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Clutch Facings for Automobiles

汽车用离合器面片

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Clutch Facings for Automobiles

1 Scope

This Document specifies the requirements, test methods, inspection rules, marking, packaging, transportation and storage of clutch facings for automobiles.

This Document is applicable to winding dry friction clutch facings for automobiles (hereinafter referred to as "facings").

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 2828.1 Sampling procedures for inspection by attribute - Part1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB 5763 Brake linings for automobiles

GB/T 23263 Determination of asbestos in products

GB/T 26125 Electrical and electronic products - Determination of six regulated substances (lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers)

JB/T 7498 Coated abrasives - Abrasive paper

JC/T 1065 Constant speed friction test machine

JC/T 2268 Measurement of copper and other elements in brake friction materials

3 Terms and Definitions

For the purposes of this Document, the terms and definitions given in GB 5763 and the following apply.

3.1 Max flexibility; δ

During the bending test, the distance of the top or bottom surface of the span center of the test

protrusions on both sides.

5.3.2 Test equipment

5.3.2.1 Standard flat plate: accuracy level is Level-2 or above.

5.3.2.2 Preloading fixture: In the circular ring shape; the mass shall meet the specified load in Table 2; the error shall be no greater than $\pm 1\%$; and the flatness shall be less than 0.05mm.

5.3.2.3 Feeler gauge: The accuracy is no less than 0.01mm.

5.3.3 Test procedures

5.3.3.1 Place the facing flat on the standard flat plate with the working surface downward. No part of the facing shall exceed the outer edge of the standard flat plate.

5.3.3.2 Select the appropriate preloading fixture according to the size of the facing. Place the preloading fixture flat on the facing to be tested; and ensure that any part of the facing is completely covered by the fixture and it is concentric with the facing. Use a feeler gauge to check the gap between the working surface of the facing and the flat plate. It is required to measure 6 points on the inner hole and the outer circle at 60° intervals along the circumference.

5.3.4 Expression of results

Take the maximum value among the 12 measured gaps as the flatness value of the facing.

5.4 Friction property

5.4.1 Test pieces

5.4.1.1 Two test pieces are made from the same facing.

5.4.1.2 The size of the test piece is 25mm×25mm; and the allowable deviation is ± 0.2 mm.

5.4.1.3 The thickness of the test piece is that of the facing; and the thickness difference between the two test pieces is less than 0.2mm.

5.4.2 Test equipment

5.4.2.1 Fixed-speed friction testing machine: Its performance and accuracy shall comply with the provisions of JC/T 1065.

5.4.2.2 Micrometer: The accuracy is no less than 0.01mm.

5.4.3 Test conditions

5.4.3.1 The pressure of the test piece is 0.49MPa.

5.4.3.2 The disc material shall comply with the provisions of JC/T 1065. The surface shall be treated by sandpaper with grain size of P240 specified in JB/T 7498; so that there are no obvious scratches, rust, pits and other defects on the surface of the disc.

5.4.3.3 The rubbing direction is the same as that of the facing.

5.4.4 Test procedures

5.4.4.1 Put the two test pieces into the test piece support arm and run them in at 100 °C and below until the contact surface reaches more than 95%. Use a micrometer with an accuracy of no less than 0.01mm to measure the thickness of the test piece. The thickness measurement shall be carried out after the test piece has cooled to room temperature. Measure 5 points on each test piece and take the arithmetic mean value.

5.4.4.2 At the test temperature of 100°C, measure the friction force during the disc rotation of 5000r. After the friction test, measure the thickness of the test piece according to the requirements of 5.4.4.1.

5.4.4.3 At each test temperature of 150°C, 200°C, 250°C, and 300°C, conduct the same test according to the requirements of 5.4.4.2. The maximum test temperature of various types of facings shall comply with the provisions of Table 3. During each temperature test, the disc temperature shall rise to the specified test temperature within 1500r. When the disc temperature cannot reach the specified test temperature within 1500r, the auxiliary heating device shall be used.

5.4.4.4 After the maximum test temperature measurement is completed, measure the friction force during the disc rotation of 3000r at 100°C.

5.4.4.5 After the test, the appearance of the friction surface of the test piece and disc shall be inspected visually.

5.4.5 Calculation

5.4.5.1 The coefficient of dynamic friction at each test temperature is calculated according to Formula (1):

$$\mu_d = \frac{f}{F} \dots\dots\dots (1)$$

Where:

μ_d – coefficient of dynamic friction;

f – friction force (the average friction force of the second half of the total friction distance), in N;

F - the normal force exerted on the test piece, in N.

