



Designation: E1911 – 19 (Reapproved 2024)

Standard Test Method for Measuring Surface Frictional Properties Using the Dynamic Friction Tester¹

This standard is issued under the fixed designation E1911; 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 the procedure for measuring surface frictional properties as a function of speed using the dynamic friction tester (DF tester).

1.2 The DF tester consists of a horizontal spinning disk fitted with three spring-loaded rubber sliders which contact the surface as the disk rotational speed decreases due to the friction generated between the sliders and the surface. A water supply unit delivers water to the surface being tested. The torque generated by the slider forces measured during the spin-down is then used to calculate the friction as a function of speed.

1.3 The DF tester can be used for laboratory investigations and in the field on *in situ* surfaces.

1.4 The values stated in SI (metric) units are to be regarded as standard. The inch-pound equivalents are rationalized, rather than exact mathematical conversions.

1.5 The Nippo Sangyo dynamic friction tester is covered by a patent. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patented item to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

1.6 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of Committee E17 on Vehicle - Pavement Systems and is the direct responsibility of Subcommittee E17.21 on Field Methods for Measuring Tire Pavement Friction.

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2. Referenced Documents

2.1 ASTM Standards:²

D2240 Test Method for Rubber Property—Durometer Hardness

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E501 Specification for Standard Rib Tire for Pavement Skid-Resistance Tests

E524 Specification for Standard Smooth Tire for Pavement Skid-Resistance Tests

E867 Terminology Relating to Vehicle-Pavement Systems

E3145 Test Method for User-Level Calibration of Dynamic Friction Tester (DF Tester)

3. Terminology

3.1 *Definitions*—For definitions of terms pertaining to this standard, see Terminology E867.

4. Summary of Test Method

4.1 This test method uses a disk that spins with its plane parallel to the test surface. Three rubber sliders are mounted on the lower surface of the disk. The disk is brought to the desired rotational velocity corresponding to the maximum tangential velocity of the sliders. The DF tester provides a maximum tangential velocity of 90 km/h (55 mph).

4.2 Water is introduced in front of the sliders and the disk is lowered to contact the test surface so that it bears the full velocity of the disk and model assembly.

4.3 The torque is monitored continuously as the disk rotational velocity reduces due to the friction between the sliders and the test surface.

4.4 The torque signal is reduced to a measurement of friction by converting the torque to the force on the sliders and dividing by the weight of the disk and motor assembly.

4.5 The friction at 20, 40, 60, and 80 km/h (12, 25, 37, and 50 mph) is recorded and the friction-speed relationship can be plotted.

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

5. Significance and Use

5.1 This test method provides a measure of surface friction as a function of sliding speed, either in the field or in a laboratory.

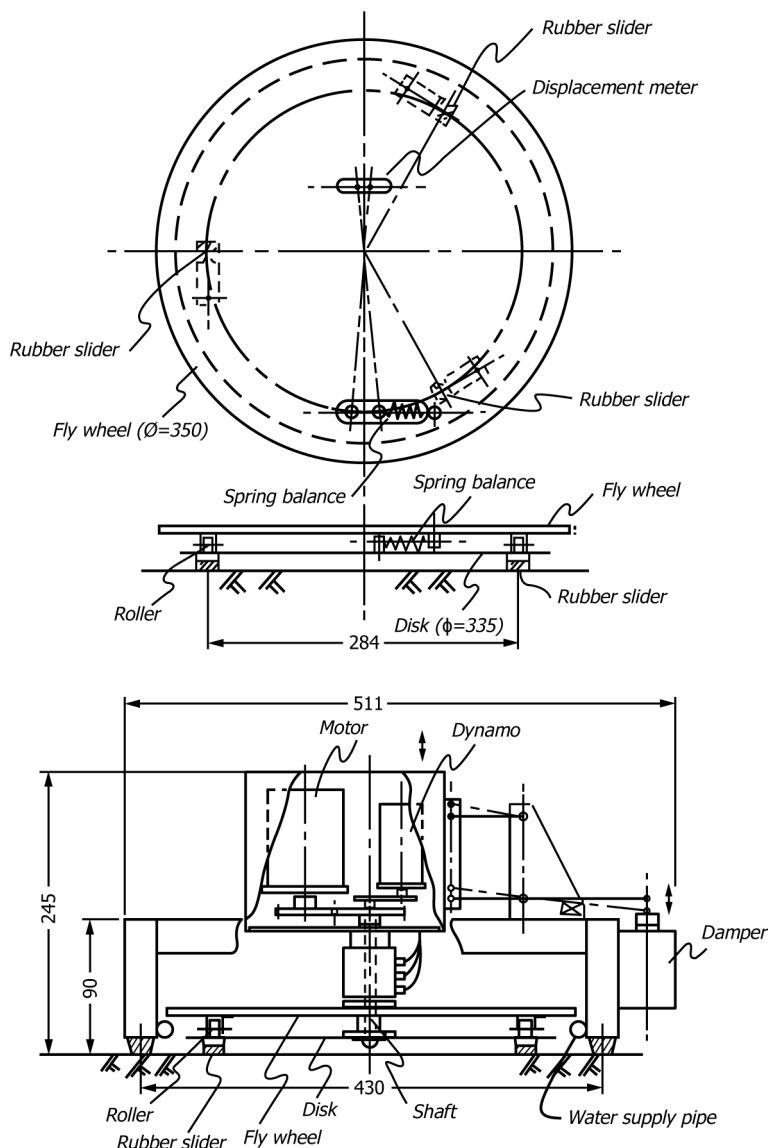
5.2 This test method can be used to determine the relative effects of various polishing techniques on materials or material combinations.

5.3 The values measured in accordance with this method do not necessarily agree or directly correlate with those obtained utilizing other methods of determining friction properties or skid resistance.

6. Apparatus

6.1 *DF Tester* (see Fig. 1)—The measuring instrument

consists of a main body and a control unit. A portable personal computer, dedicated controller, or an X-Y plotter can be used to operate the main body and record the data. Fig. 1 shows the DF tester main body, consisting of a flywheel and disk that is driven by a motor. Three rubber sliders are attached to the disk by leaf springs. The sliders are pressed onto the test surface by the weight of the device through three rollers. Each slider is loaded to 11.8 N (2.65 lbf) by the leaf springs. The disk and the flywheel are connected by a spring balance mounted along a circle on which the rubber sliders are fixed. Due to the forces on the rubber sliders, displacement occurs in a spring balance. This displacement is converted to an electrical signal through a displacement transducer with an accuracy of $\pm 1\%$ of full scale attached to the opposite side of the disk. This signal is output through a slip ring and brush, both of which are



NOTE 1—Dimensions in mm; 25.4 mm = 1 in.

FIG. 1 The DF Testers