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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 12542-2020

Replacing GB/T 12542-2009

**Thermal balance capacity on-road test method for motor
vehicles**

汽车热平衡能力道路试验方法

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Foreword

This Standard was drafted as per the rules specified in GB/T 1.1-2009. This Standard replaced GB/T 12542-2009 Thermal Balance Capacity on-Road Test Method for Motor Vehicles. Compared with GB/T 12542-2009, this Standard has the major technical changes as follows besides the editorial modifications:

- Add the provisions for indoor tests, and revise the provisions for applicable vehicle models (see Clause 1 of this Edition);
- Modify the definitions of environment temperature and motor vehicle thermal balance (see 3.1, 3.3 of this Edition; 3.1, 3.4 of 2009 Edition);
- Replace the cooling constant by the temperature difference constant; replace the maximum approved temperature of the cooling medium by the temperature limit; replace the approved environment temperature for limit use and approved environment temperature for normal use by the approved environment temperature (see 3.4, 3.6, 3.7 of this Edition; 3.5, 3.6, 3.9, 3.10 of 2009 Edition);
- Add the terms and definitions of temperature difference, resistance apply device, the

maximum torque speed, rated power speed, and no obvious upward trend (see 3.2, 3.5, 3.8, 3.9,

3.10 of this Edition);

--- Delete the terms and definitions of cooling medium, thermal balance, limit use conditions, and normal use conditions (see 3.2, 3.3, 3.7,

3.8 of 2009 Edition);

--- Modify the relevant requirements for climatic conditions and measurement parameters (see 4.1,

4.3 of this Edition;

1 Scope

GB/T 12542-2020 is the Chinese national standard on thermal balance capacity on-road test method for motor vehicles, in the field of road vehicles engineering. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 29 September 2020 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 April 2021. Classification: ICS 43.020, CCS T04. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This Standard specifies the test conditions, test preparation, test methods, data processing and test reports for the thermal balance capacity on-road test method of for motor vehicles. This Standard is applicable to the thermal balance capacity on-road test of Type-M and Type-N vehicles with forced circulation liquid-cooled engines, which can be implemented by reference when testing indoors; other Type-M and Type-N vehicles can also be implemented by reference.

2 Normative References

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this document.

GB/T 3730.2 Road Vehicle - Masses - Vocabulary and Codes

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

GB/T 15089 Classification of Power-Driven Vehicles and Trailers

3 Terms and Definitions

For the purpose of this document, the terms and definitions given in GB/T 3730.2, GB/T 15089 and the following apply.

3.1 Environment temperature The temperature of the environment where the vehicle is located. NOTE: During the measurement, the sensor for measuring the environment temperature is installed on the outside of the sample vehicle in an appropriate manner, 1.5m from the ground. Avoid direct sunlight, reflections and interference from other heat sources.

3.2 Temperature difference; ΔT The difference between the temperature of each system, assembly, and parts of the automobile and the environment temperature.

3.3 Motor vehicles thermal balance The temperature difference between the temperature of each system, assembly and parts of the automobile and the environment temperature becomes stable.

3.4 Temperature difference constants; ΔT_c The temperature difference of each system, assembly and parts of the automobile during the thermal balance.

3.5 Resistance apply device The device that provides the driving resistance (such as load trailer, chassis dynamometer, etc.), which may be measured.

3.6 Temperature limits; T_{lim} The maximum approved operating temperature of each system, assembly, and parts of the automobile that is given by the automobile manufacturer.

3.7 Approved environment temperature; T_{apr} Due to the limitation of temperature limit, the highest environment temperature at which the automobile can work normally.

3.8 The maximum torque speed; n_t The speed at the maximum torque of the automobile engine; if the engine obtains the maximum torque at different speeds, it is the highest speed corresponding to the maximum torque of the engine.

3.9 Rated power speed; n_p The speed at maximum power of the automobile engine; if the engine obtains the maximum power at different speeds, it is the highest speed corresponding to the maximum power of the engine.

3.10 No obvious upward trend The temperature rise is less than 2°C within 4min, and the temperature rise rate of the latter is less than that of the former between the two adjacent time periods.

5.1.4 Fire extinguishers shall be prepared to ensure the safety of the test.

5.1.5 Before the test, the automobile shall be technically inspected and maintained in accordance with the provisions and requirements of the automobile's instruction manual

and related technical conditions; especially the thermostat, cooling fan, radiator expansion valve, etc.

5.1.6 If necessary, the engine coolant, engine lubricating oil, gearbox lubricating oil and transaxle lubricating oil shall be replaced in accordance with the model and quantity specified in the automobile's instruction manual.

6 Test Methods

6.1 Automobile preheating The automobile preheating shall be carried out according to GB/T 12534.

6.2 Air conditioning

6.2.1 The outer loop shall be selected during the test; the temperature adjustment switch is placed in the maximum cooling mode; and the air volume adjustment switch is placed in the maximum position.

6.2.2 If the air conditioner stops working (non-faulty) during the test, the test may be continued.

6.3 Test conditions

6.3.1 Engine maximum torque speed test When the automobile selects the engine speed nt, the vehicle speed is no higher than the reference speed at the highest gear (manual transmission automobile) or Gear-D (automatic transmission automobile); and drive with the throttle fully open. The resistance apply device gradually applies resistance to the automobile to stabilize the engine speed at nt.

6.7 Test termination conditions Pay attention to safety during the test, and terminate the test in the following cases:

- The temperature of a certain system, assembly, or parts exceeds its temperature limit;
- The automobile has abnormal noise, smoke, etc.;
- Other conditions that affect test safety and test results.

6.8 Judgment of the thermal balance

6.8.1 When the change of DeltaT at each measuring point for 4min does not exceed $\pm 2^{\circ}\text{C}$ and there is no obvious upward trend, it shall be considered that the automobile has reached thermal balance.

6.8.2 When at least one of the important measuring points in Table B.1 satisfies 6.8.1, and the remaining measuring points have no obvious upward trend, it shall be considered that the automobile has reached thermal balance.