



Vehicle Odometer/Speedometer Validation

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. To provide a uniform test method for determining the visibility and accuracy of vehicle odometers and speedometers.

1.2 Applicability. Passenger vehicles and trucks < 4536 kg (< 10 000 lb) not including buses or commercial vehicles used to transport hazardous waste.

1.3 Remarks. This procedure may be used for two purposes:

1.3.1 Determine the accuracy of a speedometer or odometer prior to conducting other testing. This information may be used to calibrate the odometer/speedometer or to create calibration stickers for the vehicle.

1.3.2 Determine the accuracy of a speedometer or odometer to demonstrate compliance to design or government requirements.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

Argentina Article 30/N 2, 3	IRAN CETIA 13J7 1981	Malaysia P.U. 409 2011
Australia Design Rule 18/03	2006	Russia TR CU 018/2011
Belarus TR CU 018/2011		SAE J678
Brazil Inmetro Directive 83/99		SAE J862
Canada\Province of Quebec C-24.2, r. 32		Singapore S345/74
Canada\Province of Newfoundland/Labrador 1007/96		South Africa SANS 1441:2006
Chile 18.290 Amended by Article 75 of 20068		Taiwan COP 28
China GB 15082-2008, GB/T 12534, GB 7258-2012		Thailand DLT-BE.2556
Customs Union of Belarus, Kazakhstan, Russia TR CU 018/2011 Attachment 2 Item 31		United Nations UN R 39.01
Egypt General Information		USA/State of California Business and Professions Code §12501.1
Euro NCAP		USA/State of Connecticut 14-63-21
Gulf Cooperation Council GSO 42 2014		USA/State of Hawaii §4-101-2, §486-75
India IS-11827:2008 Amend 1		USA/State of Maryland 11.13.06.01, 11.14.02.19
Indonesia PP.55 2012		USA/State of Pennsylvania 175.74, 175.104
Israel 75/443/EEC or UN R 39.01		USA/State of Wisconsin 305.28, 347.41
Japan Article 46 Attachment 88 TRIAS 46 - J088R039 2012		USA/State of Utah 41-1A-901
Kazakhstan TR CU 018/2011		Uruguay Traffic Law 118/84 Chapters VII to X Articles 7.22, 8.2, 9.1 and 10.7 to 10.22
Korea KMVSS 54 and KMVSS 110		Uzbekistan OzDSt 973:2012
Morocco 75/443/CEE 2015		Venezuela Covenin 2855/92 and 2859/92

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2.2 GM Standards/Specifications.

None

2.3 Additional References.

- CG2240 PPEI Vehicle Speed and Rough Road Sensing Test Procedures (ID)
- National Bureau of Standards Odometer Code Handbook 44
- National Institute for Standards and Technology Handbook 44, Specifications, Tolerances, and Other Technical Requirements for Weighing and Measurement Devices. Section 5.53(T)

(ID) = This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Facilities. The facilities include the following depending on test run. See 3.4 Instructions and Appendix A.

Note: All road surfaces have to be smooth, flat, dry and provide sufficient adhesion.

- GM Milford Proving Ground (MPG), Dudenhofen, and Millbrook Circular track or equivalent.
- MPG North/South Straightaway or equivalent.
- MPG East-West Straightaway, Oval Test track or equivalent.
- Public or other marked roads having Certified Distances posted. **Note:** Certified means that distances are either guaranteed by municipality or have been verified by GM personnel.
- All other International GM Proving Grounds will use the nearest equivalent track available.

3.1.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.1.2 Equipment.

3.1.2.1 Tire Pressure Gauge.

3.1.2.2 Speed/Distance Measurement System, i.e., Fifth Wheel, Global Positioning System (GPS) Receiver, Optical Sensor or Radar Sensor.

Note: All speed/distance measurement equipment used shall have an accuracy of $\pm 0.5\%$.

Note: Fifth Wheel System must have distance measurement capabilities for odometer accuracy testing and speed measurement capabilities for speedometer accuracy testing.

Note: GPS Receiver, Optical Sensor and Radar Sensor systems are alternate methods for speedometer/odometer accuracy measurement.

3.1.2.3 Vehicle Weighing Scale.

3.1.2.4 Ballast.

3.1.2.5 Exterior Ambient Temperature Measuring Device and, if available, Wind Speed Indicator Measuring Device.

Note: Proving Ground weather station may be used when conducting tests on-site.

3.1.2.6 Vehicle Interior Air Temperature Measuring Device (located near speedometer/odometer area).

Note: All instrumentation is to be calibrated as required. Record instrumentation details and date of calibration in Appendix B, Data Sheet B1, unless the information is otherwise preserved in the testing facility records.

