



SURFACE VEHICLE RECOMMENDED PRACTICE

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Inertia Calculation for Single-Ended Inertia-Dynamometer Testing

RATIONALE

This document has been stabilized because the committee has determined that there is no longer any customer pull for further maintenance, review, or revision.

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Documents

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1. SCOPE

This procedure provides methods to determine the appropriate inertia values for all passenger cars and light trucks up to 4540 kg of GVWR. For the same vehicle application and axle (front or rear), different tests sections or brake applications may use different inertia values to reflect the duty-cycle and loading conditions indicated on the specific test.

1.1 Purpose

The purpose of this procedure is to provide a common methodology to calculate test inertia (wheel load and tire rolling radius). The use of common inertia values allows the comparison of test results from different inertia-dynamometers or different testing facilities. This makes the overall testing activities more cost-effective and repeatable.

2. REFERENCES

2.1 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.1.1 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 611 Road Vehicles - Braking of Automotive Vehicles and Their Trailers - Vocabulary

3. DEFINITIONS

3.1 ANTILOCK BRAKING SYSTEMS - ABS

Closed-loop control device which prevents wheel lock when braking and, as a result, retains the vehicle's steering ability and stability.

3.2 ELECTRONIC BRAKE DISTRIBUTION - EBD

Closed-loop technology that automatically varies the amount of pressure applied to the rear brakes to maximize tire-to-road adhesion utilization while maintaining the vehicle stability. This condition typically happens at or near the wheel lock-up condition.

3.3 GROSS VEHICLE WEIGHT RATING - GVWR

Maximum vehicle weight indicated by the manufacturer. [kg]

3.4 LIGHTLY LOADED VEHICLE WEIGHT - LLVW

Unloaded vehicle weight plus 180 kg including driver and test instrumentation. [kg]

3.5 TIRE DYNAMIC ROLLING RADIUS - RR

Tire radius that equates to the Revolutions Per Mile (RPM) published by the tire manufacturer for the specific tire size. If unknown, the rolling radius can be calculated from the RPM value using Equation 1. Use the tire dynamic rolling radius to calculate test inertia and the dynamometer rotational speed in revolutions per minute (r/min) for a given linear vehicle speed.

$$RR = \frac{1\,609.344}{2 \cdot \pi \cdot RPM} \quad (\text{Eq. 1})$$

where:

RR = Tire dynamic rolling radius [m]

RPM = Tire manufacturer specification for revolutions per mile. Typically shown for the tire size on the manufacturer's website.

4. TEST INERTIA CALCULATION METHODS

There are three methods available to calculate the test inertia depending upon the amount of information available, the vehicle type, and the deceleration level for the specific test section or brake application.

The inertia values are required to determine the amount of energy imposed on the brake during testing. Also, the inertia value is required to determine the torque level for a given deceleration value or set-point.

The minimum information required to run an inertia-dynamometer test is:

- Vehicle Description: make or manufacturer, model year, brand or platform, trim level
- Gross Vehicle Weight Rating
- Lightly Loaded Vehicle Weight
- Tire Size Description
- Brake Proportioning Type (fixed or electronic)

Use the flowchart in Figure 1 to determine the appropriate method as a function of availability of vehicle information, type of front-to-rear brake proportioning, and target deceleration. Follow the steps on the flowchart, answer the questions and then proceed to the corresponding section using the information available for the specific vehicle application.

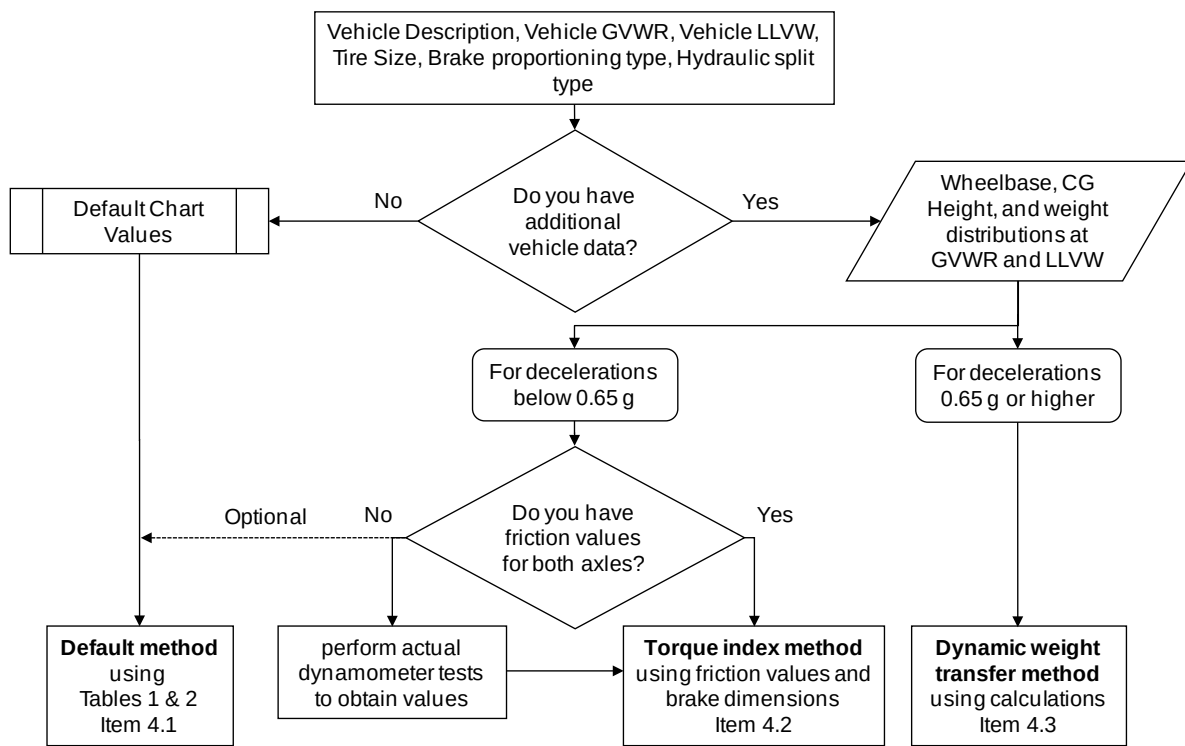


Figure 1 - Workflow to select the inertia calculation method