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Performance Requirements and Test Methods of Tire Pressure Monitoring System for Passenger Cars

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Foreword

Articles 4, 5, 6, 7 and 8 of this Standard are compulsory; and the rest are voluntary.

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB/T 26149-2010, *TPM Sensor Module Based Tire Pressure Monitoring Systems for Motor Vehicles*. Compared with GB/T 26149-2010, major changes of this Standard are as follows:

-- the nature of the standard is changed from the former voluntary national standard into the compulsory national standard;

-- the application scope is changed (GB/T 26149-2010 applies to the TPM module based tire pressure monitoring systems for vehicles and this Standard applies to vehicles of category M1);

-- the classification of tire pressure monitoring systems is added;

-- the functions and performance requirements are changed (GB/T 26149-2010 specifies the functions and of the TPM based tire pressure monitoring system and the performance requirements of relevant functions);

-- the test methods are modified corresponding to the changes of functions and performance requirements;

-- the requirements for the pressure monitoring system of the mandatory installation tires of vehicles of category M1.

This Standard was proposed by the Ministry of Industry and Information Technology of the People's Republic of China.

This Standard shall be under the jurisdiction of the National Technical Committee of Auto Standardization (SAC/TC 114).

The drafting organizations of this Standard: China Automotive Technology and Research Centre, Great Wall Motor Co., Ltd., Chery Motor Co., Ltd., SAIC-Volkswagen Motor Co., Ltd., Guangzhou Automobile Group Co., Ltd. Automotive Engineering Institute, Pan Asia Technical Automotive Center Co., Ltd., Dongfeng Motor Corporation Technology Centre, SAIC-GM-Wuling Automotive Co., Ltd., Shanghai Baolong Automotive Corporation, Suzhou Sate Auto Electronic Co., Ltd., Beijing Sincode Science and Technology Co., Ltd., Steelmate Co., Ltd., Shanghai Hangsheng Industry Co., Ltd., Hamaton Automotive Technology Co., Ltd., Shanghai Topsystem Electronic Technology Co., Ltd., Shanghai Aero-care Technology Co., Ltd., Beijing Research and Design Institute of Rubber Industry, Triangle Tire Co., Ltd., MESNAC Co., Ltd.

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Performance Requirements and Test Methods of Tire Pressure Monitoring System for Passenger Cars

1 Application Scope

This Standard specifies the performance requirements and test methods of tire pressure monitoring system of passenger cars.

This Standard applies to the vehicles of category M_1.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition dated applies to this document. For undated references, the latest edition of the referenced documents (including all amendments) applies to This Standard.

GB/T 12534, *Motor Vehicles - General Rules of Road Test Method*

ECE R10, *Uniform Provisions Concerning the Approval of Vehicles with Regard to Electromagnetic Compatibility*

3 Terms and Definitions

For the purposes of this Standard, the following terms and definitions apply.

3.1

tire pressure monitoring system; TPMS

A system which is installed on the vehicle, monitors the tire pressure in some way and gives an alarm in case of any under-inflation of one or several tires.

3.2

recommended cold tire pressure; P_{rec}

The tire pressure value at the environmental temperature which is recommended by the vehicle manufacturer for the tires in different positions in accordance with the intended working conditions (such as load and vehicle speed), and causes no pressure accumulation because of use.

NOTE P_{rec} is generally indicated in the places including user's manual or cab door (B pillar), fuel tank cap, trunk and so on.

3.3

under inflation

The tire pressure which is less than or equal to 75% of the recommended tire pressure (P_{rec}) of the vehicle.

3.4

common space

The functional area which displays two or more kinds of information (such as signs) in a nonsynchronous way.

4 Classification

If the vehicle is equipped with one of the following two categories of TPMS, then it is deemed that the vehicle is equipped with the tire pressure monitoring system as defined by this Standard:

-- the TPMS of category I: meeting all the relevant functional and performance requirements except 5.2.3, 5.3.2 and 5.4.2;

-- the TPMS of category II: meeting all the relevant functional and performance requirements except 5.2.2, 5.3.1 and 5.4.1.

5 Functional and Performance Requirements

5.1 Electromagnetic compatibility

The TPMS installed on the vehicle shall meet all the electrical/electronic requirements of ECE R10.

5.2 Signalling devices

5.2.1 The signs of tire pressure abnormality and failure alarm signalling devices shall meet one of following criteria:

a) the sign as shown in Figure 1.

b) the sign as shown in Figure 2 or the sign in Figure 2 which is modified to be close to the real appearance of a real vehicle, indicating the tire(s) of under inflation.

5.4.1.3 After the test of 7.3.1 f), the tire pressure abnormality alarm signalling device of the TPMS shall be lighted off.

5.4.2 TPMS of category II

5.4.2.1 When the under-inflation alarm test for multiple tires is conducted as specified in a) ~ c) in 7.3.2, the TPMS of category II shall light on the tire pressure abnormality alarm signalling device within 15 min; and the TPMS of category II equipped with the alarm signalling device as specified in 5.2.1 b), shall also indicate the specific positions of the under-inflated tires.

5.4.2.2 After the test of 7.3.2 d), the tire pressure abnormality alarm signalling device of the TPMS shall not be lighted off.

5.4.2.3 After the test of 7.3.2 e), the tire pressure abnormality alarm signalling device of the TPMS shall be lighted off.

5.5 Failure alarm

5.5.1 Conduct failure alarm test as specified in a) ~ c) of 7.4, the TPMS shall light on the failure alarm signalling device within 10 min.

5.5.2 After the test of 7.4 d), the tire pressure abnormality alarm signalling device of the TPMS shall not be lighted off.

