



Scratch and Mar Resistance

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 scratch resistance of plastics (Method A) and the determination of the mar resistance of plastics (Method B).

Note: Method A is the standard method. Method A may be used for molded parts and for sample plaques. Method B is a development method. Method B may only be used for sample plates with correct color and grain.

Method A is based on SAE J1545 and SAE J1767.

Method B is based on ISO 2813.

1.2 Applicability. Uncoated interior and exterior plastic parts.

1.3 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

ISO 2813 SAE J1545 SAE J1767

2.2 GM Standards/Specifications.

None

2.3 Additional References.

None.

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.

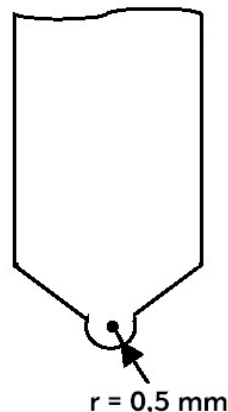
3.2 Equipment.

3.2.1 Method A.

3.2.1.1 Tool. Cylindrical hard metal pen with ball-shaped end, polished and with a radius of $0.5 \text{ mm} \pm 0.01 \text{ mm}$ according to Figure 1. Prior to the measurement, the pen shall be checked by microscope. The surface shall be free of any deterioration. In case of any surface change or damage to the pen, a new pen shall be used to prevent incorrect measurements caused by a damaged tool.

3.2.1.2 Measuring Equipment. Spherical geometry spectrophotometer that fulfills the requirements of SAE J1545 and SAE J1767 capable of measuring color using D65 illuminant, 25 mm or 27 mm diameter porthole, 8 degree geometry with Specular Component Excluded (SCE).

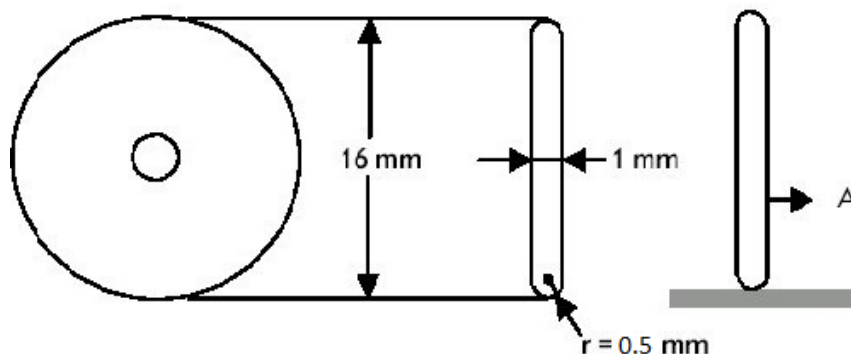
Figure 1: Cylindrical Hard Metal Pen



3.2.2 Method B.

3.2.2.1 Tool. Stainless steel disc (diameter $(16 \text{ mm} \pm 0.3 \text{ mm})$, $(1 \text{ mm} \pm 0.02 \text{ mm})$ thick) with rounded and polished border radius $(0.5 \text{ mm} \pm 0.01 \text{ mm})$ according to Figure 2.

Prior to the measurement, the disc shall be checked by microscope or magnifying glass. The surface shall be free of any deterioration. In case of any surface change or damage to the disc, the disc shall be turned such that a non-damaged area is used for test. If this is not possible, a new disc shall be used to prevent incorrect measurements caused by a damaged tool.

Figure 2: Disc ^{Note 1}

Note 1: A = Scratch direction.

3.2.2.2 Measuring Equipment. Gloss measuring apparatus with 60 degree measurement geometry to ISO 2813, elliptic measurement area according to apparatus supplier information.

3.2.3 Scratching Device. Motor driven cross cutting tool, e.g., Erichson Model 430, with the ability to scratch the specified grid pattern at specified test speed and ability to place the specified loads on the scratching tool.

3.3 Test Vehicle/Test Piece. Test pieces shall be obtained from finished parts. The test piece shall be flat and a size that allows an even contact between the test piece, its support and the measurement equipment and a stroke on the test piece surface of $\geq 40 \text{ mm}$.

For initial sample approval and arbitration purposes, **at least three (3)** test pieces shall be examined; for routine quality control purposes, at least one (1) test piece shall be examined.

3.4 Test Time.

Calendar time: 1 d

Test time: 4 h

Coordination time: 4 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Standard lab testing skills and training.

4 Procedure

4.1 Preparation. For initial sample approval and arbitration purposes, the minimum period between manufacturing of the component and testing shall be seven days. For routine quality control tests, 72 h will be sufficient.

Note: The tested surface shall not be touched and shall be free of any contamination.

4.2 Conditions.

4.2.1 Environmental Conditions. The test shall be performed at a temperature of $23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.

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 The measurement of lightness (Method A) or gloss (Method B) shall be conducted immediately after scratching grid.

4.3.2 Method A. For the test, the tool is clamped in a suitable apparatus with lever arm. The lever arm shall be balanced out. The tool is loaded with the first required load (coding per Table 1) and is pulled over the test piece surface $\geq 40\text{ mm}$ with a speed of $(1000\text{ mm/minute} \pm 50\text{ mm/minute})$. Make at least twenty (20) scratches parallel to each other, 2 mm apart. The application of the scratches is repeated perpendicular to the first set, so that the result is a scratching grid (see Figure 3). The scratching direction shall be unidirectional. The test is repeated for each additional required load, until for each load a separate scratching grid (see Figure 3) has been scratched. Each scratching grid shall be marked by the related code of the load per Table 1.

Note: If no definition is given in the material specification or on the engineering drawing, Code 2 (10 N) applies.

Figure 3: Scratching Grid (Method A)

