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Tri-wheel vehicles - Axle shaft

三轮汽车 半轴

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Tri-wheel vehicles - Axle shaft

1 Scope

This document specifies the technical requirements, test methods, inspection rules, marking, packaging, transportation, and storage of tri-wheel vehicle axle shafts (hereinafter referred to as axle shafts).

This document is applicable to the design, manufacture, and product quality inspection of axle shafts for tri-wheel vehicles.

2 Normative references

The following documents contain the provisions which, through normative reference in this document, constitute the essential provisions of this document. For the dated referenced documents, only the versions with the indicated dates are applicable to this document; for the undated referenced 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 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 3077 Alloy structure steels

GB/T 5216 Structural steel with specified hardenability bands

GB/T 5617 Determination of effective depth of hardening after induction or flame hardening of steel

GB/T 10610 Geometrical product specifications(GPS) - Surface texture: Profile method - Rules and procedures for the assessment of surface texture

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 axle shaft

The axle that transmits the torque transmitted from the differential or final drive to the wheels of a tri-wheel vehicle.

NOTE: Some axle shafts can withstand bending moments.

3.2 full-floating axle shaft

An axle shaft that transmits only torque.

3.3 semi-floating axle shaft

An axle shaft that both transmits torque and withstands bending moments.

3.4 rated torque

Maximum allowable torque designed for an axle shaft.

3.5 ultimate failure torque of static torsional testing

The maximum breaking torque value during the static torsion testing of an axle shaft.

3.6 static torsional strength safety factor

The ratio of the ultimate failure torque of static torsional testing of an axle shaft to the rated torque of the axle shaft.

3.7 torsional fatigue life

The number of cycles at which cracks or fractures occur during axle shaft torsional fatigue testing.

4 Technical requirements

4.1 Axle shafts shall be manufactured in accordance with product drawings and technical documents.

4.2 Under the condition of ensuring product design performance requirements, axle shaft material shall comply with the chemical composition, mechanical properties, and other relevant requirements required by GB/T 3077 and GB/T 5216. The recommended materials for axle shafts are 40Cr, 40CrH, 42CrMo, 42CrMoH, 40MnB, 40MnBH, and 50CrVA. Other materials that meet the requirements of this document can also be used.

4.3 It is recommended to use the surface medium frequency quenching process after pre-tempering treatment. Under the condition of ensuring the performance index requirements of the axle shaft, other heat treatment processes can be used, such as the surface medium frequency quenching process after normalizing treatment.

4.4 After heat treatment of the axle shaft, the surface hardness and hardened layer depth shall meet the following requirements:

-- The recommended core hardness value of the axle shaft after pre-tempering treatment is 24 HRC~30 HRC, and the recommended core hardness value of the axle shaft made of 42CrMo and 42CrMoH materials after pre-tempering treatment is 28 HRC~36 HRC;

-- The surface hardness of the rod after medium frequency quenching treatment is not less than 52 HRC, and the spline can be reduced by 3 HRC; the depth of the hardened layer of the rod ranges from 10% to 20% of the diameter of the rod, and the change in the depth of the hardened layer is not greater than 5% of the diameter of the rod;

-- The effective depth of the quenched and hardened layer at the spline is measured from the minor diameter of the spline, and its depth is not less than 10% of the major diameter of the spline; the length of the non-quenching area of the spline is measured from the end of the spline, and the maximum value is 10 mm;

-- The effective depth of the hardened layer at the root fillet of the axle shaft flange is measured along the direction of the fillet, the depth of the hardened layer is not less than 5% of the root diameter of the axle shaft flange and is not greater than the upper limit value of the effective depth of the quenched and hardened layer at the rod; the hardness of the semi-floating axle shaft flange shall be 180 HB~240 HB.

4.5 Roughness shall meet the following requirements:

-- For the installation end face of the flange, it shall not be larger than *Ra*3.2;

-- The surfaces of the non-processed rod and the fillet at the rod root are rough surfaces. For the processed rod, it is not larger than *Ra*6.3 (if shot-peened surface, it is allowed to be not larger than *Ra*12.5), and for the fillet at the processed rod root, it is not larger than *Ra*3.2;

-- For the mating surface of the bearing and oil seal, it is not larger than *Ra*1.6;

-- For the spline outer circle centering surface, it is not larger than *Ra*1.6;

-- For the tooth side centering surface, it is not larger than *Ra*3.2.

4.6 There shall be no defects such as cracks inside the axle shaft.

4.7 The cumulative pitch tolerance, tooth profile tolerance, and tooth composite tolerance of the axle shaft spline teeth shall comply with the requirements of the product drawing.

4.8 There shall be no defects such as folds, dents, scratches, or cracks on the surface of the axle shaft. The surface of the rod may show signs of cleaning defects. The depth of

6 Inspection rules

6.1 Factory inspection

6.1.1 Each axle shaft shall be inspected by the manufacturer before it can leave the factory. The product shall be accompanied by a certificate of conformity when it leaves the factory.

6.1.2 See Table 1 for factory inspection items and the classification of non-conformance. The manufacturer shall follow the inspection sampling and judgment rules specified in GB/T 2828.1. For spline form and position tolerances, material requirements, roughness, internal defects, and surface quality, the manufacturer shall sample and inspect whether the axle shaft complies with the provisions of Chapter 4. It is recommended to use normal inspection with a single sampling plan, the inspection batch size is the daily (or hourly) output of the product or the quantity of each packaging batch, the inspection level is general inspection level-II, and the acceptance quality limit (AQL) is 4.0.

6.2 Type inspection

6.2.1 Type inspection shall be carried out whenever one of the following situations occurs:

a) Pattern evaluation of trial production of new products or old products transferred to another factory for production;

b) During formal production, when there are major changes in structure, materials, and processes, which may have effects on product performance;

c) When production is resumed after a long time (more than half a year) of suspension;

d) When mass-produced products are inspected periodically (at least once every six months);

e) When the factory inspection results are significantly different from the last type inspection;

f) When the national quality supervision organization requests type inspection.

6.2.2 The inspection items and the classification of non-conformance of type inspection are shown in Table 1.

6.2.3 The inspection items that do not meet the requirements of Chapter 4 are nonconforming items (defects) and are divided into Category A nonconforming items and Category B nonconforming items according to their importance on the quality

6.2.5 The judgment rules for type inspection are as follows.

-- In each nonconforming category, when the number of nonconforming samples is not greater than Ac, the category is evaluated as qualified, and when the number of nonconforming samples is not less than Re, the category is evaluated as unqualified. When all nonconforming categories are qualified, the final assessment is qualified; when one or more nonconforming categories are evaluated as unqualified, the final assessment is unqualified.

-- If a failure occurs due to product quality problems, the testing shall be stopped and the product will be treated as unqualified.

6.3 Inspection under special circumstances

For other forms of inspection, the sampling quantity and judgment rules can be determined according to the corresponding requirements, and the test results shall comply with the provisions of this document.

7 Marking, packaging, transportation, and storage

7.1 Marking

The outer end of an axle shaft flange shall be marked with the manufacturer's mark.

7.2 Packaging

7.2.1 Axle shafts shall be packaged with anti-rust and anti-collision packaging methods.

7.2.2 The following documents shall be attached when axle shafts are packed:

a) Product certificate;

b) User feedback form;

c) Packing list.

7.2.3 The pictorial mark on the outside of the packaging box shall comply with the provisions of GB/T 191, and shall indicate the following:

a) Manufacturer's name and address;

b) Product name and specifications;

c) Implementation standard number;

d) Mass (net weight and gross weight including packaging), in kilograms (kg);

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