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Test method for constant velocity universal joint and assemblies for automobiles

汽车等速万向节及其总成试验方法

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Test method for constant velocity universal joint and assemblies for automobiles

1 Scope

This standard specifies the test methods for constant velocity universal joint and assemblies for automobiles.

This standard applies to the test of constant velocity universal joint and assemblies for automobiles.

2 Normative references

The following documents are essential to the application of 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) are applicable to this standard.

JB/T 10189-2010 Rolling bearing - Constant velocity universal joints and assemblies for automobiles

3 Terms and definitions

The terms and definitions as defined in JB/T 10189-2010 as well as the following terms and definitions apply to this standard.

3.1

Universal joint

An articulated mechanical component that can transmit torque and rotational motion from one shaft to another when the angle between the two shafts remains unchanged or changes.

3.2

Constant velocity universal joint

A universal joint where the instantaneous angular velocities of the input shaft and output shaft are equal at all working angles.

3.3

Interconnecting shaft

The solid (or hollow) shaft that connects the constant velocity joint on the side of the differential or the end reduction gear and the constant velocity joint on the wheel side.

3.4

Side shaft

A component which is usually installed between the differential or the end reduction gear and the wheel, consists of one or two constant velocity universal joints, interconnecting shafts and other parts.

3.5

Fixing joint

Constant velocity joints that can only change the working angle.

3.6

Plunging joint

Constant velocity universal joint that can not only change the working angle but also perform axial telescopic sliding movement.

3.7

Driveshaft size

Driveshaft sizes can be classified in two ways. Indicate the carrying capacity of the drive shaft, which can be directly classified by the torque value that the drive shaft can carry. For example, if the driveshaft size is 1500, it indicates that the carrying capacity is 1500 N • m. It can also be classified according to the nominal diameter of the interconnecting shaft on the drive shaft. At this time, the corresponding torque value that the drive shaft can carry can be found by checking the JB/T 10189-2010.

3.8

Universal joint size

Indicate the bearing capacity of the universal joint, which can be directly classified by the torque value that the universal joint can bear. For example, if the specification of the universal joint is 1500, it indicates that its bearing

3.10

Torsion of maximum, T_m

The maximum value of torque on the relationship curve between torque and torsion angle as shown in Figure 1.

3.11

Static torsion strength

The static torsion strength of the drive shaft, universal joint or interconnecting shaft is used to express its load-bearing capacity, usually expressed by Johnson's apparent elastic limit and/or maximum torque.

3.12

Quasi-static torsion strength

The quasi-static torsion strength of the drive shaft, universal joint or interconnecting shaft is used to express its structural strength and the low-speed dynamic high-torque characteristics of the automobile.

3.13

Endurance

The endurance of a universal joint is used to express its durability characteristics.

3.14

Torsional fatigue

The torsional fatigue of the drive shaft, universal joint or interconnecting shaft is used to express the fatigue resistance of the structure.

3.15

Bending angle

The supplementary angle of the angle between the input shaft and the output shaft of the universal joint.

3.16

Displacement

The stroke of the telescopic sliding movement of the movement joint.

3.17

Axial clearance

The sum of the axial clearance between the parts on the constant velocity universal joint or the drive shaft under a certain axial force.

3.18

Bending torque

The torque required to swing the universal joint under specified conditions.

3.19

Rotational torque

The torque required to rotate the universal joint under specified conditions.

3.20

Rotational blacklash

The sum of the rotational blacklash between the parts on the constant velocity universal joint or the drive shaft under a certain torque.

4 Test method

4.1 Static torsion strength

4.1.1 Test requirements.

The test equipment shall be able to apply sufficient torque, to make the entire drive shaft, universal joint or interconnecting shaft test until it fails. In order for the universal joint to be tested at a certain angle, the test equipment shall also have appropriate means to impose an angle on the universal joint.

The test equipment shall be able to continuously record the characteristics of the torsion angle of the drive shaft, universal joint or interconnecting shaft with torque.

4.1.2 Test procedure.

4.1.2.1 As shown in Figure 2, when the bending angle of the universal joints at both ends is 0° or under the specified bending angle, torque is applied at a rate of 30°/min ~ 200°/min (recommended value is 180°/min).

environment temperature.

The test program is usually derived from the statistical analysis results of the road spectrum of the vehicle. Appendix A (informative) gives a typical example of a multi-section test program.

4.4.2 Test procedure.

4.4.2.1 Universal joints and drive shafts shall be tested according to multi-section procedures.

4.4.2.2 The direction of torque application and the way of torque transmission between the two universal joints shall be consistent with the loading.

4.4.2.3 Before the formal life test, run-in for 24 hours according to the test procedure; the load is half the torque of the standard test procedure.

4.4.2.4 Use wind to cool each universal joint and ensure that the outer surface of the universal joint has wind passing through at each test angle.

4.4.2.5 If the surface temperature of a universal joint exceeds the set value, or there is abnormal vibration, noise or gap, it shall stop the test.

4.4.2.6 After completing the specified number of test cycles, it shall disassemble the universal joint and the make grading according to the wear condition of each part.

4.4.2.7 Appendix B (informative) gives the evaluation method of the wear condition of universal joint parts.

4.5 Displacement and bending angle

4.5.1 Test requirements.

Figure 5 shows the relationship between displacement and bending angle. The test equipment shall be able to bend the angle, move the interconnecting shaft and rotate the drive shaft, at a speed of 30 r/min ~ 120 r/min. Use a recording device to record the displacement and bending angle.

4.9.2 Test requirements.

Fix both ends of the drive shaft on the test bench with suitable clamps. The bending angle of the two universal joints is 0°; the clamps shall be able to withstand the test torque. The test bench shall have the ability to support the drive shaft or universal joint to be smoothly loaded to the specified torque.

The test bench shall be able to measure the rotational blacklash between two reference points, so that the effect of elastic deformation of the shaft can be eliminated. The measurement accuracy shall be within: ±1'. It shall record the angle change value and be able to draw the change curve composed of angle and torque.

4.9.3 Test procedure.

Fix the drive shaft on the test bench without preload or deformation in the axial or radial direction. Whether it is used as the test piece alone or as a part of the tested drive shaft assembly, the plunging joint shall be set at its design position. When the design is not specified, the plunging joint shall be in the theoretical design position or according to customer requirements.

Apply torque to the drive shaft or component. The torque value starts from 0 N • m and increases to the specified torque; then returns to 0 N • m and then increases to the specified torque in the reverse direction; finally returns to 0 N • m. At this time, the forward and reverse rotation speed shall not exceed 60°/min. Record the torque angle change curve as shown in the Figure 10.

The arrow in Figure 10 indicates the direction of the loading cycle: from point O to point P, back to point O, to point Q, then back to point O. Point A, point B, point C, point D are the intersection points of the extended stiffness line and the 0 N • m torque. These straight lines shall be obtained from the graph using linear regression.

For some drive shaft assemblies or parts, point A and point B (or point C and point D) will be the same point. The rotational blacklash is the maximum value of A-C angle value or B-D angle value.

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