



Standard Test Method for Determining Change in Groove (or Void) Depth With Distance Traveled for Passenger Car Tires¹

This standard is issued under the fixed designation F762/F762M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers a procedure to be used to obtain data for determining the changes in tire tread depth over any specified course and test period.

1.2 The tire tread depth loss data obtained according to the procedures for this test method may be used to calculate tire tread wear by way of the procedures described in Practice F1016.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

F421 Test Method for Measuring Groove and Void Depth in Passenger Car Tires

F457 Test Method for Speed and Distance Calibration of Fifth Wheel Equipped With Either Analog or Digital Instrumentation

F538 Terminology Relating to the Characteristics and Performance of Tires

F1016 Practice for Linear Tire Treadwear Data Analysis

F1502 Test Method for Static Measurements on Tires for Passenger Cars, Light Trucks, and Medium Duty Vehicles

¹ This test method is under the jurisdiction of ASTM Committee F09 on Tires and is the direct responsibility of Subcommittee F09.30 on Laboratory (Non-Vehicular) Testing.

Current edition approved June 1, 2014. Published November 2014. Originally approved in 1982. Last previous edition approved in 2008 as F762/F762M – 08. DOI: 10.1520/F0762_F0762M-08R14.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 Definitions:

3.1.1 *break-in, n*—one or more periods of initial standardized tire operation during which tire is brought to the state which will lead to more consistent test results. **F538**

3.1.2 *element, n*—an isolated (totally bounded by void) projection. **F538**

3.1.3 *groove, n*—a void that is relatively narrow compared to its length. **F538**

3.1.4 *groove (void) average depth, n*—the average depth of all groove depth measurements in a single groove. **F538**

3.1.5 *groove (void) depth, [L], n*—a measurement of the perpendicular distance from a real or calculated reference plane defined by edges of two adjacent ribs or elements to the lowest point of contact in the groove (void). **F538**

3.1.6 *irregular wear, n*—a type of treadwear characterized by substantial variations of tread loss both from projection to projection and frequently from point to point on a given projection. **F538**

3.1.7 *measurement interval, n*—the distance travelled, in kilometres [miles], between two successive groove (void) depth measurements. **F538**

3.1.7.1 *Discussion*—A specified number of test cycles will constitute a measurement interval. If a tire rotation plan is specified, the measurement interval shall include equal distance on each specified wheel position for each tire test specimen. More frequent measurements may be made if desired. The number of measurement intervals should be compatible with the tire rotation plan to result in a logical basis for data interpretation.

3.1.8 *projection, n*—a pavement contacting area of the tread band, bounded by void. **F538**

3.1.9 *rib, n*—a continuous circumferential projection. **F538**

3.1.10 *rotation plan, n*—in tire testing, the scheduled change of wheel positions for all tires on a vehicle, and between vehicles in a convoy, and scheduled change of vehicle position in a convoy during a road test as appropriate. **F538**

3.1.10.1 *Discussion*—Test tires should occupy each position on the vehicle for the same number of cycles. A tire rotation

plan may be designed for each test in accordance with the requirement of the test program.

3.1.11 *test cycle, n*—in tire testing, one complete circuit of the specified test course. **F538**

3.1.12 *tread depth average, n*—in a single tire, the average of all tire groove (void) depth measurements.

3.1.13 *void, n*—a volume (in the tread band) defined by the lack of rubber; the depth dimension of the volume may vary from point to point in (on) the tread band. **F538**

4. Summary of Test Method

4.1 The tire test procedure is carried out by repeatedly driving one or more test vehicles over a specified test course. All tires on each test vehicle are of the same tire size designation: duplicate tires are mounted on each axle. A break-in period prior to the measurement program is optional. The tires may be rotated among wheel positions after completion of a specified number of runs over the test course. Drivers maintain the same position in the convoy; the vehicle's position in the convoy is rotated uniformly.

4.2 The test consists of a predetermined number of road testing cycles. Groove (void) depth measurements are made after completion of a specified number of test cycles.

4.3 The wear rate may be calculated in a number of ways (see Practice **F1016**).

5. Significance and Use

5.1 The test data obtained with this test method may be used to compare the performance of various tires for the conditions under which they were tested.

