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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 14229-2021

Replacing GB/T 14229-1993

Test method of surface contact strength for gear load capacity

齿轮接触疲劳强度试验方法

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1 Scope

GB/T 14229-2021 is the Chinese national standard on test method of surface contact strength for gear load capacity, in the field of mechanical systems and components. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 21 May 2021 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 December 2021. Classification: ICS 21.200, CCS J17. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document specifies the principles, objectives, methods, equipment, failure criteria, procedures, data processing, and test reports for surface contact strength for gear load capacity. This document is applicable to the basic data required for designing the contact fatigue load-bearing capacity of involute cylindrical gear teeth made of steel or cast iron. It is also suitable for comparing and analyzing the contact fatigue performance of gears under different materials, processes, and profile modifications. Similar tests on gears made of other materials or non-involute gears can be used as a reference.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 1356, Cylindrical gears for general and heavy engineering -- Standard basic rack tooth profile

GB/T 3358.1, Statistics -- Vocabulary and symbols -- Part

3 Terms and definitions, codes

For the purposes of this document, the terms and definitions defined in GB/T 3358.1, GB/T 3480.1 and GB/T 3480.2, as well as the codes in Table 1, apply.

4 Test principles

4.1 By subjecting the test gear pair to meshing operation under controlled load, the number

of cycles required for contact fatigue failure of the tooth surface (or failure after exceeding the tooth surface stress cycle base N0) is determined, or the stress (load) level at which contact fatigue failure of the tooth surface occurs at a given number of cycles (e.g., N0) is determined. After statistical processing of the test data, a "stress-cycle count" curve or "load-life" curve 1 reflecting the contact load capacity of the test gear

1 The stress-cycle curve or load-life curve is also known as the S-N curve. is obtained, or it is used to compare the contact fatigue performance of gears under different materials, different processes, and different modification methods. An example of the test principle is shown in Figure 1.

4.2 Because the dispersion of fatigue test data is unavoidable, its distribution only has statistical significance when a sufficient amount of test data is obtained. Therefore, in practical applications where only a limited number of test data points can be used for analysis or comparison, the test process shall be strictly controlled, and the limitations of the conclusions shall be taken into account.

5 Test objectives

5.1 Basic data determination When test gears are manufactured using specific materials and processes, the contact fatigue limit stress or S-N curve of that type of gear can be obtained by processing the test data. This stress can then be used as the basis for the strength design of the material and process. Specific requirements are as follows:

a) For high-cycle fatigue life design, the durability fatigue limit stress shall be determined;

b) For finite-life design, the S-N curve for the corresponding life range shall be determined;

b) are required, or when there is no explicit requirement, a complete S-N curve shall be determined. Test methods are detailed in Chapter 6.

5.2 Performance comparison

5.2.1 When test gears are manufactured using different materials or processes, the influence of various factors on the contact fatigue performance of the gears can be evaluated by processing the test data. These factors include, but are not limited to. - Gear material; - Gear heat treatment; - Machining process (grinding, shaving, etc.); - Surface treatment (e.g., plating, shot peening, ultra-precision machining, etc.); - Machining process; - Gear geometric parameters; - Gear surface modification; - Lubricating oil; - Operating temperature; - Pitch circle velocity.

5.2.2 Based on the comparison in 5.2.1, the materials, processes, and lubrication conditions of the gears can be optimized. To improve efficiency, after thorough evaluation, it is advisable to conduct tests at finite-life stress levels. The number of test points shall be determined according to the dispersion of the test results. The number of test points for

each comparison shall not be less than 5.

5.2.3 If it is necessary to compare the ultimate fatigue stress of durability, the test shall be conducted in accordance with the requirements of