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Road evaluation automotive thermal management performance - Powertrain cooling and thermal protection test method (English Translation)

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1 Scope

This standard specifies the road test method for testing the cooling and thermal protection performance of the automobile powertrain under the high temperature environment in summer.

This standard applies to all types of automobiles equipped with forced-circulation liquid-cooled internal combustion engines and non-independent air-conditioning systems. Other automobiles can be implemented by reference.

2 Normative references

The following documents are indispensable for the application of this document. For dated reference documents, only the dated version applies to this article. For undated reference documents, the latest version (including all amendments) is applicable to this document.

GB/T 3730.2-1996 Road Vehicle Quality Vocabulary and Code GB/T 12534-1990 General rules for road test methods for automobiles GB/T 12542-2009 Road test method for automobile heat balance ability GB/T 18352.6-2016 Light-duty vehicle pollutant emission limits and measurement methods QC/T 658-2009 Road test method for performance of automotive air conditioning and refrigeration systems

3 Terms and definitions

The following terms and definitions apply to this document.

Ambient temperature

The air temperature at a distance of 1.5 to 2.0 meters from the ground in the shadow of the surrounding environment when the car is driving.

Relative humidity (RH) Refers to the ratio of the absolute humidity in the air to the saturated absolute humidity at the same temperature and pressure (usually expressed as a percentage), which can be measured by temperature Moisture meter measurement.

Allowable temperature abort temperature the maximum temperature allowed for the normal operation of the system and its components.

Complete vehicle curb mass the total mass of the vehicle under a given model of powertrain and corresponding vehicle configuration.

The curb quality is based on the quality of the entire vehicle and should include at least the quality of the following elements.

- Cooling fluid (add to product definition state);
- Lubricating oil (add to product definition state);
- Cleaning fluid (including windshield cleaning fluid and headlight cleaning fluid);
- Fuel (not less than 90% of the effective volume of the fuel tank);
- Spare tires (if tires are not equipped, emergency repair tools for vehicle tires should be included);
- Vehicle-mounted tools (such as jacks, wrenches, towing hooks, etc...).

Gross vehicle mass (GVM) the full load mass of the vehicle is equal to the curb weight of

the whole vehicle + $N \times 75\text{kg}$ + the maximum load mass of the roof + the mass of optional components.

--N is the maximum number of passengers in the vehicle;

--The maximum load mass of the roof is defined as the vehicle type that uses the roof rack, and the maximum mass allowed to be loaded on the roof rack;

--The quality of optional components is for a given powertrain and level, and there may be quality differences due to the optional components, such as the optional sunroof, then
Optional quality = of roof with sunroof-quality of steel roof.

Thermal protect

The temperature of a certain part of the whole vehicle, system and component exceeds the upper limit of its allowable temperature, causing potential harm to it, accelerating the aging of parts or causing the performance of the vehicle is reduced.

4 Test equipment and materials

The equipment used for thermal performance data collection during the test includes. thermocouple, analog voltage, flow sensor, pressure sensor, fan Speed sensor, daylight intensity sensor, environmental pressure sensor, environmental humidity sensor, tachometer or speedometer, multi-channel data recording Instrument and vehicle bus tools, instrument description and accuracy should meet the requirements of Table 1. The data collection frequency should be set to 1 Hz.

Table 1 Test equipment and accuracy requirements

5.1 Performance requirements

The road test should be used to complete the powertrain cooling and air conditioning cooling test in the environmental wind tunnel, and complete the simple dynamic test on the performance road.

And complete the rectification of related problems at the current stage; or use another vehicle with the same technical status to ensure that the test vehicle is cooled, the cooling and power of the air conditioner meet the design requirements of the current stage. In order to quickly find the cause of unexpected situations during the road test and the solution to the problem.

5.2 Status check

5.2.1

Confirm that the state of the vehicle meets the design requirements of the current stage, and record the basic information of the vehicle in the vehicle information table (see Table

A.1), Including relevant information such as the vehicle, engine, gearbox, cooling system, etc.

5.2.2

If the vehicle is in a new offline state, the vehicle should be run-in in accordance with GB/T 12534, and the run-in mileage should be at least 3000 km. Special case Under, you can select a vehicle with a mileage of more than 1000 km. If the vehicle is not in the new offline state, the vehicle maintenance record needs to be checked, and the last time the vehicle is maintained If the mileage after maintenance exceeds 5000 km, the coolant, engine oil, gearbox oil, other parts and oil should be replaced.

Follow the regulations in the vehicle instruction manual.

5.2.3

The vehicle should be equipped with a front license plate or a cover plate equal in size to the front license plate.

5.2.4

The cold inflation pressure of vehicle tires should meet the requirements of the vehicle instruction manual, and the error should not exceed ± 10 kPa. Front tires of front-wheel drive vehicles the pressure increases by 0.1 bar, and the rear tire pressure of the rear-wheel drive vehicle increases by 0.1 bar. It is recommended to add nitrogen to the tires to stabilize the tire pressure.

5.2.5

Test accessories include engine coolant, engine lubricating oil, transmission lubricating oil and transaxle lubricating oil, which must meet the requirements of the engine, Gearbox and other design requirements, and fill in accordance with the vehicle manual or add to the specified filling amount.

5.2.6

The charge of refrigerant should meet the requirements without leakage.

5.2.7

The test vehicle should be loaded according to the full load of the vehicle. After loading, the height of the front and rear wheel eyebrows above the ground needs to be measured and recorded in the vehicle information

Table (see Table A.1).

5.3 Sensor installation

According to the vehicle structure and principle, select the measuring point and install the sensor in accordance with the provisions of Table B.1.