5.2 This test method is suitable for a variety of quality assurance, research, and development purposes, when tires are to be compared during a single series of tests. *The procedure described may not be suitable for regulatory statutes or specification acceptance because the values obtained may not agree, or correlate either in rank order or absolute tread wear performance level, with values obtained on other road surfaces, or on the same surface after additional wear, under other environmental conditions, on other test vehicles, or with results obtained by other test procedures.*

6. Interferences

6.1 Vehicles of different types can influence test results. When involved in comparison testing, avoid mixing of vehicles with significantly different drivelines or suspensions.

7. Apparatus

7.1 *Test Vehicle*—Any vehicle compatible with test load and tire dimensions.

7.2 *Rims*, of design rim width + 0.5, – 0.0 in. for the test tire as recommended by the Tire and Rim Association (T&RA)³ or other standard tire and rim organizing bodies.

7.3 *Speed Recording Equipment*, to record speed history as a function of time, accurate to $\pm 2\%$.

7.4 *Distance Recording Equipment*, to accumulate the total test distance, accurate to $\pm 2\%$.

7.5 *Vehicle Weighing Device*.

7.6 *Vehicle Wheel Alignment Equipment* (front wheel and, where applicable, rear wheel).

7.7 *Tire Pressure Gage*.

7.8 *Groove (or Void) Measurement Device (Depth Gage)* meeting the specifications of the American Gage Design Committee and Test Method **F421**.

7.9 *Tread Hardness Gage*.

8. Test Course

8.1 The test course is any network of public or private roads, or both. A speed schedule shall be defined as well as reasonable number of defined and scheduled stops and starts.

9. Safety Precautions

9.1 All normal traffic safety precautions must be observed and appropriate vehicle spacing maintained. Posted and procedural speed limits must be observed. Vehicle spacing should be at least one car length for each 15 km/h [10 mph] speed plus three car lengths.

9.2 All safety related mechanical and electrical systems of the vehicle must be in good operating condition for the test.

9.3 Refer to RMA Demounting and Mounting Procedures for Automobile Tires⁴ for additional safety warnings.

10. Sampling

10.1 A sample is set of n sampling units obtained from the population being sampled. For example, the population may be a portion of a dealer's stock or a single lot from a manufacturer.

10.2 A sampling unit is a minimum of two duplicate tires.

10.3 The test specimen is a single tire of a sampling unit.

11. Selection and Preparation of Test Tires

11.1 All test tires shall be approximately the same age and shall have been stored under the same conditions (unless age or storage effects are the factors being studied).

11.2 Mount test tires on rims in compliance with T&RA or other standard tire and rim organizing bodies using conventional mounting procedure approved by RMA.

11.2.1 Inflate the tire at ambient temperature to the specified test pressure, which shall not exceed the maximum inflation pressure molded on the tire, unless the experiment requires it, for example, if inflation effects are being studied.

11.2.2 Balance the tire and wheel assembly.

11.2.3 If, prior to starting the test, pressure loss is noted, determine and eliminate the cause and adjust the inflation pressure.

³ Available from Tire and Rim Association, Inc., 175 Montrose West Ave., Copley, OH 44321.

⁴ Available from Rubber Manufacturers Association, 1400 K St. NW, Washington, DC 20005.

11.3 Locate and prepare tread measurement positions carefully in accordance with Test Method **F421**. Mark and record these positions clearly. Renew the markings throughout the test to ensure that measurements are always made at the same locations.

11.4 If storage is required, place the mounted tires in locations that do not subject the tires to undesirable effects, for example, direct sunlight, extreme temperature, and ozone.

12. Preparation of Apparatus and Instruments

12.1 Preparation of Test Vehicle:

12.1.1 *Loading*—Adjust the vehicle load so that each test tire has the specified load $\pm 1\%$, with all wheel positions being measured simultaneously. Adjust vehicle load with mounted spare tire(s), necessary emergency and safety equipment, test instrumentation all stored in place, a 68 kg [150 lb] simulated driver, and a full fuel load.

12.1.2 *Alignment*—Align the wheels in accordance with the vehicle manufacturer's specifications after test loads have been installed. Deviation from vehicle manufacturer's specification based on experience may be used to ensure even tread wear across the tire.

12.1.3 Install the speed and distance recording equipment and verify that the instrumentation accuracy is in accordance with Test Method **F457**.