3.1.3 Test Vehicle/Test Piece. The test vehicle shall be representative of a class of vehicles to be evaluated. For Validation testing, the test vehicle shall be of the latest build phase with production intent electrical parts.

Note: All components involved must have the latest production intent released level software and production intent calibrations.

3.1.3.1 Tires. Design intent tires having a minimum of 50% of tread depth remaining. Verify with the appropriate Tire Release Engineer what the "new" tire tread depth should be for the tire in question. If new tires are used,

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break in with road use of at least 500 km (311 mi) or distance recommended for running in of the vehicle, whichever is lower, at 100 km/h (62 mph) It is preferred that tires be mounted and inflated to the vehicle manufacturer recommended value (sticker inside door sill) plus 20 kPa (3 psi) a minimum of 24 h prior to test to allow tire growth to stabilize.

Ensure test vehicle is equipped with the correct Regular Production Option (RPO) tire, such that all test speeds will be within the tire capability.

3.1.3.2 Transmission/Tires/Axle Combinations. Vehicle must have the correct Transmission Output Speed Sensor (TOSS) and/or electrical speed sensor, tone wheel and buffer amplifier for the transmission, tires, and axle combination being tested.

For TOSS based systems, all possible optional hardware including engines, controllers, final drives, transmissions, tires, and Instrument Panel Clusters (IPC) must be tested in at least one RPO combination. Not every possible combination of optional equipment must be tested.

For Antilock Brake System (ABS) based systems, final drive variations can be ignored. Testing of the smallest and largest tire circumference for each calibration is sufficient. However, every engine, controller, and IPC must be tested in at least one possible RPO combination.

3.1.4 Test Time.

Calendar time:	1 d to 2 d
Test time:	4 h
Coordination time:	8 h Fifth Wheel and/or "new" tires need to be installed 0 h GPS Receiver, Optical Sensor and Radar Sensor and "not new" tires

3.1.5 Test Required Information. See 3.2.2.

3.1.6 Personnel/Skills.

3.1.6.1 North America. Obtain required track access/certification from the GM Milford Proving Ground Traffic Safety Department, as necessary. No other special training needed.

3.1.6.2 GM Europe (GME). For testing at Dudenhofen Proving Grounds, a 1 h training course must be taken before permission is granted to use the road system.

3.1.6.3 Global Proving Grounds. Refer to the local traffic safety group for specific requirements.

3.2 Preparation.

3.2.1 Verify test software/calibration is the latest production intent release per the approved software development system.

3.2.2 The test engineer shall record the following in Appendix B, Data Sheet B2.

- Test vehicle description.
- Manufacturer's recommended tire pressure cold setting (usually located on driver door opening rocker panel area).
- Vehicle mass. **Note:** Usually "Curb Mass", i.e., vehicle "as built" plus fuel filled to capacity. See exception for Korea in Data Sheet B2, Appendix B.
- Odometer accuracy method, whether Certified Distance (validation test), Fifth Wheel, GPS Receiver, Optical Sensor or Radar Sensor.
- Speedometer accuracy method, whether Fifth Wheel, GPS Receiver, Optical Sensor or Radar Sensor.

3.2.3 Install "new" tires, if necessary. Refer to 3.1.3.1.

3.2.4 Ballast vehicle, enter on Data Sheet B2 in Appendix B. Record as tested weight of vehicle on data sheet including driver and instrumentation. **Note:** Driver mass must be ≤ 75 kg (≤ 165 lb).

3.2.5 Install speed/distance measurement system. **Note:** If using Fifth Wheel, verify Fifth Wheel tire air pressure is set to equipment specifications. If using the GPS Receiver, Optical Sensor or Radar Sensor verify that the system is functioning properly.

3.2.6 Install vehicle interior air temperature sensor near speedometer/odometer area.

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3.2.7 Tire Temperature Correction. Record the preparation area temperature, the test area temperature and test area wind speed on the Data Sheet B2 in Appendix B. Use Proving Ground weather station for test area temperature, if applicable.

Correct for any temperature difference between the vehicle preparation area and vehicle test area. The tire pressure should be increased by 1 kPa for each 1 °C (1 psi for each 13 °F) that the vehicle preparation area temperature is greater than the test area temperature.

Record corrected tire pressure settings.

3.2.8 Drive to test facility.

3.3 Conditions.

3.3.1 Environmental Conditions. Maintain vehicle cabin (speedometer/odometer area) at 23 °C to 28 °C (73.4 °F to 82.4 °F). Test surfaces shall be flat and dry.

3.3.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

3.4 Instructions.

Note: Assure that no local speed restrictions are violated. Consult Proving Ground Driving Regulations and local Proving Ground traffic safety group as needed for specific vehicle speed restrictions.

