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

GB/T 5599-2019

**Specification for dynamic performance assessment and testing
verification of rolling stock**

机车车辆动力学性能评定及试验鉴定规范

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1 Scope

China's national specification for assessing and verifying the dynamic performance of

rolling stock on the line. Dynamic performance is what determines whether a vehicle is safe and comfortable at speed, and it cannot be established anywhere but on real track: the vehicle's suspension, its wheel profiles and the track's geometry form one system, and the behaviours that matter - hunting instability, derailment quotient at curves, wheel unloading over twist, and the ride quality the passenger feels - emerge from that interaction rather than from the vehicle alone. China's fleet runs from 120 km/h freight to 350 km/h high speed on the same standard gauge, which is why a single assessment framework matters. The standard specifies the test method and the assessment indices for dynamic performance testing and verification of standard gauge rolling stock, may be referenced for urban rail vehicles and industrial and mining electric and diesel locomotives, and does not apply to railway machinery such as special vehicles, construction machinery or track maintenance machines.

This standard specifies the method and assessment index, for the dynamic performance test and verification of standard gauge rolling stocks along the line. This standard applies to the dynamic performance assessment and test verification of standard gauge rolling stocks along the line. For the test verification of dynamic performance of urban rail vehicles, industrial and mining electric power, diesel locomotives, it may refer to this standard. This standard does not apply to test verification of the dynamic performance of railway machinery, such as the standard gauge railway special vehicles (long- large freight trains and rail vehicles with and without power), construction machinery (bridge erecting machines, track laying machines, track cranes, etc.), road maintenance machinery (screening machines, tamping machines, etc.).

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 standard. TB/T 3332-2013 Railway application - Method for the determination of wheel track equivalent conical degree TB/T 3355-2014 Dynamic testing and assessment of geometric state of track UIC 513.1994 Guidelines for evaluating passenger comfort in relation in railway vehicle

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Maximum operating speed The maximum speed, to which the rolling stock can adapt to, in case of long- term continuous operation.

Note. The maximum operating speed is expressed in kilometers per hour (km/h).

3.2 Operating speed The operating speed, which is comprehensively determined based on

the transportation organization, routes, signals, rolling stocks.

Note. The operating speed is expressed in kilometers per hour (km/h).

3.3 Permissible cant deficiency The maximum unbalanced superelevation allowed, when the rolling stock passes through a curve.

Note. The permissible cant deficiency is expressed in millimeters (mm).

3.6 Vibration acceleration Linear acceleration, which is measured on parts, such as axle box, bogie, vehicle body.

Note. Vibration acceleration is expressed in meters per second (m/s²).

4 Symbols

Symbols and units are as shown in Table 1.

5 Coordinate system of rolling stock

5.1 Coordinate system for dynamics test of rolling stock The coordinate system for dynamics test of the rolling stock is a right-hand coordinate system. For the forward-moving direction of the vehicle, the x-axis is the positive direction.

5.2 Naming rules of measuring points First, name the sequence, in order, along the running direction, as shown in j of Figure 1. THEN, name the vehicle side symmetrically according to the xOz plane, as shown in k of Figure 1.

6 General

6.1 The verification of the dynamic performance of rolling stock shall be carried out through the method of route test.

6.2 After leaving the factory, the rolling stock shall undergo a running-in operation of no less than 5 x 10³ km.

6.3 The following parameters shall be confirmed before the test.

6.4 The surface of the rail should be in a dry state. The state of the rail, climatic conditions, test time shall all be stated in the test report.

7 Test conditions

7.1 General rules The test operating conditions shall consider factors, such as route grade, test speed, cant deficiency, curve radius, marshalling, running direction.

7.2 Test segments and sampling requirements

7.2.1 Classification of test segments The test segment is divided into straight line, large radius curve, small radius curve, straight through turnout, lateral through turnout.

7.2.3 Large radius curve segment

7.2.3.1 The curve radius of the large radius curve is selected, according to different operating conditions, vehicle types, speed levels, actual working conditions of common routes, with reference to Table 2 and Table 3.

7.2.3.3 The quantity of sampling segments, N , is ≥ 25 .

7.2.3.4 The sampling length of each segment. if $v_{opr} \leq 140$ km/h, then $l = 100$ m; if 140 km/h $< v_{opr} \leq 220$ km/h, then $l = 250$ m; if $v_{opr} > 220$ km/h, then $l = 500$ m. The allowable deviation of the sampling length of each segment is 10%.

7.2.4 Small radius curve segment

7.2.4.1 The range of radius R of small radius curve. $250 \text{ m} \leq R \leq 400 \text{ m}$.

7.2.5 Straight through turnout Design speed of segment

7.2.5.1 The maximum test speed v_{max} is

1.1 times v_{opr} , which shall not be lower than v_{opr} under difficult conditions. The test shall be divided into a number of speed levels, at the maximum test speed; the speed level increments are 10 km/h or 20 km/h. The tolerance of speed control is ± 5 km/h.

7.2.5.2 Each turnout area, through which it passes straightly, is regarded as a sampling segment. The number of sampling segments, N , at each speed level, is ≥ 10 .

7.2.6 Lateral through turnouts

7.2.6.1 The maximum test speed v_{max} is

1.1 times v_{opr} , which shall not be lower

7.3.1 Mechanical characteristics

7.3.1.1 During the verification test, the manufacturer shall provide the relevant characteristic parameters of the rolling stock under test; confirm that its condition is normal AND meets the specified requirements.

7.3.2 Load status

7.3.2.1 The rolling stock test shall be carried out in the unladen state.

7.3.3 Tread profile of wheel rim