5.5.2.4 Micrometer: With accuracy no less than 0.01mm.

5.5.2.5 Vernier caliper: With accuracy no less than 0.02mm.

5.5.3 Test procedures

5.5.3.1 The thickness of the test piece shall be measured by a micrometer at three points in the middle; and the arithmetic mean value shall be taken. The width of the test piece shall be measured by a vernier caliper at three points in the middle; and the arithmetic mean value shall be taken.

5.5.3.2 Adjust the distance between the fulcrums according to the test piece.

5.5.3.3 Place the test piece on the fulcrum of the test fixture with the friction surface side facing up.

5.5.3.4 Start the testing machine to apply load, and measure the maximum load at the moment when the test piece breaks and the max. flexibility at the time of failure.

5.5.4 Calculation

5.5.4.1 The bending strength of the facing is calculated according to Formula (3):

$$\sigma = \frac{3\omega L}{2bd^2} \dots\dots\dots (3)$$

Where:

σ – bending strength, in N/mm²;

ω – max. load, in N;

L – distance between fulcrums, in mm;

b – width of test piece, in mm;

d – thickness of test piece, in mm.

5.5.4.2 The max. strain of the facing is calculated according to the Formula (4):

$$e = \frac{6d}{L^2} \times \delta \dots\dots\dots (4)$$

Where:

e – max. strain, in mm/mm;

d – thickness of test piece, in mm;

Key:

- 1 – motor;
- 2 – belt pulley;
- 3 – transmission belt;
- 4 – test piece;
- 5 – destruction cabin.

Figure 1 – Principle Diagram of Test Equipment of Rotate Bursting Test Strength

5.6.3 Test procedures

5.6.3.1 Carry out idle test run first; and use a speedometer to check whether the set speed and angular acceleration are consistent with the test conditions.

5.6.3.2 Select the appropriate test fixture according to the size of the test piece.

5.6.3.3 Install the test piece on the test fixture and press it tightly; close and lock the test chamber.

5.6.3.4 Normal temperature test: Adjust the angular acceleration to $200\text{r}/\text{min}\cdot\text{s}^{-1}$; turn off the heating device; start the motor to accelerate the rotation of the test piece until the test piece bursts; and record the rotation speed at this moment.

5.6.3.5 High temperature test: Heat the test piece to $200^{\circ}\text{C}\pm 2^{\circ}\text{C}$ at $300\text{r}/\text{min}$ in the test chamber and keep it for $15\text{min}\pm 10\text{s}$; or place the test piece fixed on the test fixture and the fixing fixture in the oven, and heat them to $200^{\circ}\text{C}\pm 2^{\circ}\text{C}$; keep for $15\text{min}\pm 2\text{min}$; and then install it immediately on the test axis of the testing machine. Adjust the angular acceleration to $200\text{r}/\text{min}\cdot\text{s}^{-1}$; start the motor to accelerate the rotation of the test piece until the test piece bursts and record the rotation speed at this moment.

5.6.3.6 After the test is completed (such as a high-temperature test, cooling is required after the test), open the test chamber and take out the test piece fragments.

5.6.4 Test report

The limit rotation speed when the test piece rotates on the rotate strength testing machine under normal temperature or high temperature conditions until bursting is the rotate bursting test strength at normal temperature or high temperature; when the test piece reaches the upper limit of the equipment speed and still does not burst, record the upper limit speed as the test result, and indicate not bursting.

5.6.5 Expression of results

7 Marking, Packaging, Transportation and Storage

7.1 Marking

7.1.1 The non-working surface of the facing shall have the manufacturer's name or trademark, production date or batch number.

7.1.2 The product name, this Document number, model specification, product quantity, category, specified coefficient of dynamic friction, manufacturer name or trademark, address, etc. shall be printed on the four sides of the packaging box of the facing.

7.2 Packaging

7.2.1 The facings shall be packed tightly and neatly into clean, dry, strong and durable packaging boxes.

7.2.2 Each packaging box shall be installed facings of the same model and specifications.

7.2.3 Each packaging box shall be accompanied by a product qualification certificate.

7.3 Transportation

During transportation, the facings shall not be damaged or contaminated by oil or water.

7.4 Storage

The facings shall be stored in a ventilated, dry room with a flat floor.

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Linkin: <https://www.linkedin.com/in/waynezhengwenrui/>

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