Designation: F1923 – 98 (Reapproved 2014)

Standard Test Method for Tires, Pneumatic, Low Speed, Off Highway[1]

This standard is issued under the fixed designation F1923; 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.

INTRODUCTION

This ASTM Standard has been developed to replace ASTM Provisional Standard PS 86-97. The Provisional Standard was approved so that the U.S. military and other government agencies could continue to purchase tested and qualified tires, until F1923 had been approved. The provisional standard replaced the government's specification ZZ-T-1083, *Federal Specification, Tires, Pneumatic, Low Speed, Off Highway*, under the former Federal Tire Program. That program was discontinued and is replaced by the U.S. Army Tank Automotive Command's Cooperative Tire Qualification Program (CTQP). While fulfilling the military's commercial and tactical needs, the CTQP will continue to serve federal, state, and local agencies that want to purchase qualified tires using this test method.

This test method is designed to be used in conjunction with the Administrator's Approval and Requirements Manual for Tires, Pneumatic, Low Speed, Off Highway (CTQP F1923) (**1**),[2] to qualify tires for purchase by the U.S. federal government, military, and other state and local entities.

1. Scope

1.1 This test method covers measurements for comparative tire strength and dimensional characteristics. This test method covers new and retreaded pneumatic tires, both tube and tubeless types, and flaps when applicable, for mounting on construction, earthmoving, mining and logging equipment, graders, mobile cranes, and similar vehicles operated at low speeds off the road.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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:*[3]

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

F538 Terminology Relating to the Characteristics and Performance of Tires

3. Terminology

3.1 *Definitions:*

3.1.1 *bead, n—of a tire*, the part of a tire that comes in contact with the rim and is shaped to secure the tire to the rim. **F538**

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

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

3.1.4 *load index, n*—a numerical code associated with the maximum load a tire can carry at the speed indicated by its speed symbol under specified conditions.

3.1.5 *load symbol, n*—a code associated with the maximum load a tire can carry at the speed indicated by its speed symbol under specified conditions.

3.1.6 *nominal plunger energy, ½ [ML²/T²], n—in tire testing*, one half of the product of a peak force (required to rupture the tire structure in the tread area) and maximum plunger travel into a tire at the time of rupture. **F538**

3.1.7 *outside diameter, n*—the maximum diameter of a tire when it is mounted and inflated. **F538**

[1] This test method is under the jurisdiction of ASTM Committee F09 on Tires and is the direct responsibility of Subcommittee F09.20 on Vehicular Testing.

Current edition approved Jan. 1, 2014. Published February 2014. Originally approved in 1998. Last previous edition approved in 2005 as F1923 – 98 (2005). DOI: 10.1520/F1923-98R14.

[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

[3] 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.

3.1.8 *overall width, n*—the maximum cross-sectional width of a tire, including protective or decorative ribs. F538

3.1.9 *ply, n—in a tire*, a layer of rubber-coated parallel cords. F538

3.1.10 *ply rating, n*—the term is used to identify a given tire with its maximum recommended load when used in a specific type of service, giving an index of tire strength, not necessarily representing the number of cord plies in the tire.

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

3.1.12 *rim, n*—the periphery of a wheel to which a tire or a tube assembly may be affixed. F538

3.1.13 *sidewall, n—of a tire*, that portion of a tire between the tread and the bead. F538

3.1.14 *tire, n*—a load-bearing ground-contacting circumferential attachment to a vehicle wheel. F538

3.1.15 *tread, n—of a tire*, the part of a tire that comes in contact with the ground. F538

3.1.16 *tread depth,* [L], *n*—synonym for *groove (void) depth.* F538

4. Significance and Use

4.1 This test method establishes a standard procedure of comparative testing, for tire strength and dimensional characteristics, for use under the Administrator's Cooperative Approved Tire List (CATL) (2).

5. Procedure

5.1 *Selection and Preparation of the Test Tires:*

5.1.1 *Preparation of Tire for Outside Diameter, Tire Width, and Tread Depth Measurements and Tests:* The tire shall be mounted on the design rim specified by The Tire and Rim Association, Inc., Year Book (3), The European Tyre and Rim Technical Organization, Standards Manual (4), or the Japan Automobile Tire Manufacturers' Association, Inc., Year Book (5). It shall be inflated to the pressure corresponding to the reference load for its ply rating or symbol marking. The measurement is taken at the center of the crown. The tire shall stand in a controlled temperature environment of 15–32°C (60–90°F) for the 24-h period and the pressure adjusted within 3 kPa (½ psi) of the pressure specified by the standardizing body.

