



Designation: E3145 – 19 (Reapproved 2024)

Standard Test Method for User-Level Calibration of Dynamic Friction Tester (DF Tester)¹

This standard is issued under the fixed designation E3145; 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 describes the equipment and procedure to ensure that the calibration performed by various dynamic friction tester (DF tester) users is uniform and in accordance with manufacturer specifications. There are three models of the DF tester in use: (1) USB/personal computer, (2) controller, and (3) X-Y plotter. Procedures specific to the different models are noted. User-level calibration software is separate from the operation software and must be obtained from the manufacturer for the USB/personal computer model.

1.2 This test method is a static calibration of the vertical load, friction (μ) force, and speed of the DF tester. Compliance to this user-level calibration procedure ensures a higher level of repeatable and reproducible performance of the DF tester when used in accordance with Test Method E1911.

1.3 The user-level calibration doesn't include the replacement of the mu spring or the adjustment of linearity of the DF tester. It is recommended that DF testers be inspected by a manufacturer-approved laboratory on an annual basis to replace the mu spring, ensure linearity, and to identify other non user-serviceable wear.

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 *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.*

1.6 *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 ASTM 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

E867 Terminology Relating to Vehicle-Pavement Systems

E1911 Test Method for Measuring Surface Frictional Properties Using the Dynamic Friction Tester

3. Terminology

3.1 *Definitions:*

3.1.1 *calibration platform*—a platform with weighing capability built specifically to calibrate the DF tester. The design and requirements for the calibration platform are described herein.

3.1.2 *calibration weights*—weights of known and stable value used to apply a load to the flywheel and disk during the calibration of the friction (μ) force. These weights should be sized to apply an initial load of 1.80 kg (± 0.01 kg) and a total of 3.60 kg (± 0.01 kg). The weights must be verified annually using an accredited, calibrated scale or calibrated by an accredited facility to ensure accuracy.

3.1.3 *friction (μ) force*—the force measured by the potentiometer and spring between the flywheel and the disk of the DF tester.

3.1.4 *standard surface*—a paved surface with a consistent and resilient surface friction that is used to verify the output of the DF tester before use in lieu of using a verification plate.

3.1.5 *verification plate*—a plate with a consistent and resilient surface friction that is used to verify the output of the DF tester before use, including before and after a calibration procedure is performed.

3.1.6 *verification weights*—weights of known and stable value used to verify the correct operation of the calibration platform. These weights should be sized to apply incremental loading up to a total of 4.00 kg (± 0.01 kg). The weights must be verified annually using an accredited, calibrated scale or calibrated by an accredited facility to ensure accuracy.

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.

3.1.7 *vertical load*—the vertical load applied to the rubber pads that are in contact with the surface of the pavement when the DF tester feet are in the same plane as the test surface.

3.2 For definitions of additional terms used in this standard, refer to Terminology E867.

4. Summary of Test Method

4.1 Verification of the functionality and output of the DF tester is performed on a verification plate (or standard surface) prior to starting the user-level calibration procedure.

4.2 The static vertical load on the rubber sliders is measured by the integrated scale in the calibration platform.

4.3 The friction (μ) force output is adjusted, either electronically or manually depending on the DF tester model, to the value of a known weight that is applied to the flywheel/disk.

4.4 The rotational speed of the flywheel/disk is checked and adjusted as necessary to meet manufacturer's specifications.

4.5 Verification of the functionality and output of the DF tester is performed on a verification plate (or standard surface) after the user-level calibration procedure is completed. Significant differences between pre- and post-calibration data from the verification plate should be noted. Any significant differences should be investigated to determine the potential effect on previously acquired data.

5. Significance and Use

5.1 The user-level calibration process may be used to verify that the DF tester is functioning properly, that it is within manufacturer specifications, and to perform minor adjustments to bring the unit back into conformance with manufacturer specifications.

5.2 The DF tester user-level calibration described herein does not eliminate all error sources, nor does it guarantee the proper operation of the device. Several adjustments and repairs are beyond the scope of this standard, and manufacturer-approved calibrations are still recommended on an annual basis.

