



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

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**Test method of transition test for the quantification of vehicle
on-centre handling**

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1 Scope

This document specifies the test method for the steering wheel of a motor vehicle from a straight-line driving state to leaving the center area.

This document applies to M1 and N1 vehicles, and can be implemented by reference for other types of vehicles.

2 Normative references

The contents of the following documents constitute the indispensable clauses of this document through normative references in the text. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 3730.1, Motor vehicles and trailers - Types - Terms and definitions

GB/T 3730.2, Road vehicle - Masses - Vocabulary and codes (GB/T 3730.2-1996, idt ISO 1176:1990)

GB/T 12534-1990, Motor vehicles - General rules of road test method

GB/T 12549, Terms and Definitions for Vehicle Controllability and Stability

GB/T 15089, Classification of power-driven vehicles and trailers

3 Terms and definitions

Terms and definitions determined by GB/T 3730.1, GB/T 3730.2, GB/T 12549 and GB/T15089, and the following ones are applicable to this document.

3.1 On-centre handling The steering "feel" and precision of a vehicle during nominally straight-line driving and in negotiating large radius bends at high speeds but low lateral accelerations.

3.2

6.2.1 The ambient wind velocity during the test shall not exceed 5 m/s (the recommended wind velocity shall not exceed 1.5 m/s).

6.2.2 The atmospheric temperature shall be within the range of 0 °C ~ 40 °C.

6.2.3 For each test, the test report shall record the climatic conditions during the test; see Appendix C.

6.3 Test vehicle

6.3.1 Vehicle parameters

6.3.1.1 The basic data information of the test vehicle shall be recorded in the test report in Appendix D. For any changes in vehicle parameters (such as load) during the test, the basic data information shall be recorded again.

6.3.1.2 The wheel alignment parameters shall meet the product design requirements.

6.3.2 Tyres

6.3.2.1 The tyres shall be installed on the test vehicle according to the manufacturer's instructions. The tyres shall be run-in for at least 150 km on the test vehicle or a similar vehicle; but it must be ensured that there is no excessive use, such as emergency braking, rapid acceleration, sharp turns, and road shoulder pressure. After running-in, the tyre shall be kept in the same position for testing.

6.3.2.2 The tyre tread depth (including the entire width of the tyre contacting the ground and the entire tyre surface) shall be more than 90% of the initial tyre tread depth.

6.3.2.3 The production date of the tyre shall be recorded in the test conditions;

see Appendix C. The test tyre shall not exceed one year from the production date.

6.3.2.4 The tyres shall be inflated according to the pressure corresponding to the test environment temperature that is specified by the automobile manufacturer. When the tyre pressure is not greater than 250 kPa, the error of cold inflation pressure shall be ± 5 kPa; when tyre pressure exceeds 250 kPa, the error shall not exceed 2%.

6.3.2.5 The tyre pressure and the depth of the tyre tread pattern before warming-up shall be recorded in the test report; see Appendix C.

6.3.2.6 In addition to the basic tyre conditions, tests can also be carried out under other conditions. The specific details shall be recorded in the test report;

see Appendix C.

6.3.2.7 The wheel/tyre assembly shall be dynamically balanced before the test.

6.3.3 Test load

6.3.3.1 The test vehicle load is BETWEEN the curb weight of the vehicle plus the mass of the driver and the necessary test equipment (not exceeding 150 kg) AND the maximum allowable total mass of the vehicle; but it shall not exceed the maximum allowable axle load of the vehicle.

6.3.3.2 The recommended test load for category M1 vehicles is the curb weight of the vehicle plus one driver, one tester and necessary test equipment. The recommended test load for category N1 vehicles is the maximum design total mass of the vehicle.

7 Test procedure

7.1 Warm-up Before the start of the test, the vehicle shall be driven for 10 km at the test speed or for 500 m at the corresponding speed of the lateral acceleration of 3 m/s^2 (one left turn and one right turn) to warm up the tyres.

7.2 Initial conditions According to the initial conditions given in Appendix E, use the yaw velocity as the variable to determine the initial conditions. At t_0 , perform the steering input in accordance with 7.3. At the end of the test, the test specified in 7.3 can be ended by re-establishing the steady driving condition of straight-line driving.

7.3 Transition test procedure

7.3.1 Selection of gears during the test: for the manual transmission, the highest gear shall be selected when multiple gears are applicable; for the automatic transmission, D gear shall be used. The gear and driving mode selected for the test shall be recorded in the test report; see Appendix C.

7.3.2 The recommended vehicle speed for the test is 100 km/h; other vehicle speeds shall be decremented or incremented by 20 km/h from the standard velocity. The vehicle speed for the test shall be recorded in the test report; see

Appendix C. 7.3.3 After the start of the test, the signal of the transducer shall be recorded

completely. In order to ensure that the required data is not affected by the instrument, the data shall be recorded continuously for more than 1 s after the end of the test.

8.3 Characteristic values

8.3.1 Steering-wheel torque (MH) versus steering-wheel angle ($\Delta\alpha$)

The following characteristic values need to be calculated in this coordinate system:

Steering-wheel torque versus steering-wheel angle gradient -- gradient of straight-line fit to data for the left and right turn directions.

Note: The abscissa is the steering-wheel angle, and the ordinate is the steering-wheel torque.

8.3.2 Yaw velocity ($\dot{\alpha}$) versus steering-wheel angle ($\Delta\alpha$)

The following characteristic values need to be calculated in this coordinate system:

a) Yaw velocity versus steering-wheel angle gain -- gradient of straight-line fit to data for the left and right turn directions;

b) Steering-wheel angle versus yaw velocity deadband -- abscissa deadband at ordinate threshold of ± 1.1 ($^\circ$)/s.

Note: The abscissa is the steering-wheel angle, and the ordinate is the yaw velocity.

8.3.3 Yaw velocity ($\dot{\alpha}$) versus steering-wheel torque (MH)

The following characteristic values need to be calculated in this coordinate system:

a) Yaw velocity versus steering-wheel torque gain -- gradient of straight-line fit to data for the left and right turn directions;

b) Steering-wheel torque versus yaw velocity deadband -- abscissa deadband at ordinate threshold of ± 1.1 ($^\circ$)/s.

Note: The abscissa is the steering torque, and the ordinate is the yaw velocity.

8.3.4 Lateral acceleration (a_Y) versus steering-wheel angle ($\Delta\alpha$)

The following characteristic values need to be calculated in this coordinate system:

a) Lateral acceleration versus steering-wheel angle gain -- gradient of straight-line fit to data for the left and right turn directions;

Appendix B (Normative) Data preprocessing requirements