3.4.1 Odometer Accuracy (Two Wheel Drive (2WD) Vehicles). For Validation purposes use 3.4.1.1. For Development purposes, the use of GPS/Optical and other sensors may be substituted.

3.4.1.1 Method for Validation Test Purposes Only. This method uses Certified Distance markers, e.g., Proving Ground track distance markers.

If testing is to be performed in North America, Dudenhofen GME, or Millbrook, United Kingdom (UK), follow the specific instructions outlined in Appendix A pertaining to specific tracks and procedures.

Note: All other International GM Proving Grounds will need to use the nearest equivalent track available. Public or other marked roads will need to use distances guaranteed by municipality or have been verified by GM personnel.

3.4.1.2 Mid Speed Odometer Accuracy.

3.4.1.2.1 Conduct the test on a measured track, with the distance known for each particular lane.

3.4.1.2.2 Drive vehicle between 90 km/h and 100 km/h (55 mph and 62 mph) for a minimum of 8 km (5 mi) to stabilize tire operating temperature.

3.4.1.2.3 Drive to the starting point marker and stop on the stop pad.

3.4.1.2.4 Record the start odometer reading to the nearest 0.1 km (0.1 mi with Imperial units display only cluster). Zero the trip odometer. See Appendix B, Data Sheet B3.

3.4.1.2.5 Drive the vehicle at between 80 km to 100 km/h (50 mph to 62 mph) for the necessary number of laps to achieve 40 km (or 25 mi for Imperial units only clusters).

3.4.1.2.6 Record the finish odometer reading to the nearest 0.1 km (0.1 mi with Imperial units display only cluster). Also record the trip odometer reading in Appendix B, Data Sheet B3.

3.4.1.2.7 Subtract the start odometer reading from finish odometer reading to get the odometer distance in Appendix B3, Data Sheet B3.

3.4.1.2.8 Calculate the odometer error by subtracting the Actual (true) distance from the Odometer distance, then divide by the Actual distance and finally multiply by 100 to get percent Odometer Error. Fill in the spaces allocated in Appendix B, Data Sheet B3 in the "Mid Speed Odometer" area.

3.4.1.2.9 Round the percent Odometer Error to two decimal places.

3.4.1.3 Low Speed Odometer Accuracy. Use this test to confirm odometer accuracy while vehicle is operating at low speeds, < 40 km/h (25 mph).

3.4.1.3.1 Conduct the test on a measured track, with the distance known for each particular lane.

3.4.1.3.2 Drive to the starting point marker and stop on the stop pad.

3.4.1.3.3 Record the start odometer reading to the nearest 0.1 km (0.1 mi with Imperial units display only cluster). Zero the trip odometer. See Appendix B, Data Sheet B3.

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3.4.1.3.4 Drive the vehicle for the necessary number of laps at approximately 32 km/h to 40 km/h (20 mph to 25 mph) to achieve 40 km (or 25 mi with Imperial units display only cluster).

3.4.1.3.5 Record the finish odometer reading to the nearest 0.1 km (0.1 mi with Imperial units display only cluster). Also record the trip odometer reading in Appendix B, Data Sheet B3.

3.4.1.3.6 Subtract the start odometer reading from finish odometer reading to get the odometer distance on the Appendix B, Data Sheet B3.

3.4.1.3.7 Calculate the odometer error by subtracting the Actual (true) distance from the Odometer distance, then divide by the Actual distance and finally multiply by 100 to get percent Odometer Error. Fill in the spaces allocated on the Appendix B, Data Sheet B3 in the "Low Speed Odometer" area.

3.4.1.3.8 Round the percent Odometer Error to two decimal places.

3.4.1.4 High Speed Odometer Accuracy. Use this test to confirm odometer accuracy while vehicle is operating at high speeds, 150 km/h to 180 km/h (93 mph to 111 mph) or within 20 km/h (12 mph) of the Product Program Content (PPC) rated top speed, if < 150 km/h (< 93 mph).

3.4.1.4.1 Conduct the test on a measured track, with the distance known for each particular lane.

3.4.1.4.2 Drive to the starting point marker and stop on the stop pad.

3.4.1.4.3 Record the start odometer reading to the nearest 0.1 km (0.1 mi with Imperial units display only cluster). Zero the trip odometer. See Appendix B, Data Sheet B3.

3.4.1.4.4 Drive the vehicle for the necessary number of laps at approximately 150 km/h to 180 km/h (93 mph to 111 mph) or within 20 km/h of the PPC rated top speed, (if < 150 km/h (< 93 mph)) to achieve 40 km (or 25 mi for Imperial units display only cluster).

