

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1059

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SPEEDOMETER TEST PROCEDURE

Foreword—This Document has also changed to comply with the new SAE Technical Standards Board Format. References were added as Section 2. All other section numbers have changed.

1. **Scope**—This SAE Recommended Practice provides a test procedure for eddy current speedometers, including the odometer if an integral portion of the speedometer, for passenger car service.

2. References

2.1 **Applicable Publication**—The following publication forms a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATION—Available from SAE 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J678—Speedometers and Tachometers—Automotive

3. **Performance Tests**—All performance tests shall be made with the dial tilted at its design angle but shall not be less than 5 deg backward. Reference temperature for all performance tests is $75 \pm 5^\circ\text{F}$ ($24 \pm 2.8^\circ\text{C}$).

3.1 The calibration shall be as in paragraph 2.4 of SAE J678.

3.1.1 The temperature compensation shall be as noted in paragraph 2.4 of SAE J678

3.1.2 The speedometer shall smoothly break away from the design rest position in a manner agreed to by the customer and manufacturer.

3.1.3 The indicator shall always return to its rest positions when the drive becomes immobile. This must be accomplished throughout the range of specified temperature and without external vibration. The condition may also be tested at zero drive speed by releasing the indicator from the 5 mph (8 km/h) position. The indicator must return to its design rest position.

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- 3.1.4 The total backlash (hysteresis) in an instrument with a live bearing indicator shaft system shall not exceed 1.5 mph (2.4 km/h), or 3 mph (4.8 km/h) for a stationary bearing pointer shaft system, on both accelerating and decelerating without external vibration being applied to the instrument. This condition shall be checked at 500 rpm and the checkpoint shall be approached at the rate of 1 mph (1.6 km/h) from 25 mph (40 km/h) ascending or 35 mph (56 km/h) descending. A 2 s time interval must be allowed for dissipation of the damping effect prior to observing the readings.
- 3.1.5 The balance of the speed cup and indicator assemblies shall be such that no more than a total of 6 mph (10 km/h) change of indication occurs when the speedometer is driven at 500 rpm and the instrument is rotated 360 deg about the indicator axis and in the design mounting angle.
- 3.1.6 The rotation of the internal parts of the speedometer shall not result in unusual indicator flutter or waver or in erratic deflections of the indicator. This condition shall be checked at random speeds and be observed from a 2 ft (0.6 m) distance perpendicular to and at 45 deg angle to the dial. During this test, the speedometer shall be driven by means which exclude excitement caused by or transmitted through the speedometer cable.
- 3.1.7 The speedometer shall be so damped that when being driven at 500 rpm and the indicator is physically displaced to 70 mph (110 km/h), and released, the indicator shall reverse direction not more than four times; and if it does not reverse direction, it shall return to the original reading within 1.5 s.
- 3.1.8 The torque required to rotate the magnet shaft and odometer shall not exceed 0.00752 lbf-in (0.00085 N·m) for single odometer units not more than 0.01328 lbf-in (0.00150 N·m) with total and trip odometers. During these tests, all odometer numerals shall be in operation. The test shall be conducted between a drive speed of 3 and 1000 rpm at a temperature of 75 ± 5 °F (24 ± 2.8 °C).

4. **Vibration Tests**

- 4.1 Test speedometers shall be vibrated for 3 h. For 1 h in each direction along three mutually perpendicular axis with a total excursion of 0.020 in (0.5 mm) and a frequency varying 16-50 c/s, the frequency shall be cycled from 16 to 50 to 16 over a 2 min period. The mounting to be at design angle but no less than 5 deg backward.
- 4.2 After completion of the vibration test, the performance deviation listed in Section 7 will be permitted.

5. **Laboratory Endurance Tests**

- 5.1 Endurance life tests for the speedometer shall be 50 000 miles (80 000 km) or a duration test for an equivalent number of driveshaft revolutions, with speed and temperature cycling as follows:
 - 5.1.1 SPEED CYCLING—The speed shall be cycled from 167 rpm reverse to 1500 rpm forward to 167 rpm reverse every 2 min.
 - 5.1.2 TEMPERATURE CYCLING—Elevate the test chamber to 120 ± 5 °F (49 ± 2.8 °C) each day for three consecutive days, 6 h per day, and speed cycle as per paragraph 5.1.1. The speedometers are operated at room temperature and 1500 rpm for the remainder of the 24 h period.
 - 5.1.3 Elevate the test chamber to 170–180 °F (76–82 °C) for 6 h one day each week. The speedometers are not operated during this heat cycle. The speedometers are then continued operating at room temperature and 1500 rpm for the remaining hours of the day.

- 5.1.4 Reduce the test chamber to 0 ± 5 °F (-17.8 ± 2.8 °C) for 6 h one day each week. During the first hour, the speedometer shall not be operated. During the next 5 h, the speedometer shall be operated according to the speed cycling test of paragraph 5.1.1., except that the maximum speed shall be 1000 rpm. The test sample is then to be operated at room temperature and 1500 rpm for the remainder of the day. Throughout the cold test and any subsequent testing, the speedometer shall not seize or exhibit an appreciable increase in noise level when tapped by a wooden drafting pencil held loosely in the fingers.
- 5.1.5 Test speedometers shall be run at room temperature and 1500 rpm constant speed for two days to complete the weekly cycle.
- 5.2 After completing the life test (paragraph 5.1), the performance shall be as specified by Section 7.
6. **Vehicle Testing**—Test speedometers shall be installed in test vehicles and subjected to a 25 000 mile (40 250 km) (or equivalent driveshaft revolutions) general endurance road test whereby a great variety of road conditions are encountered. After completing the vehicle test, the performance deviation permissible in Section 7 will be permitted.
7. **Performance Checks after Vibration, Endurance, or Vehicle Tests**—After completion of the endurance, vibration, or vehicle test, the performance of the instruments shall be checked against the readings taken during the initial performance check. Deviations are allowed as follows:
- 7.1 The calibration shall not deviate more than 3% of the test speed from the limits of paragraph 2.4 of SAE J678.
- 7.2 The temperature compensation shall be as stated in paragraph 2.4 of SAE J678.
- 7.3 The indicator must have a positive smooth breakaway movement from its design rest position, as agreed to by the manufacturer and customer.
- 7.4 The indicator must return to design rest position.
- 7.5 The indicator backlash (hysteresis) shall not exceed 2.5 mph (4.0 km/h) for live bearing units or 4.0 mph (6.5 km/h) for a stationary bearing unit.
- 7.6 The rotation of the internal parts of the speedometer shall not result in unusual indicator flutter or waver or in erratic deflections of the indicator. This condition shall be checked at random speeds and be observed from a 2 ft (0.6 m) distance perpendicular to and at a 45 deg angle to the dial. During this test, the speedometer shall be driven by means which exclude excitement caused by or transmitted through the speedometer cable.
- 7.7 The damping shall be within the original specification, except five reversals of direction shall be allowed.
- 7.8 The drive torque shall be no more than 0.00885 lbf-in (0.00100 N·m) for single odometer units or 0.01549 lbf-in (0.00175 N·m) for double odometer units. Tests shall be as described in paragraph 3.1.8.
- 7.9 The balance of the indicator assembly may change no more than 2 mph (3 km/h), as compared to the reading obtained as per paragraph 3.1.5.
8. **Notes**
- 8.1 **Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE SPEEDOMETER AND TACHOMETER COMMITTEE