastomers, plastics, and adhesives.

1.2 Applicability. Elastomers, plastics, and adhesives in contact with light metals.

1.3 Remarks. If body panels, made of light metals (e.g., aluminum, magnesium) or are zinc-plated, can be in contact with precious metals or solid bodies conducting electrons (e.g., graphite) and are in the presence of electrolytes, note this may lead to the preferential corrosion of the light metals.

To avoid the contact corrosion, elastomers, plastics, and adhesives shall have a sufficiently high insulation resistance. The same applies if such materials are in contact with painted light metal surfaces as the insulating paint layer may not offer sufficient protection against contact corrosion, because of faults or damages in the part. The insulation resistance depends both on the specific volume resistance and on the specific surface resistance of the test piece.

The determination of the specific volume resistance is performed to check the uniformity of the insulating material. The specific volume resistance is considerably affected by temperature and moisture.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

IEC 62631-3

2.2 GM Standards/Specifications.

GMW3221

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Test Equipment.

3.2.1.1 Clamping equipment with two (2) electrodes of each $10\text{ mm} \pm 0.1\text{ mm} \times 10\text{ mm} \pm 0.1\text{ mm}$, gold plated to ensure good electrical contact. See Appendix A, Figure A1.

3.2.1.2 Pressure gauge to apply a pressure force of $0.2\text{ N/cm}^2 \pm 0.02\text{ N/cm}^2$.

3.2.1.3 Multi-meter with suitable connectors in accordance to IEC 62631-3.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Material.

3.3.1.1 Shape and Size. Unless otherwise specified, the following test pieces shall be used.

3.3.1.1.1 Test pieces from test panels shall be 120 mm × 120 mm × 2 mm ± 0.1 mm.

3.3.1.1.2 Test pieces from finished parts are strip-shaped test pieces with parallel sides, length and width of each is 11 mm minimum and a thickness of 2 mm ± 0.1 mm. If the required thickness of 2 mm cannot be reached from the finished part, coplanar test pieces of a smaller thickness shall be prepared.

3.3.1.1.3 To calculate the specific volume resistance, the thickness and the width (if <11 mm) of the test pieces shall be measured to an accuracy of 0.1 mm.

Note: Do not mark the test pieces in the measuring area.

3.3.1.2 Number of Test Pieces. For initial sample approval and arbitration purposes, at least five (5) test pieces cut from at least two (2) components shall be tested. For routine quality control purposes, at least five (5) test pieces shall be tested.

3.4 Test Time. Reference the lab test procedure(s) in Section(s) 4 for timing details.

3.5 Test Required Information. See 5.3.

3.6 Personnel/Skills. Conform to company and/or laboratory requirements. Technician training records must be available upon request.

4 Procedure

4.1 Preparation.

4.1.1 Test Sample Preparation. The surface of the test pieces shall be cleaned with ethanol before conditioning. Before measurement, the test pieces shall be conditioned for a minimum of 48 h, per GMW3221 Code A.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Test Procedure. The test pieces are positioned between two (2) electrodes the size of 10 mm ± 0.1 mm × 10 mm ± 0.1 mm and to avoid air inclusions, a pressure force of 0.2 N/cm² ± 0.02 N/cm² is applied. The specific volume resistance shall be measured in an atmosphere to GMW3221 Code A or within 10 minutes of being removed from this atmosphere. Test pieces may be transported in a conditioned desiccator.

The volume resistance is measured per IEC 62631-3. The preferred test voltage is 100 V. If the test voltage differs, this fact shall be stated along with the actual value of the voltage. Conduct test until volume resistance measurement stabilizes but no longer than two (2) minutes to avoid overheating sample.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Not applicable.

5.3 Test Documentation.

5.3.1 Evaluation and Rating. The specific volume resistance in ohm centimeter (Ωcm) shall be calculated per 5.3.1.1 and 5.3.1.2.

5.3.1.1 Test pieces with 11 mm minimum edge length in both directions:

$$Rx = \frac{R \times a^2}{d}$$

Where:

- Rx = Specific Volume Resistance in ohm centimeter (Ωcm)
- R = Volume resistance, measured in ohm (Ω)
- a = Length of measuring electrode in centimeter (cm)
- d = Test piece thickness in centimeter (cm)