3.4.1.4.5 Record the finish odometer reading to the nearest 0.1 km (0.1 mi with Imperial units display only cluster). Also record the trip odometer reading in Appendix B, Data Sheet B3.

3.4.1.4.6 Subtract the start odometer reading from finish odometer reading to get the odometer distance in Appendix B, Data Sheet B3.

3.4.1.4.7 Calculate the odometer error by subtracting the Actual (true) distance from the Odometer distance, then divide by the Actual distance and finally multiply by 100 to get percent Odometer Error. Fill in the spaces allocated in Appendix B, Data Sheet B3 in the "High Speed Odometer" area.

3.4.1.4.8 Round the percent Odometer Error to two decimal places.

3.4.1.5 Four Wheel Drive (4WD) Equipped Vehicle Odometer Accuracy. Repeat the applicable procedures outlined in 3.4.1 for each 4WD mode as applicable. Check vehicle specifications to ensure maximum safe vehicle speeds for each of the tested 4WD modes are not exceeded. Identify this test type in the "Driveline Type" area in Appendix B, Data Sheet B2.

3.4.2 Speedometer Accuracy (Two Wheel Drive (2WD) Vehicles). There are two general methods used to determine speedometer accuracy.

Note: When taking the vehicle speedometer readings, it is important that the observer sit directly behind the steering wheel in a normal driving position to minimize parallax.

3.4.2.1 Method 1 (Fifth Wheel, GPS Receiver, Optical Sensor).

3.4.2.1.1 Using the Data Sheet B4 (Imperial units (mph)) or B5 (metric units (km/h)) in Appendix B as a guide, stabilize the vehicle to each required speed listed.

Note: Stabilize is defined as holding the vehicle speedometer reading to a variance of no more than 1 km/h (1 mph with Imperial units display only cluster).

3.4.2.1.2 Record the sensor speed for each required data sheet entry.

3.4.2.1.3 Calculate and record the speedometer error at each of the data sheet entries by using the formula on Data Sheets B4 or B5.

3.4.2.2 Method 2 (Radar Sensor). If testing at GM Milford Proving Ground North/South Straightaway or Dudenhofen GME circle track, refer to Appendix A for specifics.

3.4.2.3 Four Wheel Drive (4WD) Equipped Vehicle Speedometer Accuracy. Select one of the Methods listed (see 4.3.2) and repeat the procedures outlined in those applicable sections for each 4WD mode as applicable.

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Check vehicle specifications to ensure maximum safe vehicle speeds for all of the tested 4WD modes are not exceeded. Identify this test type in the "Driveline Type" area in Appendix B, Data Sheet B2.

3.5 Data.

3.5.1 Calculations. For all applications, record pertinent test results on the supplied Appendix B Data Sheets. All applications (except North America) will also be required to fill out Data Sheet B6 - Global Speedometer, Accuracy, Graduations, and Markings (except North America) Conformance Data Sheet.

Calculate data as described on the data sheets.

3.5.2 Interpretation of Results. Country dependent. See Section 4.

3.5.3 Test Documentation. Refer to applicable Data Sheets in Appendix B and Section 4.

3.6 Safety.

This standard may involve hazardous materials, operations, and equipment. This standard does not propose to address all the safety problems 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.

In general, a risk assessment needs to be performed for every driving instruction prior to executing this standard. (**Note:** National law needs to be considered while performing a risk assessment.) The required rating of risk by exposure probability and possible violation will be done in a separate document. Every identified risk must be named inside the risk assessment for the relevant driving instruction in order to announce that risk to employees. Within the risk assessment, the vehicle equipment and different vehicle build stages have to be considered. After performing a risk assessment, non-acceptable risk needs to be mitigated by appropriate countermeasures. Here technical measures are preferred because these are independent from attendant circumstances. In case technical measures are not appropriate, organizational and/or personal measures will apply. This includes training, wearing of Personal Protection Equipment, or arrangement of idle time.

3.6.1 Safety Precautions.

3.6.1.1 Instrumentation and other test equipment must be securely mounted in accordance with proving grounds traffic safety guidelines for mounting and usage of in-vehicle instrumentation.

3.6.1.2 All running lights and vehicle safety features must be operational according to proving grounds rules for running lights and power windows. Exterior lights must not be obscured by styling add-ons, covers or camouflage packages. The horn may be disabled because of steer angle transducer installation.

3.6.1.3 A helmet is required in accordance with the regulations of the test facility. The vehicle should never be operated in a manner where the vehicle leaves the roadway or goes onto the shoulder for any reason.

3.6.1.4 Check for proper attachment of the steering wheel to the gear via the intermediate shaft. If it feels loose or abnormal, do not run the test until the parts are properly assembled according to the intended design.