13. Calibration of Measurement Equipment

13.1 Calibrate all measurement and test equipment in accordance with an established calibration procedure.

13.2 Establish procedures for using the measurement and test equipment under specific conditions to ensure their accuracy and stability.

13.3 Calibration instruments and standards shall be traceable to the National Institute of Standards and Technology.

13.4 Label all measuring and test equipment with the date of calibration and the name of the person who calibrated the equipment.

13.5 Maintain records of calibration for all measuring and test equipment to ensure maintenance of established calibration schedules.

14. Procedure

14.1 Install the test tires at the specified test positions of the specified test vehicle.

14.2 Adjust the cold tire inflation pressure to the specified value just prior to the start of the test.

14.3 If break-in is desired, it shall consist of one or more complete measurement intervals.

14.4 Inspect all tread grooves (or voids) and all rib or element surfaces. Note and describe any irregular wear. Record other external tire conditions such as checking, cracking, bead chafing, and external damage.

14.5 Measure each tire prior to the first test cycle and at the end of each subsequent, predetermined measurement interval. Record results as per test instructions.

14.6 Install the tire on the test vehicle in the position specified by the tire rotation schedule.

14.7 Check and record the inflation pressure and, if necessary, adjust to specified pressure when the tire is in temperature equilibrium with the environment.

14.8 Drive the test vehicle over the test course at the specified speed.

14.9 Measure the groove (or void) depths in accordance with Test Method **F421**.

14.10 Record the measured values and inspection notes as per test instructions.

14.11 Repeat **14.6** through **14.10** until the required distance or groove (or void) depth has been achieved.

14.12 Certain measurements, although not directly applicable to a tread loss determination, are often of value in the analysis of data or in the monitoring and control of the test. Among these measurements are: tire weight, outside diameter, cross section width, overall width, outside diameter, cross-section width, tread radius (or profile), and tread hardness. These measurements are optional. (See Test Method **F1502**).

15. Report

15.1 There are two basic reports: driver's trip sheet and tire measurement and inspection.

15.1.1 Driver's Trip Sheet Information:

15.1.1.1 Date,

15.1.1.2 Test number,

15.1.1.3 Odometer reading at the beginning of a shift,

15.1.1.4 Odometer reading at the end of a shift,

15.1.1.5 Actual distance traveled,

15.1.1.6 Distance traveled on wet roads,

15.1.1.7 Odometer reading at premature tire removal,

15.1.1.8 Tire codes,

15.1.1.9 Cold tire inflation before the start of a shift,

15.1.1.10 Hot tire inflation at half point,

15.1.1.11 Hot tire inflation at the end of a shift, and

15.1.1.12 Driver's comments on tire performance.

15.1.2 Tire Measurement and Inspection Data Sheet:

15.1.2.1 Measurement date,

15.1.2.2 Tire test report number,

15.1.2.3 Test tire application date,

15.1.2.4 Originator,

15.1.2.5 Test program number,

15.1.2.6 Test procedure number,

15.1.2.7 Vehicle description,

15.1.2.8 Test load front and rear axle,

15.1.2.9 Test cold inflation,

15.1.2.10 Tire rotation pattern,

15.1.2.11 Rim size,

15.1.2.12 Tire manufacturer,

15.1.2.13 Tire size,

15.1.2.14 Tire description,

15.1.2.15 Tire number,

15.1.2.16 Measured at test kilometres,

15.1.2.17 Tire serial number,

15.1.2.18 Test wheel position,

- 15.1.2.19 Tread hardness,
- 15.1.2.20 Tire outside diameter,
- 15.1.2.21 Tire section width,
- 15.1.2.22 Tread radius,
- 15.1.2.23 Tire weight,
- 15.1.2.24 Non-skid groove (or void) depth, and
- 15.1.2.25 Tire inspection data.

NOTE 1—The lists in 15.1.1 and 15.1.2 are suggested only. With electronic data acquisition and analyzing, there are many different data output formats that may be used.

16. Precision and Bias

16.1 The precision of the groove (or void) depth measurement is given in Test Method F421. The precision with which the distance traveled can be measured is found in Test Method F457.

16.2 No concept of bias in the sense of deviation from a reference value is applicable to the ratio of groove (or void) depth change to distance traveled.

17. Keywords

17.1 test course; tire; tire groove depth loss; tire test; trip sheet

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>