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Roller Opposite Forces Type Automobile Brake Tester

滚筒反力式汽车制动检验台

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Roller Opposite Forces Type Automobile Brake Tester

1 Scope

This Document specifies the requirements for classification and model, technical requirements, test methods, inspection rules, and marking, packaging, transportation and storage of roller opposite forces type automobile brake tester.

This Document applies to the design, production, inspection and use of the roller opposite forces type automobile brake tester; and the roller opposite forces motorcycle brake tester can use it as a reference.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in 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 191 Packaging – Pictorial Marking for Handling of Goods

GB/T 13306 Plates

GB/T 13384 General Specifications for Packing of Mechanical and Electrical Product

JT/T 1279 Axle (Wheel) Weighing Instrument for Motor Vehicle Detection

3 Terms and Definitions

For the purposes of this Document, the following terms and definitions apply.

3.1 Roller opposite forces type automobile brake tester

A device for detecting the braking performance of an automobile by measuring the opposite force of the wheel braking force acting on the main roller.

3.2 Roller opposite forces type automobile lift loading brake tester

A device for detecting the braking performance of an automobile by measuring the opposite force of the wheel braking force acting on the main roller, and by using a lifting device to raise

the axle under test to a specified height, increase the static axle load of the axle.

3.3 Main roller

The roller that is driven by the motor and is directly driven to rotate through the deceleration mechanism.

3.4 Auxiliary roller

The roller that is parallel to the main roller and is driven by the main roller to rotate through a synchronizing device.

3.5 Resolution of a displaying device

The smallest difference between the displayed indications that the displaying instrument can effectively identify.

3.6 Third roller

The roller that is independent and located between the main roller and the auxiliary roller, and is used to detect the linear speed of the wheel under test.

3.7 Rated loading capacity

The maximum axle mass of the automobile under test that is allowed to be carried by the roller opposite forces type automobile brake tester.

3.8 Slip adhesion coefficient of roller

The ratio of the wheel braking force to the wheel load measured by the roller opposite forces type automobile brake tester, when the test wheel of the roller adhesion coefficient tester locks and slips on the busbar on the main roller.

3.9 Idling dynamic zero error

The maximum zero deviation value displayed by the instrument of the roller opposite forces type automobile brake tester under the no-load stable operation state.

3.10 Differences between indications value

The absolute value of the differences between the indications value of the braking force measured by the left and right roller groups at the same test point.

3.11 Equate position roller

The position on the roller surface or extension of roller axis that is close to the roller side.

3.12 Slip rate

shall be no greater than 2mm.

5.4.2 The third roller

5.4.2.1 The third roller shall rotate flexibly without sticking.

5.4.2.2 The slip rate when the drive motor automatically stops shall be 25%~35%.

5.4.2.3 The third roller shall be in reliable contact with the wheel under test. When the wheel under test is braking, the third roller shall not lose contact with the wheel under test due to jumping.

5.4.3 Displaying device

The digital display shall be stable, with no missing segments or flickering. For the brake tester used by a single machine, the retention time of the measured data shall be no less than 8s.

5.4.4 Electrical system

5.4.4.1 Electrical system response error

The electrical system shall have the filtering function to eliminate invalid signals such as rack vibration and electromagnetic interference; and the response error of the electrical system of the brake tester shall not exceed ±3%.

5.4.4.2 Data sampling

The sampling frequency of brake force shall be no lower than 100Hz.

5.4.4.3 Data processing

Under the condition that the third roller stops and control does not work, the continuous sampling time of the braking force is no less than 3s. The maximum braking force shall be screened and displayed in all sampling points collected in the whole process of braking detection.

5.4.4.4 Safety protection

5.4.4.4.1 The electrical system shall be able to withstand the withstand voltage test of 50Hz, 1.5kV, which lasted for 1min; and shall not appear breakdown, arcing and other phenomena.

5.4.4.4.2 The insulation resistance of the electrical system shall be no less than 5MΩ.

5.4.4.4.3 The electrical system shall be equipped with fuses or circuit breakers according to the size of the load; the drive motor control shall be provided with overload and phase failure protection devices.