3.6.1.5 Check to be certain that all wheel lugs are present and have the specified torque. Loose or missing wheel fasteners are to be replaced, installed or tightened before the test may begin.

3.6.1.6 The driver's seatbelt must be worn at all times during the test. Passengers accompanying the test operator must also be safely belted in the vehicle, preferably in the right rear seat.

Note: Passengers are allowed for observation or training purposes.

3.6.1.7 If a crossbar is used to hold the steering wheel angle transducer base plate, the passenger side airbag is to be disabled or disconnected.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM Department prior to the start of delivery of production level components or materials.

Any change to the component or material, e.g., design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to, the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases, a shorter test can be agreed to between the responsible GM department and the supplier.

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3.7.1 Test Results. Refer to applicable Data Sheets in Appendix B and Section 4.

4 Requirements and Procedure

4.1 Argentina Article 30/N 2, 3 IRAN CETIA 13J7 1981 (779/95) Speedometer and Odometer.

Note: The "relevant IRAM Standards" in the following text do not exist as of the time of this publication.

4.1.1 Odometer.

4.1.1.1 Totalizer Odometer (compulsory). Instrument intended for automatic and cumulative indication and recording of distances covered by the vehicle from its startup, allowing direct reading of the total distance and that can be set back to zero (0) automatically (but not manually), after totaling the amount of indicated kilometers. Compliant with the following characteristics:

1. It shall have a minimum cumulative capacity of one hundred thousand kilometers (100 000 km) setting back to zero (0) automatically and instantaneously, after totaling such figure, and then accumulating kilometers again.
2. The maximum error margin admissible in calculating distances indicated and recorded, in relation to actual distances covered by the vehicle, shall be as set forth in the relevant IRAM Standard.

4.1.1.2 Partial Odometer (optional). It is a mechanism similar to the precedent one, but it is intended for recording of partial distances covered by the vehicle, which that can be set back to zero (0) at any time using a device to such effect. Compliant with the following characteristics:

1. It shall have a minimum cumulative capacity of one thousand kilometers (1000 km).
2. It shall have a manual control to set it back to zero (0) at any time.
3. If the number of kilometers set forth in 1 are accumulated, it shall be able to set back to zero (0) automatically and instantaneously, then accumulating kilometers again.
4. The maximum admissible error of distances indicated and recorded in relation to actual distances covered by the vehicle shall be as set forth in the relevant IRAM standard. Test methods shall be as set forth in the relevant IRAM standard.

4.1.2 Speedometer. Shall indicate the instantaneous vehicle speed measured in kilometers per hour (km/h) with the following characteristics:

1. The instantaneous speed shall be shown using a scale graded in kilometers per hour (km/h) whereupon an index, a light signal or a number representing speed shall move, in all cases in compliance with the relevant IRAM standards.
2. The maximum speed of the scale shall be higher than the maximum actual speed that the vehicle can reach.

4.2 Australia Design Rule 18/03 2006 Instrumentation. Per United Nations (UN) UN R 39 however the primary display of the speedometer has to be in metric units. Indicated speed accuracy shall be between 0 km/h and +3 km/h from actual speed.

Note: Due to error budget considerations, General Motors will use European New Car Assessment Program (Euro NCAP) Speedometer Accuracy. See 4.25.5.

4.3 Belarus TR CU 018/2011 Technical Regulation "On the Safety of Wheeled Vehicles". Per UN R 39.

4.4 Brazil Inmetro Directive 83/99 Tachograph.

4.4.1 Inaccuracy. The following maximum permissible inaccuracies are established and the corresponding terms fixed for assistance, regarding the chronotachographs in operation and those, which are submitted to the first checking, previously installed in the vehicle, as well as in the periodical checking:

1. $\pm 4\%$ of the actual distance, the latter being at least equal to 1 km.
2. $\pm 6\%$ or ± 6 km/h, whichever the greater of the two values, for actual speed.

4.5 Canada Provincial.

Note: Speedometers and odometers must use the international system of units.

4.5.1 Province of Quebec C-24.2, r. 32 Regulation Respecting Safety Standards for Road Vehicles. The speedometer and odometer shall provide accurate readings with a margin of error of less than 10%.

4.5.2 Province of Newfoundland/Labrador 1007/96 Consolidated Newfoundland and Labrador Regulations. States as follows:

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1. A motor vehicle other than a traction engine shall be fitted with an efficient speedometer so constructed and in a position that indicates to the driver of the vehicle, within a margin of accuracy of plus or minus 10%, the speed at which the motor vehicle is being driven.
2. A speedometer provided in compliance with this section shall at all times be kept from an obstruction which might prevent it from being easily read by the driver of the vehicle.
3. Every odometer fitted to a motor vehicle shall be maintained in good working order.
4. The minister may, by permit, allow a foreign vehicle that has been previously registered outside the province and does not comply with this section to be operated on a highway where, in the minister's opinion, modification to the vehicle is not practical.

