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Bench test methods of static roll stability for motor vehicles, trailers and combination vehicles

汽车、挂车及汽车列车静侧倾稳定性台架试验方法

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Bench test methods of static roll stability for motor vehicles, trailers and combination vehicles

1 Scope

This Standard specifies test equipment, test conditions, test methods and test records for bench test of static roll stability for motor vehicles, trailers and combination vehicles.

This Standard is applicable to motor vehicles, trailers and combination vehicles. Other types of vehicles may refer to this Standard for implementation.

2 Normative references

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

GB/T 1184-1996, *Geometrical tolerancing - Geometrical tolerance for features without individual tolerance indications*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 3730.1 as well as the followings apply.

3.1 static roll stability

the vehicle's inherent anti-rolling ability when subjected to lateral forces under static conditions

3.2 roll angle

when the vehicle tilts with the tilt test bench, the angle between the vehicle tire support plane and the horizontal plane

3.3 maximum stable roll angle

In order to prevent the vehicle from skidding during the test, an anti-skidding block can be installed on the roll test bench. The height of the anti-skidding block is set to minimize the impact on the test results. The height of the block shall not be greater than 2/3 of the distance between the tire ground plane and the lower edge of the rim before the vehicle rolls or 60mm, whichever is greater. The length of the block shall not be less than 500mm. The fillet radius of the top end of the block and the tire contacting side is not less than 10mm.

4.4 Anti-rollover safety equipment

Special safety equipment to prevent the vehicle from overturning accidents shall be equipped during the test. The restraining force of the safety equipment on the vehicle shall be zero before the vehicle reaches the critical state of rollover.

5 Test conditions

5.1 Vehicle conditions

5.1.1 Tires

In the test load state, the cold inflation pressure of the test vehicle's tires shall meet the vehicle manufacturer's regulations.

5.1.2 Loading

The load state of the vehicle shall be determined according to the measurement requirements (in accordance with the curb quality state when there is no special requirement). When the vehicle needs to be loaded with simulated loads, all loads shall be fixed and reliable. At the same time, it shall be ensured that the vehicle axle (wheel) load distribution and the height of the center of mass are consistent with the measurement requirements, or consistent with the actual driving state. In order to prevent the leakage of fuel, lubricating oil, and coolant, blockage or equivalent quality substitution methods can be used.

5.1.3 Vehicle preparation

All vehicle assemblies, components and auxiliary equipment (including tools and spare tires) shall be fully equipped according to the manufacturer's regulations and installed in the prescribed positions. As for the assembly or component whose position can be adjusted (such as lifting shaft, adjustable air suspension), it shall be adjusted to a state suitable for the load.

During the test, the vehicle suspension shall be in the normal working position and pressure state. For a self-adjusting suspension with relatively fast response characteristics, it is allowed to supply power to the adjustment system to make

6.1.1.1 Place the vehicle on the roll test bench. The tires are driving in a straight line. The longitudinal symmetry plane of the vehicle is parallel to the centerline of rotation of the test bench.

6.1.1.2 Implement the parking brake. The transmission is in neutral position (when applicable). The differential lock is in an inactive state. Install anti-skidding block and anti-rollover safety equipment.

6.1.1.3 Start the test bench and make the vehicle tilt to the left at an appropriate speed with the test bench (when the roll angle is close to the vehicle roll limit, the ascent speed shall not be higher than 3°/min). Monitor the right wheel load until the normal reaction force of all tire support planes on the right side of the vehicle is zero (if there is no wheel load measuring device, test until all the tires on the right side are off the test bench; for passenger trains and freight trains, as long as all the tires on the right side of the tractor and trailer meet this condition, it will stop). At this time, the roll angle of the test bench is the maximum stable roll angle when the vehicle is tilted to the left.

6.1.1.4 Control the lowering of the test bench to restore the tilt angle of the test bench to 0°.

6.1.1.5 Drive the vehicle away from the roll test bench and park again according to the requirements of 6.1.1.1.

6.1.1.6 Repeat the provisions of 6.1.1.1~6.1.1.5. The test is carried out three times in total.

6.1.1.7 If the maximum difference between the three measurements exceeds 0.6°, the number of tests shall be increased until the maximum difference between the three consecutive measurements does not exceed 0.6°. It shall be based on the last three measurements.

6.1.2 Measure the maximum stable roll angle when the vehicle leans to the right

Repeat the test steps in 6.1.1. Measure the maximum stable roll angle when the vehicle leans to the right.

6.1.3 Data processing

Calculate the arithmetic average of the three measurement results of the vehicle to the left and right (take the value to tenths) respectively as the maximum stable roll angle of the vehicle to the left and right. Take the smaller value of the left and right maximum stable roll angles as the vehicle's maximum stable roll angle.

6.2 Test for the specified stable roll angle θ

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