Road vehicles - Tyre Pressure Monitoring Systems - Vehicle test procedures

1 Scope

This standard specifies the onboard test method for the tyre pressure monitoring systems (hereinafter abbreviated as TPMS) for tyres mounted on vehicles.

The vehicles with the TPMS to which this standard applies do not include vehicles having dual tyres for one wheel but include passenger vehicles, SUVs, trucks, and buses with a gross vehicle mass of 4536 kg or less.

2 Normative reference

The following standards contain which, thorough reference in this Standard, constitute provisions of this Standard. The most recent editions of the standard indicated below shall be applied.

JASO Z201 General Rules for Glossary of Terms Relating to Automobiles

JIS D0101 Glossary of terms relating to kinds of automobiles

JIS D0102 Road vehicles -- Dimensions, masses, weights and performances -- Vocabulary

JIS D0103 Automobile parts -- Devices and parts of electric equipment -- Nomenclature

3 Definitions

Definitions of main terms used in this standard shall be based on **JIS D0101**, **JIS D0102**, **JIS D0103** and as follows.

3.1 TPMS

The system that warns the driver against significant reduction in tyre pressure and resulting problems related to driver's safety.

3.2 Lightly Loaded Vehicle Weight (LLVW)

The vehicle weight including 180 kg of a test driver and measuring equipment.

3.3 Gross Vehicle Weight Rating (GVWR)

The maximum loaded vehicle weight specified by manufacturers.

4 Test condition

4.1 Equipment

The following equipment and apparatuses shall be used for the test.

a) Air chuck with a tyre pressure gauge

Shall be a portable air chuck with a tyre pressure gauge whose operating pressure is 0 to 700 kPa, pressure accuracy is ±0.5 % and minimum scale is 1 kPa.

b) Air compressor

Shall be a portable, rechargeable air compressor to inflate tyres of passenger vehicles or small-size trucks.

c) Portable sunshade for tyres

d) Portable lighting devices for tests at night

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e) Ballast (weight) to simulate passengers and luggage

f) Outside temperature gauge

Shall be a temperature gauge with a minimum scale of 1 degree for measurement of ambient temperature from 0 to 55 °C within accuracy of ±0.1 % and 0.7 °C).

g) Data collection system

Shall be a data collection system measuring, calculating and consecutively recording the speed and time for the TPMS-equipped vehicle that runs on the test road at 113 km/h or less for at least 90 minutes. The system shall also have the following accuracy and resolution.

Table 1 Accuracy and resolution

Item	Accuracy	Resolution
Speed	0.1 km/h (full scale)	0.01 km/h
Time	0.01 s	0.001 s

h) Temperature gauge for tyre side surface and road surface

Shall have a minimum scale of 0.2 °C for measuring tyre side surface and road surface temperatures from 0 to 400 °C. The accuracy of the gauge shall be within ±1 % or within ±1 °C, whichever is higher, for temperatures of 25 °C or more, and within ±2 °C for temperatures from -18 to 24 °C.

i) Weight measuring equipment

Shall be capable of measuring wheels of 0 to 4000 kg (0 to 1000 kg per pad multiplied by 4), shafts, and vehicle load. The accuracy shall be up to ±1 % of the measured value, and the minimum scale shall be 0.5 kg.

4.2 Ambient temperature

Shall be within 0 to 40 °C.

4.3 Road surface

Shall be dry and smooth.

4.4 Location

Shall not be a place interrupted by radio such as strong electric field.

4.5 Vehicle condition

4.5.1 Vehicle weight

Shall be LLVW (+50, -0 kg) and/or GVWR (+0, -50 kg) within a limit of GVWR or vehicle permissible weight.

4.5.2 Vehicle speed

The onboard TPMS shall be calibrated and tested at a vehicle speed of 40 to 100 km/h. If the vehicle is equipped with a cruise control system, the system shall not be actuated during the test.

4.5.3 Location of wheels

Shall be any location in line with the instruction or limitation specified in the owners' manual.

4.5.4 Parking location

The tyres shall not be exposed to direct sunlight during parking.

4.5.5 Brake pedal

The running time shall not count during normal braking.

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4.5.6 Tyres

Shall not be a spare tyre (if equipped) but tyres mounted on the vehicle when it is first sold. However, the spare tyre may be used for the TPMS failure detection test.

5 Test procedure

5.1 Tyre pressure setting

The tyres shall be inflated up to the cold tyre pressure recommended by vehicle manufacturers that is specified on the owners' manual or tyre pressure label.

5.2 Inspection of lamp function

The lamp function shall be inspected by setting the ignition lock system to "ON" ("RUN") after the vehicle is parked and the system is set to "LOCK" or "OFF". The ignition lock system may be set to a different position if it is appropriate for lamp inspection. The lamp function of the TPMS regarding alarm indicator for low tyre pressure shall be inspected. If the vehicle is equipped with an independent TPMS failure detection indicator, the lamp function of the TPMS for this indicator shall also be inspected.