4.6 Chile 18.290 Amended by Article 75 of 20068 Mandatory Safety Equipment. Vehicles must have a speedometer.

4.7 China GB 15082-2008 Speedometers for Motor Vehicles and GB 7258-2012 Safety Specifications for Power-Driven Vehicles Operating on Roads.

4.7.1 Display Visibility. The display of the speedometer must be located within the direct field of view of the driver and must be clearly legible both day and night.

4.7.1.1 The range of speeds displayed must be sufficiently wide to include the maximum speed of this type of vehicle as stated by the manufacturer.

4.7.1.2 The speed unit for speed meters shall be km/h. The graduation shall be 1 km/h, 2 km/h, 5 km/h or 10 km/h, when the numerical values of the speed is between 20 km/h to the upper speed limit, the numerical values of the speed shall be indicated on the display as follows:

- When the highest value on the display does not exceed 200 km/h, speed values shall be indicated at intervals not exceeding 20 km/h;
- When the maximum value on the display exceeds 200 km/h, then the speed values shall be indicated at intervals not exceeding 30 km/h.

Note: The indicated speed value intervals need not be uniform.

4.7.2 Display Tolerance. The speed indicated shall not be less than the true speed of the vehicle. At the test speeds specified in 4.7.3.5, there shall be the following relationship between the speed displayed (V_1) and the true speed (V_2):

$$0 \leq V_1 - V_2 \leq \frac{V_2}{10} + 4 \text{ km/h}$$

4.7.3 Test Specification.

4.7.3.1 The reference temperature at the speedometer shall be 23 °C + 5 °C

4.7.3.2 Tolerance of test instrumentation used for speed measurement should be within +1.0%.

4.7.3.3 The vehicle shall be tested in accordance with the following requirements:

- The test shall be carried out with the vehicle at its curb mass.
- The pressure of the tires shall be the normal running pressure, namely the cold inflation pressure specified by the vehicle manufacturer increased by 0.2 MPa.

4.7.3.4 Other test conditions should comply with GB/T 12534, the surface of a test track when used shall be flat and dry, and provide sufficient adhesion.

4.7.3.5 The speed meter should be tested at speeds of 40 km/h, 80 km/h and 120 km/h. In case of maximum design speed of the vehicle ≤ 150 km/h, take 80% of maximum design speed of the vehicle specified by the manufacturer.

4.8 Customs Union of Belarus, Kazakhstan, Russia TR CU 018/2011 Attachment 2 Item 31 Speedometers.

Note: Similar to the UN, there is a regulatory body called the Customs Union (CU) of Russia, Belarus and Kazakhstan

Per UN R 39.

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4.9 Egypt General Information General Certification.

Note: GM Egypt was informed by government representatives that all vehicles assembled in or imported to Egypt will need to comply with UN Economic Commission of Europe (ECE) regulations as of July 2010. There was no specific Egypt regulations identified:

Speedometer equipment and its installation per UN R 39.

4.10 Gulf Cooperation Council GSO 42 2014 Motor Vehicles General Requirements.

4.10.1 Speedometer.

4.10.1.1 Every motor vehicle shall be equipped with a speedometer located in the driver's direct field of vision and is clearly legible by night and by day.

4.10.1.2 The speed indicated by the speedometer fitted to the vehicle shall not be less than the true speed of the vehicle.

4.10.1.3 The speedometer shall be graduated in kilometers per hour.

4.10.1.4 The range of speeds shown on the speedometer shall include the maximum speed indicated by the manufacturer and the actual running speed of the vehicle.

4.10.1.5 Graduation shall be of 1 km/h, 2 km/h, 5 km/h or 10 km/h.

4.10.1.6 The numerical values shall be spaced at intervals not exceeding 20 km/h intervals when the highest value on the dial does not exceed 200 km/h and at intervals not exceeding 30 km/h when the highest value on the dial exceeds 200 km/h.

4.10.2 Odometer.

4.10.2.1 The odometer should be located in front of the driver's direct field of vision and to be clearly legible.

4.10.2.2 Every motor vehicle shall be equipped with an odometer in a suitable place in the dashboard.

4.10.2.3 Every mechanical type odometer shall be capable of indicating up to and including 999 999 kilometers in one kilometer units. Every electronic odometer shall be capable of indicating distance up to and including 600 000 kilometers in one kilometer units.