5.5.3 After the test of 7.4 e), the tire pressure abnormality alarm signalling device of the TPMS shall be lighted off.

6 Test Conditions

6.1 Pavement and environment

During the test, the pavement and environment shall be as specified in GB/T 12534.

6.2 Instruments

The maximum tolerance for the pressure measurement device in the test shall be ± 3 kPa; all air pressure measurement data in the test shall be measured using one pressure measurement device.

6.3 Vehicles

6.3.1 Load

The vehicles shall be tested under the loading state corresponding to the tire pressure P_{rec} of any vehicle recommended by the manufacturer; its axle load shall be as specified by the vehicle manufacturer; and the load shall not be changed at will, during the whole test process.

7.2.1 Vehicles equipped with TPMS of category I

For the vehicle equipped with the TPMS of category I, conduct the under-inflation alarm test for a single tire in the following procedures:

a) after parking the vehicle at least for 1 h, inflate all tires to the vehicle's recommended tire pressure P_{rec} corresponding to the test load.

b) if needed, set or reset the TPMS in accordance with the operating method recommended by the vehicle manufacturer.

c) when the vehicle is parked, turn the ignition switch of the vehicle to "OFF" (or "LOCK"); adjust any tire's air pressure to (75% × P_{rec} - 7) kPa within 5 min. Record the time FROM turning the vehicle's ignition switch to "ON" (or "RUN") TO lighting on the under-inflation alarm signalling device. If the time exceeds that specified in 5.3.1.1, then it is deemed that it does not meet the requirement for under-inflation alarm for a single tire; the test shall be terminated.

d) start the vehicle, accumulatively drive for 10 min in a direction along the test route at the speed specified in 6.3.2.1; then accumulatively drive for 10 min in the opposite direction along the route. Then, drive the vehicle along any part of the test route; adjust the air pressure of any tire of the vehicle to (75% × P_{rec} - 7) kPa within 5 min. Record the vehicle's driving time FROM the tire pressure achieving (75% × P_{rec} - 7) kPa TO the tire pressure abnormality alarm signalling device of the TPMS being lighted on. If the time or the alarm for the indication of under-inflated tire's position is not as specified in 5.3.1.1, then it is deemed that it does not meet the requirement for under-inflation alarm for a single tire; the test shall be terminated.

e) if the tire pressure abnormality alarm signalling device of the TPMS is lighted on in the tests of c) and d) above as specified in 5.3.1.1, then stop the vehicle; turn the ignition switch to "OFF" (or "LOCK"). After 5 min, turn the ignition switch to "ON" (or "RUN"); observe whether the signalling device is lighted on.

f) after the vehicle is parked for at least 1 h, inflate all tires to the vehicle's recommended pressure P_{rec} corresponding to the test load. Reset the TPMS in accordance with the operating instructions provided by the vehicle manufacturer; the tire pressure abnormality alarm signalling device shall be lighted off. If necessary, drive the vehicle for not more than 10 min along any part of the test route at the speed specified in 6.3.2.1; observe whether the signalling device is lighted on.

7.2.2 Vehicles equipped with TPMS of category II

For the vehicle equipped with the TPMS of category II, conduct the under-inflation alarm test for a single tire in the following procedures:

a) after parking the vehicle for at least 1 h, inflate all tires to the vehicle's

d) if the tire pressure abnormality alarm signalling device of the TPMS is lighted on in the test of c) above as specified in 5.4.2.1, then stop the vehicle; turn the ignition switch to “OFF” (or “LOCK”). After 5 min, turn the ignition switch to “ON” (or “RUN”); observe whether the signalling device is lighted on.

e) after the vehicle is parked for at least 1 h, inflate all tires to the vehicle’s recommended pressure P_{rec} corresponding to the test load. Reset the TPMS in accordance with the operating instructions provided by the vehicle manufacturer; the tire pressure abnormality alarm signalling device shall be lighted off. If necessary, drive the vehicle for not more than 10 min along any part of the test route at the speed specified in 6.3.2.2; observe whether the signalling device is lighted on.

7.4 Failure alarm test

Conduct failure alarm test for the vehicle equipped with the TPMS in the following procedures; choose any type of simulated failures during the test; however, only one failure shall be simulated in each failure alarm test:

a) after parking the vehicle for at least 1 h, inflate all tires to the vehicle’s recommended tire pressure P_{rec} corresponding to the test load.

b) simulate the failure of the TPMS (including but not limited to: disconnection of the power supply of any component of the TPMS, disconnection of the electrical connection between components of the TPMS, or installation of tires not compatible with the TPMS on the vehicle). During the simulation of the failure of the TPMS, the electrical connection of the failure alarm signalling device shall not be disconnected.

c) start the vehicle; if the failure alarm signalling device is not lighted on, then drive the vehicle along any part of the test route at the speed specified in 6.3.2, until the failure alarm signalling device of the TPMS is lighted on; record the vehicle’s driving time. If the driving time exceeds that specified in 5.5.1, then it is deemed that it does not meet the requirement for failure alarm; the test shall be terminated.

d) if the failure alarm signalling device of the TPMS is lighted on in the test of c) above as specified in 5.5.1, then stop the vehicle; turn the ignition switch to “OFF” (or “LOCK”). After 5 min, turn the ignition switch to “ON” (or “RUN”); observe whether the signalling device is lighted on.

e) recover the TPMS to the normal working state; observe whether the signalling device is lighted on. If necessary, drive the vehicle for not more than 10 min along any part of the test route at the speed specified in 6.3.2; observe whether the signalling device is lighted on.

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