



SURFACE VEHICLE RECOMMENDED PRACTICE

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Kinematic Performance Metrics for Powered Standing Scooters

RATIONALE

This SAE Recommended Practice provides normalized kinematic performance metrics for powered standing scooters, recognizing that such metrics (e.g., top speed, acceleration, deceleration) are important classification criteria for these vehicles. Standardizing these metrics serves several purposes, including:

- Provide practicable vehicle-level, performance-based metrics;
- Provide standardized test methods and conditions for the above metrics; and
- Provide meaningful metrics for industry, consumers, and public agencies to evaluate safety and performance of powered standing scooters.

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Documents

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1. SCOPE

This SAE Recommended Practice (RP) normalizes kinematic performance metrics and testing for powered standing scooters as defined in SAE J3194. Specifically, it describes:

- Test procedures to measure the top speed, acceleration, and deceleration performance of powered standing scooters;
- Test scenarios that consider initial vehicle conditions, operator anthropometry, environmental and roadway conditions, and operating domains (e.g., geofence);
- Relevant units, accuracy, and precision of measurement for each test; and
- Methods to collect and report such kinematic data.

This RP does not prescribe pass/fail criteria for testing. This RP is applicable to powered standing scooters that are privately owned or available via shared- or rental-fleet operations.

2. REFERENCES

2.1 Applicable Documents

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J3007 Top Speed Test Procedure for Electric Motorcycles

SAE J3194 Taxonomy and Classification of Powered Micromobility Vehicles

2.1.2 Other Publications

Fryar, C.D., Gu, Q., Ogden, C.L., and Flegal, K.M., "Anthropometric reference data for children and adults: United States, 2011-2014," Vital Health Stat 3(39), 2016.

3. DEFINITIONS

3.1 ACCELERATOR

The hand lever or switch that actuates the speed and output of a motor.

3.2 BRAKES

The energy conversion mechanism used to slow, stop, or keep a vehicle at rest.

3.3 CURB WEIGHT

The weight of the base vehicle (i.e., with standard equipment only), with all fluids filled to the maximum (e.g., fuel, coolant, etc.) and/or batteries without material or personnel load.

3.4 FOOT PLATFORM

A flat surface where the operator places their feet; it typically accommodates the majority of the bottom surface of the feet of the operator.

3.5 GEOFENCED BOUNDARY

Virtual perimeter for a real-world geographic area that defines differences in constraints for vehicle operation (e.g., “low-speed zone,” “no ride zone”).

3.6 HANDLEBAR

The primary control for steering inputs; it also provides the operator stability support and functions as the mount for hand-operated controls and accessories.

3.7 HIGHEST REGULATED SPEED

The highest speed permitted for a powered standing scooter in a specified regulatory region(s).

EXAMPLE: If a vehicle is to be deployed in Region A, with a regulated top speed of 15 mph, and Region B, with a regulated top speed of 18 mph, then the highest regulated speed for this vehicle is 18 mph. Testing deceleration performance using the highest regulated speed allows for a more complete understanding of the vehicle's deceleration capabilities near its limits.

3.8 KICK TO START

Movement whereby the operator must use muscle power to move the vehicle from an initial rest position to motor activation.

3.9 MOTOR

A machine that converts electrical, chemical, or combustion energy into mechanical energy.

3.10 OPERATOR

The person who is exercising balance, steering, braking, and speed control of the vehicle.

3.11 POWERED STANDING SCOOTER

A category of powered micromobility vehicle as defined in SAE J3194. Specifically, a wheeled vehicle that:

- Has a center column with a handlebar;
- Is controlled by the operator using the accelerator/throttle and brakes for speed and is steered with the handlebar;
- Has a foot platform for the operator (and passenger) to stand on;
- Is powered partially or fully by a motor;
- Is manufactured primarily for transportation of not more than one person, except for specifically designed vehicles; and
- Is composed of two or three wheels held in a frame in the longitudinal direction of travel.

3.12 STATE OF CHARGE

Level of charge of an electric battery relative to its capacity.

3.13 TEST OPERATOR

The operator who is executing tests described within this RP.

3.14 TOP SPEED

Maximum speed when powered solely by the motor under the prescribed test conditions.