5.4.4.4.4 The electrical system shall have reliable grounding devices and obvious grounding signs; and the brake tester shall be reliably grounded during installation and use.

5.4.4.4.5 The electrical system shall be provided with a manual button for emergency stop.

5.5 Special requirements for loading brake tester

5.5.1 Loading device

The loading brake tester shall have a rack lifting device; and can end the lifting action accurately and reliably at the specified lifting height.

5.5.2 Lifting height error

The allowable error of the lifting height of the loading brake tester is 0mm~5mm.

5.5.3 Lifting height difference between left and right roller groups

When the loading brake tester is lifted to the specified height, the lift height difference between the left and right roller groups shall be no greater than 2mm.

5.5.4 Lifting stability

5.5.4.1 Under a load of no less than 50% of the rated loading capacity, when the loading brake tester is lifted to the highest point, the drop in 10 min shall be no greater than 2mm.

5.5.4.2 The front, rear, left and right directions of the lifting rack of loading brake tester shall be provided with adjustable limit devices.

5.5.4.3 The loading brake tester shall run smoothly when it is lifted and lowered, and there is no sticking phenomenon.

5.5.5 Weighing Requirements

The axle (wheel) weight gauge installed in combination with the loading brake tester shall meet the requirements of JT/T 1279.

5.6 Appearance quality

5.6.1 The outer surface of the brake tester shall be smooth and clean, and there shall be no obvious bruises or scratches; the coating surface shall be uniform and strong in adhesion.

5.6.2 Bolts and nuts shall be surface-treated and connected firmly.

5.6.3 Solder joints of weld assembly shall be flat and uniform; and there shall be no defects such as welding penetration, cracks, and de-soldering, and the welding slag shall be removed.

5.6.4 The gas circuit and oil circuit of the brake tester shall be well sealed, and there shall be no leakage.

5.6.5 The electrical components and connectors shall be firmly assembled; the wiring shall be reasonable and neat; the solder joints shall be smooth, and there shall be no rosin joints.

6.4.2 Idling dynamic zero error

6.4.2.1 When the brake tester is idle, the display instrument is set to zero.

6.4.2.2 Load the left and right force measure sensors of the brake tester roller, respectively; so that the indication value of the brake tester display instrument is stable at a certain value above 100daN; and the display instrument is set to zero.

6.4.2.3 Start the drive motors of the left and right roller groups; after the rotation speed of the rollers is stable, read the maximum value of the display instrument left and right braking force indications deviating from the zero position. Repeat the test three times; and the maximum deviation from the zero position is the idling dynamic zero error.

6.4.3 Repeatability

The repeatability test can be carried out simultaneously with the static indication error test. According to the test data in 6.4.1, the repeatability is calculated according to Formula (5) and Formula (6), respectively.

a) When the loading force is less than or equal to 10% (F·S)

$$\varphi_i = \frac{\delta_{i\max} - \delta_{i\min}}{C} \qquad \cdots\cdots (5)$$

Where:

φ_i – repeatability at the i^{th} calibration point, in 10 Newton (daN);

δ_{imax} – at the i^{th} calibration point, maximum value of the indication error in the 3 tests, in10 Newton (daN);

δ_{imin} – at the i^{th} calibration point, minimum value of the indication error in the 3 tests, in10 Newton (daN);

C – range coefficient, take 1.69.

b) When the loading force is greater than 10% (F·S)

$$\varphi_i = \frac{\delta_{i\max} - \delta_{i\min}}{C} \times 100\% \qquad \cdots\cdots (6)$$

Where:

φ_i – repeatability at the i^{th} calibration point;

δ_{imax} – at the i^{th} calibration point, maximum value of the indication error in the 3 tests, in %;

δ_{imin} – at the i^{th} calibration point, minimum value of the indication error in the 3 tests,

third roller; start the drive motor of the brake tester; and after the rotation speed is stable, measure the current surface linear speed, v_0, of the main roller; and take out the backing wheel.

b) Adjust the motor of the slip rate measuring device to keep the linear speed of the third roller at, v_0; then gradually reduce the speed until the drive motor of the brake tester stops automatically; and record the surface linear speed, v_i, of the third roller at this moment. Repeat the test 3 times, and calculate the slip rate at the moment of automatic shutdown of the drive motor according to Formula (7).

$$\varphi = \left| \frac{v_i - v_0}{v_0} \right| \times 100\% \qquad \cdots\cdots (7)$$

Where:

φ - slip rate when the drive motor automatically stops;

v_i - when the drive motor automatically stops, the surface linear speed of the third roller (i=1, 2, 3) measured in three tests, in km/h;

v_0 - the surface linear speed of the main roller of the brake tester, in km/h.

