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ASSOCIATION STANDARD

T/CSAE 55-2017

Relaxation resistance test method of automobile spring steel

汽车弹簧钢松弛抗力试验方法

(English Translation)

Issued on: November 3, 2017 **Implemented on: November 3, 2017**

Issued by: China Society of Automotive Engineers

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Foreword

This standard is prepared in accordance with the rules given in GB/T 1.1-2009.

Appendix A of this standard is an informative appendix.

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This standard was proposed by the Material Branch of the Chinese Society of Automotive Engineers.

This standard was approved by the Chinese Society of Automotive Engineers.

This standard was first issued in November.2017.

4 Test principle

For automotive spring steel, people are more concerned about the mechanical properties of the material under tension and compression. Bauschinger effect of materials Quality is the directionality of dislocation resistance. When the forward deformation, as the strain increases, the flow stress increases;

The variable stress decreases, and the macroscopic performance is the Bauschinger effect. For elastic components, it is the embodiment and characterization of the relaxation resistance. So the package the magnitude of each parameter of the Singh effect also largely reflects the relaxation resistance of the material.

sigmap

-sigmap

g ETC = FG

epsilonp

epsilon0

Figure 1 Schematic diagram of the Bauschinger effect parameters and ETT

14179-Test method for automobile spring steel relaxation resistance.indd 2.2017/11/7 9.58.36 According to the relevant definition of the Bauschinger effect of a material, we can obtain the following Bauschinger effect parameters.

a) the strain characterized by the Bauschinger strain beta-line DE;

b) ESC-BDE area of Bauschinger;

c) Relaxation resistance index. ETC . The larger the value, the better the material's resistance to relaxation.

5 Sample

In order to prevent the sample from being unstable during the tensile and compression test, the sample is processed into a short gauge rod-shaped sample, and the aspect ratio of the gauge section of the sample is <= 2, After processing, the surface of the sample is smooth and no visible scratches.

The specific size is determined according to the material specifications. Appendix A is a

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reference case for the tensile and compression sample size.

6.1 Test system

The testing machine should be able to provide the axial test force and minimize the bending moment and torque generated on the sample;

The test force shall be applied smoothly to the specimen;

The force measuring system of the testing machine is calibrated according to GB/T 16825.1-2008, and its accuracy is level 1 or better. Can pull the material test system for the compression test shall be capable of fully recording the stress-strain curve during the loading and unloading process.

6.2 Extensometer

The extensometer required for the relaxation resistance test should have sufficient resolution to ensure that sufficient tests are recorded throughout the test Data, the specification of the extensometer should be consistent with the dimension of the parallel end of the sample.

12160 Class 1 or better accuracy requirements.

6.3 Sensor

The load and displacement sensors or other recording equipment used in the relaxation resistance test should have sufficient resolution to ensure that Record sufficient test data during the inspection. The recommended load sensor or other recording device should have a resolution of 1 N or better, the load and displacement sensors meet the accuracy requirements of Class 1 or better than GB/T 16825.1 and GB/T 12160.

6.4 Fixtures and fixtures

Fixtures and fixtures shall ensure the test principle and obtain accurate results of material relaxation resistance evaluation.

7.1 General

The test load of automobile spring steel for relaxation resistance includes a cyclic loading and a forward and reverse loading. Cyclic loading process. forward Strain loading-unloading to zero-reloading to flow stress >= sigmaP; forward and reverse loading process. forward pre-strain loading-unloading to zero-Reverse loading until the absolute value of rheological strain >= sigmaP. Record the rheological curves during the above loading process to determine and calculate the relevant Bauschinger 14179-Test method for automobile spring steel relaxation resistance.indd 3.2017/11/7 9.58.36 14179-Test method for relaxation resistance of automotive spring steel.indd 4.2017/11/7 9.58.36 14179-Test method for

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automotive spring steel relaxation resistance.indd 5.2017/11/7 9.58.36 the stress-strain curve is shown in Figure 4. The reverse loading line is the BE curve. After passing point B, it is an extension of the AB straight line.

The horizontal line intersects at point D, where the length of ED is the Bauschinger strain beta; the total energy consumption E'P of the pre-strain under forward loading is shown in Figure 4 a).

The total energy consumption EBEE ' in reverse loading is shown in Figure 4 b). BDEE ' trapezoidal area EBDEE ', which is the reverse loading effect energy and the Bauschinger effect energy the sum is shown in Figure 4 c). The calculation method of the curve enclosing area uses the principle of calculus to approximate the adjacent data points into a trapezoid.

Based on the stress-strain data, the area of each trapezoid is obtained, and then summed to obtain the enclosed area of the curve, as shown in Figure 3.

EBEE ' EBDEE '

ggg

E ' epsilonP

sigmaP

-sigmaP

sigma sigma

epsilon

beta beta

0 0B B

D DE E

E ' E'epsilonP epsilonP sigmaP sigmaP-sigmaP -sigmaP

b) EBEE ' for reverse loading energy c) BDEE ' trapezoidal area EBDEE ' a) total energy consumption for forward loading E ' P

Figure 4 Data processing parameters of forward and reverse loading curve

8.2.1 Total energy consumption E'P in forward loading

Total forward energy E'P can be calculated from the stress-strain curve of forward pre-strain loading. E'P can be characterized as a unit body.

The total energy consumption of the pre-strain loading of the product is shown in Figure 4 a). The area enclosed by the curve is the value of E'P. It can be obtained by discrete

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