5.1.2 *Outside Diameter:* The outside diameter shall be determined to the nearest 0.25 mm (0.01 in.) by measuring the outside circumference of the inflated tire with a steel tape and dividing by 3.1416. The diameter may be determined by means of a pi tape calibrated to directly show tire diameter.

5.1.3 *Overall Width:* The overall width is the average maximum width of the inflated tire including the sidewalls, side ribs, bars, decorations, letters, or numerals. The width shall be measured to the nearest 0.25 mm (0.01 in.) at six equally spaced, different points around the inflated tire and the results shall be averaged.

5.1.4 *Tread Depth:* The deepest point of the tread groove, measured at the manufacturer's specified location to the nearest 0.25 mm (0.01 in.) at six equally spaced points around the inflated tire and the results shall be averaged.

5.2 *Preparation of Tire for Plunger Energy Test:* The tire shall be mounted on the design rim and inflated to the pressure specified by the standardizing body for its ply rating or symbol marking. The tire shall be allowed to stand in a controlled temperature environment of 15–32°C (60–90°F) for the 24-h period adjusted within 3 kPa (½ psi) of the pressure specified.

5.2.1 *Plunger Energy Procedure:* After the tire has been mounted and measured, a cylindrical steel plunger with a hemispherical end shall be forced in the center of the tread portion in the full depth area of the inflated tire (psi), at the rate of 50.8 mm (2 in.) per min. Use a 31.6 mm (1 ¼ in.) diameter plunger for tubeless and tube type tires with up to and including 12-ply rating. Use a 38.1 mm (1 ½ in.) diameter plunger for tubeless and tube type tires with 14-ply rating and above. Five measurements of force and penetration at break shall be made at equally spaced points around the circumference of the tire. In the event the tire fails to break before the plunger is stopped by reaching the rim, the force and penetration shall be taken as this occurs. Tubes shall be allowed in tubeless tires. The energy to break a tire shall be calculated from the average energy values at break by means of the following equation:

$$W = \frac{F \cdot P}{2} \quad (1)$$

where:

W = energy at break in lbf-in. or J,
F = force at break in lbf or N, and
P = penetration at break in in. or m.

6. Precision and Bias

6.1 *Precision*—Data are not yet available for making a statement on the repeatability or reproducibility of the test method.

6.2 *Bias*—There are not standards or reference values with which the results of this test method can be compared; therefore, bias cannot be evaluated.

7. Keywords

7.1 outside diameter; overall width; plunger energy; tire strength; tread depth

REFERENCES

The following documents form a part of this test method to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

(1) "Administrator's Approval and Requirements Manual for use with ASTM F1923 Standard, Test Method for Tires, Pneumatic, Low Speed, Off Highway (CTQP F1923)," U.S. Army Tank Automotive and Armaments Command, AMSTA-JD, Warren, MI 48397-5000; or Administrator, Cooperative Tire Qualification Program, PO Box 296, Roseville, MI 48066-2096.

(2) "Cooperative Approved Tire List (CATL)," U.S. Army Tank Automotive and Armaments Command, AMSTA-JD, Warren, MI 48397-5000; or Administrator, Cooperative Tire Qualification Program, PO Box 296, Roseville, MI 48066-2096.

(3) "The Tire and Rim Association, Inc., Year Book," The Tire and Rim Association, Inc., Crown Pointe, Suite 150, 175 Montrose West Avenue, Copley, OH 44321.

(4) "The European Tyre and Rim Technical Organization, Standards Manual," European Tyre and Rim Technical Organization, The General Secretary, ETRTO, Avenue Brugmann 32, Boite 2, B-1060, Brussels, Belgium.

(5) "Japan Automobile Tire Manufacturers' Association, Inc., Year Book," Japan Automobile Tire Manufacturers' Inc., 9th Floor, Toranomon Bld., No. 1-12, 1-Chome Toranomon, Mina To-Ku, Tokyo, Japan 105.