6.5.2.3 Release the stop function of the third roller; drive the test automobile onto the brake tester; start the drive motor of the roller; slowly depress the brake pedal to apply the brakes; and check whether there is any disconnection from the wheel under test due to the jumping of the third roller.

6.5.3 Display device

6.5.3.1 Check the display device of the brake tester, it shall be stable and free from missing segments and flickering.

6.5.3.2 Drive the test vehicle onto the brake tester; start the drive motor of roller and implement braking; and use a stopwatch to measure the retention time of the braking force data on the display device.

6.5.4 Electrical system

6.5.4.1 Electrical system response error

6.5.4.1.1 Disconnect the signal output of the brake tester force measure sensor and the third roller; connect the signal output terminal of the signal generator to the system input terminal of the braking force signal; and switch the brake tester display instrument to the calibration state and set it to zero. The signal generator outputs a constant voltage (V) equivalent to about 50% (F·S) of the braking force value; read the indication value of the braking force; repeat the test three times; and calculate the average value ($\overline{F}_{L(R)0}$).

6.5.4.1.2 Switch the brake tester display instrument to the detection state and set it to zero; the signal generator outputs the above voltage (V), the duration is 120ms; read the indication value of the braking force; repeat the test three times; and calculate the average value ($\overline{F}_{L(R)}$), calculate the electrical system response error according to Formula (8).

$$\delta_{L(R)} = \frac{\overline{F}_{L(R)} - \overline{F}_{L(R)0}}{\overline{F}_{L(R)0}} \times 100\% \qquad \cdots\cdots\cdots\cdots\cdots\cdots (8)$$

Where:

$\delta_{L(R)}$ – electrical response error;

$\overline{F}_{L(R)}$ – under checking state, the average value of 3 braking force indication values, in 10 Newton (daN);

$\overline{F}_{L(R)0}$ – under calibrating state, average value of 3 braking force indication values, in 10 Newton (daN).

6.5.4.1.3 Repeat the procedures of 6.5.4.1.1 and 6.5.4.1.2 to conduct the electrical system response error test on the other side of roller group.

6.5.4.2 Data acquisition

Check the data acquisition frequency of the system software.

6.5.4.3 Data processing

6.5.4.3.1 Release the stop function of the third roller; slowly depress the brake pedal of the test vehicle for no less than 5s; and check the continuous sampling time of the braking force through the "braking force-braking time process curve".

6.5.4.3.2 Check that the maximum measured and displayed braking force value, which shall be consistent with the maximum braking force value in the "braking force-braking time process curve".

6.5.5 Safety Protection

6.5.5.1 Connect the withstand voltage tester to the electrical system of the braking tester according to the method specified in the instruction manual; apply 1500V, 50Hz AC voltage for 1min; and observe whether there is a breakdown or arcing phenomenon.

6.5.5.2 In the power-off state, use a 500V insulation resistance measuring instrument to measure the resistance between two conductors separated by insulating materials, and between the system and the metal casing.

6.5.5.3 Check the fuses or circuit breakers of the electrical system, as well as the overload, overheating and phase failure protection devices of the drive motor.

6.5.5.4 Check the grounding devices and markings of the electrical system.

6.5.5.5 Check the manual button for emergency stop of the electrical system.

6.6 Special requirements for loading brake tester

6.6.1 Rack lifting device

Check the rack lifting device of the loading brake tester; and perform the lift operation checking.

