



Standard Test Method for Calibrating a Wheel Force or Torque Transducer Using a Calibration Platform (User Level)¹

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1. Scope

1.1 This test method covers the calibration of the force (or torque) transducer and associated instrumentation of a mounted test wheel by using a calibration platform.

1.2 This test method is a static calibration, simulating the traction force between a tire and the pavement.

1.3 In the case of a force-measuring system, the instrumentation readout is directly proportional to the calibration force input.

1.4 In the case of a torque-measuring system, the instrumentation readout is a measure of the calibration force input and the effective tire radius.

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

2. Referenced Documents

2.1 ASTM Standards:

E 274 Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire²

F 377 Practice for Calibration of Braking/Traction Measuring Devices for Testing Tires³

3. Terminology

3.1 Description of Terms:

3.1.1 *calibration platform*—a moving platform for applying a force in the contact plane of a tire, and associated means for measuring the applied force. The calibration platform consists of a rigid plate with a high friction surface, in contact with the tire footprint, supported on a frictionless, preferably air, bearing. It may also be instrumented to measure vertical forces (loads).

3.1.2 *calibration reference signals*—repeatable signals in the range of expected wheel-force transducer system loading.

These signals could either be constant voltages or preferably produced by a strain-gage calibration shunt resistor.

3.1.3 *crosstalk*—the undesired effect of force readings appearing on an unloaded axis of a transducer while applying force to another.

3.1.4 *horizontal traction (traction)*—a force acting in a horizontal axis through the wheel transducer; i.e., locked wheel drag force.

3.1.5 *hysteresis*—the maximum difference between corresponding transducer outputs (of the wheel force transducer system) at increasing and decreasing applied calibration force, expressed as a percentage of full load. Proven outliers are excluded.

3.1.6 *nonlinearity*—the maximum deviation of the transducer output(s) (of the wheel force transducer system) from the best-fit linear relation to the applied calibration force, expressed as a percentage of full scale. Proven outliers are excluded.

3.1.7 *test wheel*—a wheel and test tire assembly mounted to a test vehicle by means of a force or torque transducer.

3.1.8 *vertical load (load)*—force acting in a vertical axis through the wheel transducer; i.e., weight.

3.1.9 *wheel force transducer system*—a force-to-electrical signal converter system including transducer(s), associated signal condition, zeroing, amplifying, recording, and monitoring instrumentation.

4. Summary of Test Method

4.1 The vertical static loads (forces) on the test wheel(s) and hitch are established. If the tester is of the trailer type, it must be connected to its tow vehicle. Traction forces are applied to the locked wheel(s) at the tire-platform interface. The calibration platform consists of a bearing that is frictionless in all directions of the horizontal plane supporting a rigid plate with a high friction surface. The force applied to this platform is measured by suitable electronic force transducers.

4.2 Wheel transducer linearity and hysteresis are determined from an electronic digital meter (x-y chart optional) and are correlated with the tow vehicle instrumentation. Techniques are given for establishing reference signals to be used as calibration points.

4.3 With calibration platforms having force-measurement capability in the vertical direction, test wheel load (force) is

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² *Annual Book of ASTM Standards*, Vol 04.03.

³ *Annual Book of ASTM Standards*, Vol 09.02.