4.10.2.4 The odometer shall be of tamper proof and difficult to modify by design.

4.11 India IS-11827:2008 Amend 1 Calibration of Speedometer - Method of Evaluation.

4.11.1 Display Requirements. The display of the speedometer shall be located within the direct field of view of the driver and shall be clearly legible by both day and night.

4.11.1.1 The range of speeds displayed shall be sufficiently wide to include the maximum design speed of the vehicle as stated by the manufacturer.

4.11.1.2 In the case of speedometer intended for vehicles of categories L₁, the marked numerical values shall not exceed 80 km/h.

4.11.1.3 Graduations. The graduation shall be 1 km/h, 2 km/h, 5 km/h or 10 km/h. Within two adjacent marked numerical values, other than those between the first (zero) and second marked numerical values, the graduations shall be of uniform speed.

4.11.1.3.1 The marked numerical values shall be in Arabic numerals.

4.11.1.3.2 The interval between marked numerical values of the speed shall be as follows:

- a. In the case of L₁ category of vehicles, not exceeding 10 km/h.
- b. In the case of other vehicles:
 1. When the range of display does not exceed 200 km/h, not exceeding 20 km/h.
 2. When the range of display exceeds 200 km/h, not exceeding 30 km/h.

4.11.1.3.3 The intervals between marked numerical values need not be uniform.

4.11.1.3.4 Additional Requirements for Digital Display Instruments.

4.11.1.3.4.1 The sampling or update rate shall be such that the indicated speed is legible at all times and does not become illegible due to flickering or rapid change of values.

4.11.1.3.4.2 The interval of display shall be considered to be same as the minimum resolution, which shall preferably be 1 km/h. The ability to indicate increments of speed 1 km/h, in the case of speedometers with digital display shall satisfy the requirement of 4.11.1.

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4.11.2 Speedometer Accuracy Requirements. When tested as per 4.11.3, the following conditions shall be satisfied, at test speeds specified in 4.11.3.4. See 6.1 Glossary for a description of vehicle categories.

4.11.2.1 The indicated speed shall not be less than the true speed of the vehicle.

4.11.2.2 The relationship between the speed displayed and the true speed shall be:

$$0 \leq (V_1 - V_2) \leq (0.1 \times V_2) + 4 \text{ km/h}$$

$$0 \leq (V_1 - V_2) \leq (0.1 \times V_2) + 6 \text{ km/h}$$

(M and N vehicles)

$$0 \leq (V_1 - V_2) \leq (0.1 \times V_2) + 8 \text{ km/h}$$

(L vehicles except L₁)

$$0 \leq (V_1 - V_2) \leq (0.1 \times V_2) + 4 \text{ km/h}$$

(L₁ vehicles)

Where:

V_1 = speed indicated on the display of the speedometer

V_2 = true speed

4.11.3 Test Procedures.

4.11.3.1 Preparations of Test Vehicle.

4.11.3.1.1 The vehicle shall be run in as per practice recommended by the vehicle manufacturer.

4.11.3.1.2 Before the test the vehicle including all its parts, component and systems shall have reached a stable temperature normal to vehicle operation.

4.11.3.1.3 The test shall be carried out with the vehicle at curb weight plus a maximum of 75 kg for the driver and any necessary test equipment or instrumentation.

4.11.3.1.4 In case of a drive away chassis, the test shall be conducted as per declaration of vehicle manufacturer for recommended curb weight and with a maximum of 75 kg for the driver and any necessary test equipment or instrumentation. In absence of this data, drive away chassis may be loaded applying the cab/body weight allowance as per Table 1.

Table 1: Allowance of Weight

Item	Gross Vehicle Weight (GVW) Range (kg)	Allowance in Weight	
		Load Body Weight (kg)	Cab Body Weight (kg)
1	Up to 3000	120	400
2	Above 3000 but below 4000	200	400
3	Above 4000 but below 6000	400	400
4	Above 6000 but below 10 000	700	400
5	Above 10 000	1000	400

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4.11.3.1.5 The tires shall be one of the types normally fitted on the vehicle. The tires shall be run in at the same time as the vehicle and have operated at least 500 km or distance recommended for running in of the vehicle, whichever is lower, on road prior to test.

Note: Snow tires shall not be regarded as tires normally fitted.

4.11.3.1.6 Tires shall be inflated to the cold inflation pressure declared by manufacturer increased by 20 kPa.

Note: At the option of manufacturer, increasing the tire pressure by 20 kPa need not be carried out.

4.11.3.1.7 A test shall be carried out for each type of speedometer intended to be fitted by the manufacturer.

4.11.3.2 Instrumentation. The instrumentation and a method used for establishing the true speed shall have accuracy within $\pm 0.5\%$. Fitment and operation of all instruments shall be such as not to hamper the visibility or freedom of the driver/rider to have proper control of the vehicle at all times.

