GM	WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW14865

Determination of Scratch Resistance of Organic Coatings - Simulation of Car Wash Installations

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. This standard describes a laboratory test procedure for assessing the scratch resistance of organic paint coatings. This test equipment creates fine scratches close to the surface and simulates the behavior of organic paint coatings in car wash installations by using a brush oscillating forward and back and synthetic dirt.

1.2 Applicability. Preferably for high gloss organic paint coating for exterior application with decorative demands. Matte or dull organic paint coatings tend to be glossier after testing, therefore require a special agreement regarding measuring of gloss level before and after testing.

1.3 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

ASTM D2486 DIN 12605 ISO 787-7 ISO 2813

2.2 GM Standards/Specifications.

GMW3221

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 Test devices for sample pre-treatment according to GMW3221, Code B.

3.2.2 Gloss measuring instrument (e.g., micro-TRI-gloss, Byk-Gardner).

3.2.3 Washability and abrasion tester with brush and brush holder according to ASTM D2486 (e.g., Model 494, Erichsen).

3.2.4 Suitable precision balance.

3.2.5 Drying oven capable of maintaining the specified temperatures according to this test procedure.

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3.2.6 Micronized Calcium Carbonate with the following characteristics:

- Chemical composition:
  - $CaCO_3 \geq 98.5\%$
  - $MgCO_3 \leq 0.8\%$
  - $Fe_2O_3 \leq 0.1\%$
- Hardness: 3 Mohs
- Density: 2.7 g/cm^3
- Particle size distribution:
  - Sieve residue 45 µm (ISO 787-7): ≤ 0.1%
  - Upper cut (D 98%): 12 µm
  - Average particle diameter (D 50%): 2.5 µm
  - Particle proportion < 2 µm: 40%

(e.g., Omyacarb 1-AL supplied by Eduard Merkle GmbH & Co KG, Altental 6, 89143 Blaubeuren-Altental, Germany) Reference Appendix A for more information.

3.2.7 Standard Ground Weighing Bottles according to DIN 12605; h = 30 mm, d = 50 mm.

3.2.8 Spatula.

3.2.9 Graduated pipette 2.5 ml.

3.2.10 Deionized water.

3.2.11 Closed storage container, filled with deionized water to immerse the ASTM brushes.

3.2.12 Soft, non-scratching, absorbent tissues.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Material. The test shall be performed on specially prepared test samples with the dimensions 450 mm ± 5 mm × 170 mm ± 5 mm and a thickness of 10 mm maximum, which have been painted according to the requirements of the material specification. Test samples of coated metals as well as coated plastics may be used. For mold in color or powder coated test samples, a test sample with dimensions of 150 mm ± 5 mm x 100 mm ± 5 mm with a thickness of 10 mm maximum shall be used. The stroke length setting shall be adjusted to match the sample length.

Note: Other flat panel sizes have been and may be successfully used with a similar-thickness spacer panel at both ends, provided test area is sufficiently long and wide.

3.4 Test Time.

Calendar time:	1 d
Test time:	3 h
Coordination time:	3 h

3.5 Test Required Information. Not applicable.

3.6 Personnel/Skills. Laboratory assistant, technician or engineer may conduct the test. No additional special technical skill necessary.

4 Procedure

Summary of Test Method. To simulate the stress of paint surfaces in car wash installations and to test their scratch resistance, the test samples are scratched with an abrasion tester using an oscillating brush charged with calcium carbonate slurry (scratching medium is the slurry, not the brush). The gloss of the test sample shall be measured before and after scratching, and the gloss reduction after strain shall be calculated.

The determined value of gloss reduction in percent (%) is the measure of the scratch resistance of paints.

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