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AUTOMOBILE INDUSTRY STANDARD

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Automobile micromotor commutator

汽车微电机用换向器

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Automobile micromotor commutator

1 Scope

This document specifies the terms and definitions, requirements, test methods, inspection rules, marking, packaging, transportation, storage of automobile micromotor commutator.

This document applies to 12 V and 24 V automobile micromotor commutator (hereinafter referred to as commutators).

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, for dated references, only the version corresponding to the date applies to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 1800.1 Geometrical product specifications (GPS) - ISO code system for tolerances on linear sizes - Part 1 - Basis of tolerances, deviations and fits

GB/T 1804 General tolerances - Tolerances for linear and angular dimensions without individual tolerance indications

GB/T 2423.3 Environmental testing - Part 2: Testing method - Test Cab: Damp heat, steady state

GB/T 2829 Sampling procedures and tables for periodic inspection by attributes (Apply to inspection of process stability)

GB/T 4340.1-2009 Metallic materials - Vickers hardness test - Part 1: Test method

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Micromotor commutator

A component, that regularly changes the current direction of the armature winding, on the automotive micromotor.

Based on the centerline of the commutator hole, the extreme difference in the distance, from each commutator segment to the centerline, which is measured at the same section.

3.9

Bar to bar value of cylindrical commutator

The difference in the distance, between two adjacent commutator segments to the centerline of the inner hole.

3.10

Endface run-out value of flat commutator

Taking the axis of the inner hole of the commutator as the benchmark, the measured perpendicularity of each commutator segment to the axis on the same endface; take the extreme difference as the runout value of the endface of the product.

3.11

Bar to bar axial deviation value of flat commutator

The difference in perpendicularity, between two adjacent commutator segments to the centerline of the inner hole.

4 Requirements

4.1 General requirements

The commutator shall comply with the requirements of this document AND be manufactured in accordance with the drawings and technical documents, which are approved by the prescribed procedures.

4.2 Appearance quality

The shape of the commutator shall be complete; the working surface shall be smooth, without cracks, burrs, depressions, stains, or other defects.

4.3 Dimensions

4.3.1 The diameter and the inner diameter of the cylindrical commutator shall meet the requirements in Table 1. The inner diameter of the flat commutator shall meet the requirements in Table 2.

5.4 Test of copper surface hardness of commutator

It is carried out, according to the provisions of 6.7 in GB/T 4340.1-2009. Take 3 pieces of commutator segments, randomly from the specimen, for surface treatment. It shall be flat and smooth, without oil stains; the roughness is Ra0.4 μm. The applied force during the test is 49.03 N; the diamond is 136° quadrangular pyramid Vickers indenter; the pressure holding time is 15 s. Take the average value of 3 test data, as the final hardness value.

5.5 Measurement of contact resistance

Use an electric bridge, micro-ohmmeter or other similar instruments, to make measurement. One end of the instrument is clamped in the middle of the two insulating grooves (that is, the middle position of the carbon sheet), whilst the other end is clamped on the corresponding commutator hook, to carry out the testing. Directly read out the data, which is the contact resistance value.

5.6 Insulation withstand voltage test

5.6.1 Insulation withstand voltage test between adjacent commutator segments

Place the commutator on the inter-segment withstand voltage tester. Keep the commutator segment in good contact with the electrodes. Then apply the test voltage, for a duration, which is specified in Table 3.

5.6.2 Dielectric withstand voltage test between commutator segment and inner hole

Insert the additional shaft into the inner hole of the commutator. Clamp it on the sheet hole withstand voltage tester. Apply the test voltage, for a duration, which is specified in Table 3, between the commutator segment and the additional shaft.

5.7 Overspeed test

5.7.1 Sample preparation

After the sample is finished, the radial runout value of the cylindrical commutator shall not be greater than 0.01 mm; the bar to bar value shall not be greater than 0.002 mm; the endface runout of the flat commutator shall be not more than 0.01 mm; the bar to bar axial deviation value shall not be greater than 0.002 mm.