4.11.3.3 Test Track. The test may be carried out on a test track/roadway or on a roller dynamometer. If tested on a test track/roadway, the surface shall be flat and dry, and provide sufficient adhesion. The test track/roadway shall be capable of allowing the maximum test speed to be achieved and maintained over a straight measuring strip of length specified in 4.11.3.5. If a roller dynamometer is used for the test, the diameter of the roller shall be at least 0.4 m.

4.11.3.4 Test Speeds. The vehicle shall be tested at the speeds indicated in Table 2.

Table 2: Test Speeds

Item	V_{maximum} ^{Note 1} (km/h)	Test Speed (V_1) (km/h)
1	$V_{\text{maximum}} \leq 45$	80% of V_{maximum} ^{Note 2}
2	$45 \leq V_{\text{maximum}} \leq 100$	40 km/h and 80% of V_{maximum} ^{Note 2} if the resulting speed is ≥ 55 km/h
3	$100 \leq V_{\text{maximum}} \leq 150$	40 km/h, 80 km/h and 80% of V_{maximum} ^{Note 2} if the resulting speed is ≥ 100 km/h
4	$150 \leq V_{\text{maximum}}$	40 km/h, 80 km/h and 120 km/h

Note 1: V_{maximum} = maximum design speed of the vehicle specified by the vehicle manufacturer, in km/h.

Note 2: The speed calculated shall be rounded off to the newest 10 km/h for carrying out a test.

4.11.3.5 Test. The vehicle shall be driven at the applicable constant speed(s) specified in 4.11.3.4 as indicated by the speedometer and the time required for traversing a distance shall be measured.

Note: The distance shall be determined to provide the accuracy as specified in 4.11.2.2 and shall not be less than 200 m in any case.

The test shall be repeated three (3) times. The true speed shall be calculated as follows:

$$\text{True Speed (km/h)} = \frac{\text{Sum of the distance(s) traveled in three passes (m)}}{\text{Sum of the time taken for three passes (s)}} \times 3.6$$

4.12 Indonesia PP.55 2012 General Technical Requirement.

4.12.1 Speedometer and Odometer Type and Placement. The speedometer shall be in the form of a mechanical speed indicator and/or electronic speed indicator. The speedometer shall be equipped with a distance indicator and is placed to be easily seen by the driver.

4.12.2 Speedometer Test Requirements. See Table 3.

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Table 3: Indonesia Speedometer Rating Scores

Type of Testing	The Limit	Score	Comment of Score
Speedometer Test	Minimum Speed - 10%		
	< -10%	0	Failed
	-8% to -10%	1	Fair
	-6% to -7.99%	2	Good
	-4% to -5.99%	3	Very Good
	-1% to -3.99%	4	Satisfactory
	< -1%	5	Very Satisfactory
	Maximum Speed + 15%		
	< 15%	0	Failed
	12% to 15%	1	Fair
	9% to 11.99%	2	Good
	6% to 8.99%	3	Very Good
	3% to 5.99%	4	Satisfactory
	< 3%	5	Very Satisfactory

4.13 Israel 75/443/EEC or UN R 39 Metric Speedometer. Vehicle must be equipped with a metric predominant speedometer/odometer.

4.14 Japan Article 46 Attachment 88 TRIAS 46 - J088R039 2012 Speedometer.

4.14.1 Speedometer Visibility and Implementation. The motor vehicle (except motor vehicles with a maximum speed of less than 20 km/h and trailers) shall have a speedometer at a position easily seen by the driver so that the driver may easily confirm the speed while the motor vehicle is moving and the speed given has no significant error during running on even and paved road. However, for large-sized special motor vehicles and small-sized special motor vehicles for agricultural use with a maximum speed of less than 35 km/h, the speedometer may be replaced by an engine tachometer.

4.14.2 Odometer Implementation. The motor vehicle (except mini-sized motor vehicles with caterpillar tracks and sleds, motor vehicles with a maximum speed of less than 20 km/h and trailers) shall be provided with an odometer. However, large-sized special motor vehicles and small-sized special motor vehicles for agricultural use with a maximum speed of less than 35 km/h, the odometer may be replaced by an engine hour meter.

4.14.3 Speedometer Accuracy. Accuracy is calculated using Table 4.

Table 4: Japan Speedometer Accuracy

Measure Speed km/h (V ₁)	True Speed km/h (V ₂)	Measured Deviation km/h (V ₁ - V ₂)	Permissible Deviation km/h 0.1 (V ₂) + 4	Pass/Fail
40				
80				
120				
80% of V _{maximum}				

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