6.6.2 Lifting height error

6.6.2.1 Adjust the loading brake tester to a horizontal state.

6.6.2.2 Load the test vehicle (or use heavy objects to load the loading brake tester); so that the mass of the measured shaft (or the mass of the heavy object) is no less than 50% of the rated loading capacity of the loading brake tester; and the difference between the mass of the left and right wheels (or the difference between the load mass of the left and right rollers) shall be no greater than 100kg. The test vehicle shall drive to the loading brake tester straightly and along the center.

6.6.2.3 Place the laser level at an appropriate position on the ground; adjust its level and emit a horizontal beam.

6.6.2.4 In the un-lifted state, place the steel ruler vertically and centered on the busbars on each roller of the loading brake tester; and read and record the laser beam irradiation point value on the steel ruler.

6.6.2.5 The lifting height of the loading brake tester shall be no less than 60mm; and the steel rulers shall be placed vertically and centered on the busbars of each roller, respectively; and read and record the laser beam irradiation point value on the steel ruler again.

6.6.2.6 Calculate the lift range of each roller relative to the un-lifted state when it is lifted to the specified height; and the difference between the lift range and the specified height is the lifting height error.

6.6.3 Difference of lifting height between left and right roller groups

According to the test results of 6.6.2, respectively calculate the lift range of each roller relative to the un-lifted state when it is lifted to the specified height; and the difference between the lift range of the rollers is the lifting height difference.

6.6.4 Lifting stability

6.6.4.1 Load the test vehicle (or use heavy objects to load the loading brake tester); so that the mass of the measured axle (or the weight of the heavy object) is no less than 50% of the rated loading capacity of the loading brake tester. The difference between the mass of the left and right wheels (or the difference between the load masses of the left and right rollers) shall be no

greater than 100kg. Under this load, the rack is lifted to the highest position; and the upper plane of the outer frame of the brake tester is used as the benchmark to measure the initial height of the center position of the busbar on the auxiliary roller with a height caliper or a laser level; measure again after 10 min; and calculate the difference.

6.6.4.2 Check the limit devices in the front, rear, left and right directions of the loading brake tester rack; and make adjustments.

6.6.4.3 Check the operation status of the rack when it is raised and lowered.

6.6.5 Weighing requirements

According to JT/T 1279, the weighing performance of the loading brake tester is tested.

6.7 Appearance quality

The adhesion test of the coating surface of the brake tester adopts the "well" method; and the coating on the checked part shall not fall off. Tests for other items are carried out by visual inspection and hand feeling.

7 Inspection Rules

7.1 Type inspection

7.1.1 Type inspection shall be carried out in one of the following situations:

a) Trial type identification of new products or old products transferred to factories;

b) After formal production, if there is a major change in the structural material process, which may affect the performance of the product;

c) Normal production for every two years or when the output of 500 units is accumulated;

d) When the production is resumed after discontinuity for one year;

e) When there is a big difference between the exit-factory inspection results and the last type inspection;

f) When the national market supervision and management department proposes a type inspection requirement, or when the quality supervision and random inspection fails.

7.1.2 The content of type inspection shall be all contents in Clause 5.

7.1.3 The number of sampling bases for type inspection shall be no less than three sets, and the number of sampling samples shall be one set.

7.1.4 When there are unqualified items in the type inspection, the sampling base shall be

c) trademarks;

d) date of manufacture and serial number;

e) the main technical parameters of the product;

f) implementation file number.

8.1.2 Packaging marks

The packaging icon mark shall conform to the relevant provisions of GB/T 191 and contain the following contents:

a) product name and model;

b) the name of the manufacturer;

c) fragile items, handle with care;

d) Upward, upside down is strictly prohibited;

e) fear of rain;

f) total mass;

g) Dimensions of the packing box (length × width × height);

h) Receiving and delivering organizations.

8.2 Packaging

8.2.1 The packaging shall comply with the provisions of GB/T 13384.

8.2.2 The following technical documents shall be present when packing:

a) packing list;

b) product certificate;

c) product instruction manual;

d) other relevant technical documents.

8.3 Transportation and storage

8.3.1 During transportation, damp-proof, vibration-proof and shock-proof measures shall be taken for the brake tester.

8.3.2 The brake tester shall be stored in a dry, ventilated and corrosive-gas-free warehouse.

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