5.7.2 Test preparation

Load the sample into the guiding shaft. Choose one of the commutator segments as the mark, for the starting point of measurement. Use the commutator inter-segment error comprehensive tester (special testing equipment for the commutator industry) OR roundness meter and other similar instruments, to record the measurement curve. The cylindrical commutator reads out the radial circular runout value and the bar to bar

value. The flat commutator reads out the endface runout value and the bar to bar axial deviation.

5.7.3 Normal temperature overspeed test

Install the sample on the connecting shaft of the overspeed test bench. Run it at the test speed and test time, which is specified in Table 4, at room temperature. Remove the commutator and place it for 30 minutes. Use a comprehensive tester or roundness tester for the error between the commutator segments, or other similar instruments, to record the measuring. The cylindrical commutator reads the radial circular runout value and the bar to bar. The flat commutator reads the end face runout value and the bar to bar axial deviation. Make a corresponding comparison with the measurement curve, before the test. Take the maximum value of the change, before and after the test.

5.7.4 High temperature overspeed test

Put the sample into a thermal cycle oven, at the specified temperature. Take it out after preheating for 30 min. Put it on the overspeed test bench, under the heat preservation state. Then run it, according to the test speed and test time, which are specified in Table 5. Remove the commutator. Place it at room temperature for 45 minutes. Use a comprehensive tester or roundness tester for the error between the commutator segments, or other similar instruments, to record the measuring. Read out the radial circular runout and the bar to bar value. Compare it with the measuring curve before the test. Take the maximum value of the change, before and after the test.

5.8 Radial tension test of commutator segment

The test is carried out on a tensile testing machine. Clamp the hook position of the commutator segment. Set the speed to 25 mm/min. Pull it out from the radial direction of the commutator segment.

5.9 Oil resistance test

Put the carbon flat commutator into an oil-resistant test chamber, at 60 °C ± 1 °C. Soak it in automotive ethanol gasoline, for 168 hours. After taking it out, use a micrometer, a comprehensive tester for inter-piece error or other similar instruments, to check the outer diameter deformation, the height deformation, the axial error of two adjacent commutator segments.

5.10 Vibration resistance test

Install it on the matching motor. Conduct the test, on the vibration testing machine, according to the relevant technical conditions of the matching motor.

5.11 Constant damp heat performance test

The test is carried out, according to the provisions of GB/T 2423.3.

6.4.2 The commutator shall be subject to type inspection, under the following conditions:

a) When a new product is tested for type identification;

b) When the design, process, structure or main materials of the product are changed enough to affect the performance of the product, the relevant type inspection items shall be carried out;

c) During normal mass production, it is carried once a year;

d) When the national quality supervision agency proposes to carry out type inspection.

6.4.3 Sampling method for type inspection

Sampling shall be carried out, in qualified exit-factory products. It takes 5 samples, for the test of commutator diameter and overspeed. The rest adopts the one-time sampling plan, according to the relevant provisions of GB/T 2829. The rejection quality level (RQL) is specified as 50; the determination level (DL) is specified as II; the number of judgment groups [Ac, Re] is [0, l]. If one product fails in the test, carry out the second sampling, which still adopts the one-time sampling plan in accordance with the relevant provisions of GB/T 2829, the rejection quality level (RQL) as specified as 25, the determination level (DL) as specified as II, the number of judgment groups [Ac, Re] of [0, l].

7 Marking, packaging, transport, storage

7.1 Marking

The commutator shall be packed, according to different models and specifications. The following contents shall be clearly marked, on the packing box:

a) The type and quantity of commutator;

b) The name, address or trademark of the manufacturer;

c) Precautions are marked, using the words such as "Handle with care", "Do not get wet", "Keep upwards", OR other graphic signs of packaging, storage and transportation, such as "Fragile items", "Avoid rain", "Keep upwards";

d) Date of exit-factory or batch number, etc.

7.2 Packaging

The commutator shall have a complete package, which has a certain anti-humidity and anti-vibration capabilities, to ensure no collision damage during transportation. The

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