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

AASHTO Designation: T 282-01 (2023)

Technically Revised: 2001

Reviewed but Not Updated: 2023

Editorially Revised: 2021

Technical Subcommittee: 5a, Pavement Measurement

ASTM Designation: E556-11(2020)



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1. SCOPE

- 1.1. This method covers the calibration of the force (or torque) transducer and associated instrumentation of a mounted test wheel by using a calibration platform. It is used for establishing correction factors for changes in transducer output due to changes in operating conditions.
- 1.2. This 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 may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns associated with its use. It is the responsibility of whoever uses this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*
- 1.6. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
 - < R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories.
 - < T 242, Frictional Properties of Paved Surfaces Using a Full-Scale Tire

- 2.2. *ASTM Standard:*
< F377, Standard Practice for Calibration of Braking/Tractive Measuring Devices for Testing Tires

3. TERMINOLOGY

- 3.1. *Description of Terms Specific to This Standard:*
- 3.1.1. *wheel force transducer system*—a force-to-electrical signal converter system including transducer(s), associated signal condition, zeroing, amplifying, recording, and monitoring instrumentation.
- 3.1.2. *calibration reference signals*—repeatable signals in the range of expected wheel-force transducer system loading. These signals could be either constant voltages (preferably) or produced by a strain-gauge calibration shunt resistor.
- 3.1.3. *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).
- 3.1.4. *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.
- 3.1.5. *linearity/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.
- 3.1.6. *test wheel*—a wheel and test tire assembly mounted to a test vehicle by means of a force or torque transducer.
- 3.1.7. *crosstalk*—the undesired effect of force readings appearing on an unloaded axis of a transducer while applying force to another.
- 3.1.8. *horizontal traction (traction)*—a force acting in a horizontal axis through the wheel transducer, i.e., locked wheel drag force.
- 3.1.9. *vertical load (load)*—force acting in a vertical axis through the wheel transducer, i.e., weight.

4. SUMMARY OF 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 wheel transducer is calibrated while trailer and tow vehicle displacements are measured from the initial position for the applied traction force. 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 a suitable transducer.
- 4.2. Wheel transducer linearity and hysteresis are determined by recording data using an electronic digital meter and/or an x-y plotter, and should also be correlated with data collected from the tow