



Tire Footprint Image Test

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 document describes the test equipment requirements and test methodology for measuring the footprint image of a tire for measuring properties required for tire model development, such as F-Tire.

1.2 Applicability. This procedure applies to tires used on passenger cars and light trucks.

1.3 Remarks. This procedure outlines the general method to collect tire footprint data and to determine the following metrics, footprint (center) length (L), footprint width (W), footprint gross contact area (A), and groove-area fraction (N).

2 References

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

2.1 External Standards/Specifications.

ASTM F870-94

2.2 GM Standards/Specifications.

GMW14997

2.3 Additional References.

- European Tyre and Rim Technical Organisation (ETRTO) Guidelines, Brussels, Belgium (www.etrto.org)
- Rubber Manufacturers Association (RMA), Washington, DC (www.rma.org)
- The Tire and Rim Association (TRA), Incorporated, Yearbook, Copley, Ohio (www.us-tra.org)

3 Resources

3.1 Facilities. A test lab with an appropriate load frame as per 3.2.1 and footprint impression measurement technique as per 3.2.2.

3.2 Equipment.

3.2.1 A load frame with displacement rate control accurate to ± 1 mm/minute.

3.2.2 A method to gather a tire footprint impression. The method used to gather this impression can include digital sensors, optical/camera measurement, and hand measurement of an inked impression. Some measurement techniques may not have the full capability to gather all data listed in this document.

3.2.3 Tire inflation gauge, accuracy of ± 2 kPa (± 0.3 psi).

3.3 Test Vehicle/Test Piece.

3.3.1 Tire to be provided by the requestor. Should be noted if The Tire and Rim Association (TRA) or European Tyre and Rim Technical Organisation (ETRTO) guidelines are not met.

3.3.2 The test wheel must match requested width.

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3.4 Test Time.

Calendar time: 1 day (per impression)

Test hours: 2 hours

Coordination hours: 1 hour

Note: Calendar time is the overall time from start to finish assuming the parts are available. Test hours are the actual time for test setup, test execution, and test breakdown. Coordination time is the time for coordinating the test request, part procurement, part modification, analysis, and part disposition.

3.5 Test Required Information. Requestor should provide test conditions. This includes all test pressures and load combinations to be measured. Desired combinations should be requested in Global Tire – Wheel Test System (GTWTS) as part of the GMW14997 request. Requestor must also provide rim width and camber angle (0 degrees and/or 6 degrees). If no test conditions are provided, the standard test conditions listed in Table A1, Appendix A may be used.

3.6 Personnel/Skills. Test technician or test engineer.

4 Procedure

4.1 Preparation.

4.1.1 Sample Preparation. The test tire must be free of all tags, tape, stones and other foreign objects.

4.1.1.1 The tire bead must be lubricated prior to mounting.

4.1.2 Mount the tire on the wheel using Rubber Manufacturers Association (RMA) recommended practice. Never inflate a tire over 275 kPa (40 psi) to seat the beads.

4.1.3 Inflate to the first of requested pressures.

4.1.4 Inspect tire(s) for irregularities, such as excess mold material, and remove any found. Techniques for this can be found in ASTM F870-94.

4.2 Conditions.

4.2.1 Environmental Conditions. Ambient temperature: 24 °C ± 3 °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.

4.2.3 Tires standardized by an organization other than TRA and ETRTO are to be tested at the same inflation pressure as the equivalent TRA and ETRTO size.

4.2.4 Tire Camber Angle. The tire may be angled at 0 degrees and/or 6 degrees as requested. The tire should be inclined to the load surface.

4.2.4.1 Unless otherwise noted in the report/results, it is assumed that the tested angle is 0 degrees.

4.2.4.2 If no camber angle is specified in the test request, the tire shall be tested at 0 degrees.

4.2.5 Test Inflation Pressures. The test pressures should be specified by the requestor.

4.2.5.1 If no information is given, Table A1, Appendix A, outlines the inflation pressure to be tested at, based on tire type and load range.

4.2.6 Test loads. The test loads should be specified by the requestor.

4.2.6.1 If no test loads are provided, the test load is to be 70% Tire Load Limit (TLL). The TLL should be calculated with the applicable TRA or ETRTO guidelines.

4.2.6.2 The image should be taken at the specified load with a tolerance of ± 50 N.

4.3 Instructions.

4.3.1 Footprint Impression.

4.3.1.1 Mount the tire/wheel assembly in the load frame.

4.3.1.2 Perform any technique specific preparation for the impression. This can include sensor set up, ink application, or other similar functions.

4.3.1.3 Begin loading of the tire with a displacement rate of 30 mm/minute ± 1 mm/minute.

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