6. Apparatus

6.1 A vertical load weighing calibration platform consisting of a flat base plate with a minimum side length of 457 mm (18 in.); a flat, top platform that can accommodate a circular area with a minimum diameter of 310 mm; a digital display; and four pedestals with 40-mm diameter to support the DF tester. See Fig. 1. The top platform must have an integrated scale that measures the vertical load exerted by the slider pads when the disk is lowered to the level of a plane defined by the bottom of the device's feet. The scale must be insensitive to off-center loading and capable of measuring and displaying weights of 0.00 to 5.00 kg (± 0.001 kg). The four pedestals are

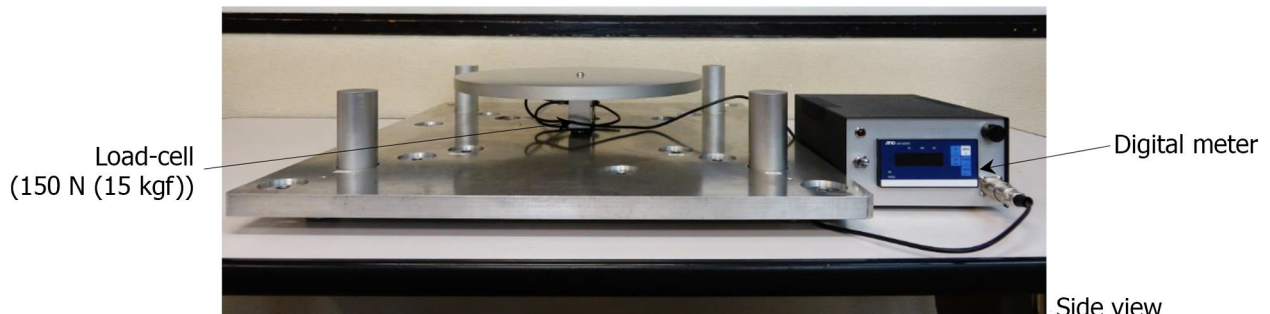
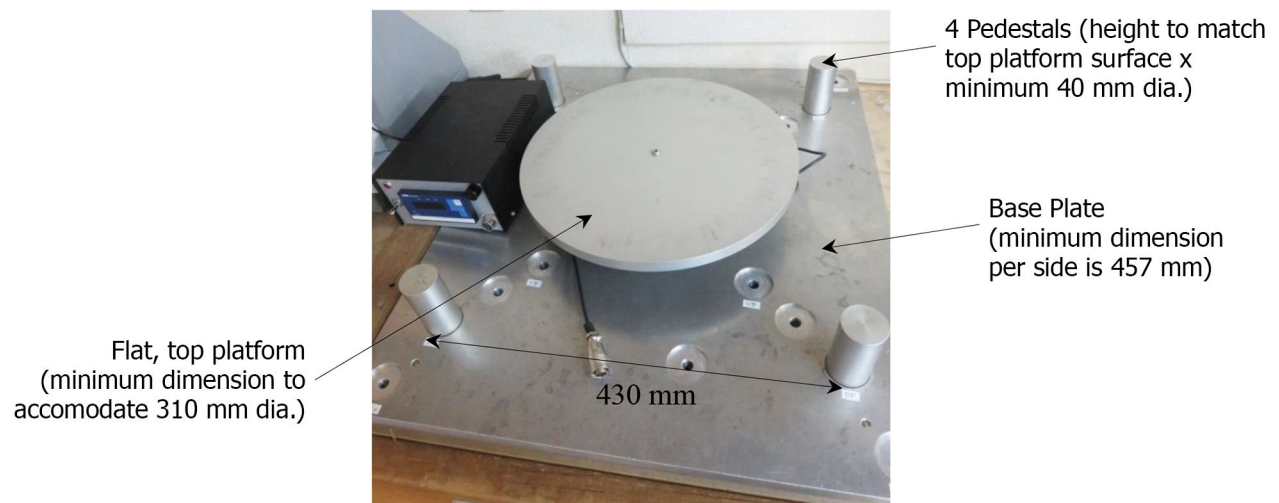


FIG. 1 Calibration Platform with Load Scale and Digital Meter