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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

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Metallic materials - Principles and designs for multiaxial fatigue testing

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Table of Contents

Foreword

This document is in accordance with GB/T

1.1-2020 "Standardization Work Guidelines Part 1.Structure and Drafting Rules of Standardization Documents"

Drafting.

The revision of this document adopts ISO /TR

12112.2018 ``Design Guidelines for Multiaxial Fatigue Tests of Metallic Materials'', the document type is determined by ISO technical

The technical report is adjusted to the national standardization guiding technical document of our country.

This document and ISO /TR

Compared with 12112.2018, there are more adjustments in the structure. The structure number changes between the two files are compared.

See Appendix A for the list.

This document and ISO /TR

Compared with 12112.2018, there are more technical differences.

The vertical single line ( ) is marked. For a list of these technical differences and their reasons, see Appendix B.

Introduction

Industrial components are subjected to different forms of multi-axial fatigue loads, and fatigue cracks usually originate from surface defects or geometric discontinuities of the components.

Continuation, so its fatigue performance is mainly affected by the plane biaxial stress state. The biaxial stress state includes the magnitude of the principal stress in the plane and the sign phase

The equal double tension state (existing in internal pressure, torsion and thermal load tests), the pure shear state with the same in-plane principal stress and the opposite sign (such as

Torsion and pure shear test) and the biaxial stress state in between.

Because the uniaxial test is simple and low-cost, the global fatigue test data is mostly carried out in the uniaxial state. Therefore, another objective of multi-axis testing

The goal is to develop a material mechanics model to realize the correlation between multi-axis and single-axis under specific conditions.

In order to ensure the reliability and consistency of multi-axial fatigue test research in different laboratories, in the process of testing and collecting data

The relevant recommendations and regulations of this document should be followed.

Design Guidelines for Multiaxial Fatigue Tests of Metallic Materials

1 Scope

This document describes the general principles of multiaxial fatigue testing and establishes design criteria for specific types of specimens for multiaxial fatigue testing.

This document is applicable to multiaxial tension and torsion fatigue test, axial tension (compression) torsion fatigue test under internal and external pressure, and biaxial tension or compression

stress test.

2 Normative references

The contents of the following documents constitute the indispensable clauses of this document through normative references in the text. Among them, dated quotations

Only the version corresponding to that date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

This document.

GB/T

6398 Fatigue test fatigue crack growth method of metallic materials (GB/T

6398-2017,ISO

12108.2012, MOD)

GB/T

12160 Calibration of Extensometer System for Uniaxial Test of Metallic Materials (GB/T

12160-2019,ISO

9513.2012, IDT)

GB/T

13992 Metal Pasted Resistance Strain Gauge

GB/T

16825.1 Inspection of static uniaxial testing machine Part 1.Inspection and calibration of force measuring system of tensile and/or force testing machine

(GB/T

16825.1-2008,ISO

7500-1.2004, IDT)

GB/T

25917.1 Uniaxial fatigue test system Part 1.Dynamic force calibration (GB/T

25917.1-2019,ISO

4965-1.

2012, IDT)

GB/T

28855 Silicon-based pressure sensor

GB/T

38250-2019 Coaxiality inspection of metal material fatigue testing machine (ISO

23788.2012, IDT)

GB/T

40410-2021 Axial-torsional strain control method for multiaxial fatigue test of metallic materials

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3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Biaxial strain ratio

strain

ratio

The ratio of the smaller principal strain to the larger principal strain on the surface.

3.2

Biaxial stress ratio

stress