5.3 Setting and re-setting of TPMS

If necessary, the TPMS shall be set or reset according to the instruction in the owners' manual.

5.4 System calibration

Calibration of the system at a learning stage shall be conducted as follows.

a) Accelerate the vehicle gradually from a parked state to 70±30 km/h. Run the vehicle within this speed totally for 10 to 15 minutes. Time during which the speed exceeds the limit or the brake pedal is pressed shall not be included in the cumulative running time. Start calibration when the speed exceeds 40 km/h, and continue while the speed is kept within the specified range. Continue calibration even when the speed falls out of the specified range, but the running time under such exceeding conditions shall not be included in the required total test time (10 to 15 minutes). Record the cumulative running time.

b) Turn the vehicle and run in the reverse direction for 5 to 10 minutes while satisfying the conditions specified in **5.4 a)**. Run the vehicle until the cumulative running time as per **5.4 a)** and **b)** is 20 minutes (may be an accumulation of interrupted running times).

c) Park the vehicle, turn off the engine, and set the ignition position back to "OFF" or "LOCK". Immediately, measure the tyre pressure, sidewall temperature, and road surface temperature and record them.

d) Remove air from one to four tyres in any combinations to obtain the pressure 7 kPa lower than that at which the TPMS should illuminate the low tyre pressure warning indicator. One minute later, check the tyre pressure of the deflated tyre again and adjust it if necessary.

5.5 Low tyre pressure detection test

The low tyre pressure detection test shall be conducted as follows.

a) Within 5 minutes after removing air from the tyre(s), run the vehicle under the conditions as per **5.4 a)** until the cumulative running time reaches 10 to 15 minutes on any section of the test course.

Note:

Ten to 15 minutes may be an accumulation of interrupted running times.

b) Turn the vehicle and run in the reverse direction until the cumulative running time including that in **5.5 a)** reaches 20 minutes (may be an accumulation of interrupted running times).

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c) Run the vehicle until the cumulative running time in **5.5 a)** and **b)** is 20 minutes or the low tyre pressure warning indicator is illuminated, whichever is shorter.

d) If the vehicle has an indicator that identifies a specific tyre having a low pressure, check if the pressure of the indicated tyre is roughly as low as that set in **5.4 d)**.

e) If the low tyre pressure warning indicator is not illuminated, terminate the test. If it is illuminated during the steps in **5.5**, turn off the system by turning the ignition lock system to "OFF" or "LOCK". Five minutes later, actuate the system by setting the ignition lock system to "ON" ("RUN"). The indicator shall be illuminated, and it shall be kept illuminated while the ignition lock system is set to "ON" ("RUN").

f) Turn off the system by setting the ignition lock system to "OFF" or "LOCK". Let the vehicle cooled for approximately 1 hour or until air pressures in all the tyres (except the deflated tyre(s) in **5.4 d)**) fall within 7 kPa below the pressure set in **5.1**, whichever is shorter. Record the cool down time. Measure the tyre sidewall temperature and road surface temperature, and record them.

g) Re-start the engine and check if the indicator is illuminated again and also if it keeps illuminated.

h) Inflate all the tyres up to the pressure set in **5.1**. One minute later, check the pressure again and record the pressure.

If the TPMS system has a manual reset function, reset the system according to the instruction in the owners' manual. Check if the indicator is turned off. If necessary, run the vehicle at 70±30 km/h until the indicator is turned off, and record the time until then. Count the time only after the vehicle speed exceeds 40 km/h.

i) In the case of the **FMVSS 138** compliance test, remove air from one to 4 tyres in any combinations and conduct the test again from **5.1** through **5.5 h)**.

5.6 Failure detection test

The failure detection test shall be conducted as follows.

a) From the state where the vehicle is parked and the engine is turned off with the ignition lock system set to "LOCK" or "OFF", set it to "ON" ("RUN") to check the failure detection indicator function. If there is a manufacturer's instruction that the system should be set midway between "ON" ("RUN") and "START", do so and check the indicator function. Then set the ignition position to "LOCK" or "OFF".

b) To simulate the condition of TPMS with one failure, turn off power to TPMS components. Alternatively, shut off electrical connection between the TPMS components. However, do not turn off power to the failure detection indicator. To simulate the condition where one sensor does not work, tyres incompatible with the TPMS may be mounted on the vehicle. If the independent TPMS failure detection indicator or integrated tyre low pressure and failure detection indicator is illuminated, proceed to **5.6 e)**.

c) From the state where the vehicle is parked, the engine is turned on, and the gear is set, accelerate the vehicle smoothly to 70±30 km/h. Run the vehicle within this speed totally for an cumulative time of 10 to 15 minutes, or until the failure detection indicator is illuminated as per **5.6 e)**, whichever is shorter. Time during which the speed exceeds the limit or the brake pedal is pressed shall not count. Count the time after the speed exceeds 40 km/h, and run the vehicle within the speed limit as much as possible. Continue the test even when the speed falls out of the specified range, but the running time under such exceeding conditions shall not be included in the required total test time. Record the cumulative running time.

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