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Steel wire ropes—Fatigue testing method

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Foreword

This document is drafted in accordance with the provisions of GB/T 1.1-2020 Directives for Standardization - Part 1: Structure and Drafting Rules for Standard Documents.

This document supersedes GB/T 12347-2008 Steel Wire Ropes - Bending Fatigue Test Methods and GB/T 38814-2020 Steel Wire Rope Slings - Fatigue Test Methods. Based primarily on GB/T 12347-2008, this document integrates the content of GB/T 38814-2020. Compared with GB/T 12347-2008, in addition to structural adjustments and editorial revisions, the main technical changes are as follows:

a) Revised the description of the scope (see Chapter 1, corresponding to Chapter 1 of GB/T 12347-2008);

b) Revised the definitions and descriptions of terms including planar reverse bending fatigue test, test sheave, and load movable pulley (see Chapter 3, corresponding to Chapter 2 of GB/T 12347-2008);

c) Added definitions and descriptions of terms such as axial tension fatigue test and combined tension-bending fatigue test (see Chapter 3);

d) Added provisions for symbols and their explanations (see Chapter 4);

e) Revised the description of the principle for steel wire rope bending fatigue test (see 5.1, corresponding to Chapter 3 of GB/T 12347-2008);

f) Added the principles for axial tension fatigue test of steel wire ropes (slings) and combined tension-bending fatigue test of steel wire rope slings (see 5.2 and 5.3);

g) Revised the requirements for steel wire rope bending fatigue testing machines (see 6.1, corresponding to 4.1 of GB/T 12347-2008);

h) Added requirements for axial tension fatigue testing machines of steel wire ropes (slings) and combined tension-bending fatigue testing machines of steel wire rope slings (see 6.2);

i) Revised the specifications for steel wire rope bending fatigue test specimens (see 7.1, corresponding to 5.1 of GB/T 12347-2008);

j) Added requirements for axial tension fatigue test specimens of steel wire ropes (slings) and combined tension-bending fatigue test specimens of steel wire rope slings (see 7.2 and 7.3);

k) Revised the procedure for steel wire rope bending fatigue test (see 8.2, corresponding to Chapter 6 of GB/T 12347-2008);

l) Added procedures for axial tension fatigue test of steel wire ropes (slings) and combined tension-bending fatigue test of steel wire rope slings (see 8.3 and 8.4);

m) Revised the requirements for test reports (see Chapter 9, corresponding to Chapter 7 of GB/T 12347-2008).

Attention is drawn to the fact that certain content of this document may involve patents. The issuing authority of this document shall not be liable for identifying any such patents.

This document is proposed by the China Iron and Steel Industry Association.

This document is administered by the National Technical Committee 183 on Steel of Standardization Administration of China (SAC/TC 183).

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This document was first issued in 1990, first revised in 1996, second revised in 2008, and this is the third revision, which incorporates the content of GB/T 38814-2020 Steel Wire Rope Slings - Fatigue Test Methods.

Steel wire ropes—Fatigue testing method

1 Scope

This document specifies the principles, test equipment, test specimens, test procedures and test reports for steel wire rope fatigue tests.

This document is applicable to the relevant fatigue performance tests of steel wire ropes and steel wire rope slings, including steel wire rope bending fatigue test, axial tension fatigue test of steel wire ropes (slings) and combined tension-bending fatigue test of steel wire rope slings.

2 Normative References

The contents of the following documents are incorporated as indispensable provisions of this document through normative reference in the text. For dated reference documents, only the edition corresponding to the stated date applies to this document; for undated reference documents, the latest edition (including all amendments) applies to this document.

GB/T 3075 Metallic Materials - Fatigue Testing - Axial Force Control Method

GB/T 8358 Steel Wire Ropes - Method for Determination of Breaking Force

GB/T 25917.1 Uniaxial Fatigue Testing Systems - Part 1: Dynamic Force Calibration

JJG 556 Axial Loading Fatigue Testing Machines

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1 plane single bending fatigue test

A reciprocating bending fatigue test in which the test specimen is bent at a certain angle in one direction via a testing pulley within the same plane.

3.2 plane reverse bending fatigue test

A reciprocating bending fatigue test in which the test specimen is bent at a certain angle in one direction via a testing pulley within the same plane, followed by bending at a certain angle in the reverse direction.

3.3 axial tensile fatigue test

A fatigue test performed on the test specimen under the action of cyclic axial tensile test force.

3.4 tensile-bending composite fatigue test

A fatigue test in which an external force is used to form a periodically varying bending angle between the center line of the test specimen and the loading line of the testing machine, and then cyclic load is applied to the test specimen.

3.5 driving pulley

A pulley or drum mounted on a bending fatigue testing machine that can rotate at a certain arc left and right to drive the test specimen to perform reciprocating bending motion within the effective length.

3.6 testing pulley

A pulley mounted on a bending fatigue testing machine that enables the test specimen to undergo reciprocating bending at a certain angle.

3.7 load free-running pulley

A pulley attached to the test specimen that, together with the applied load, subjects the test specimen to the specified tension.

3.8 bending fatigue frequency

The number of bending fatigue cycles completed by the test specimen per minute.

3.9 effective length

The length of the steel wire rope segment that undergoes fatigue loading via the testing pulley during the steel wire rope bending fatigue test.

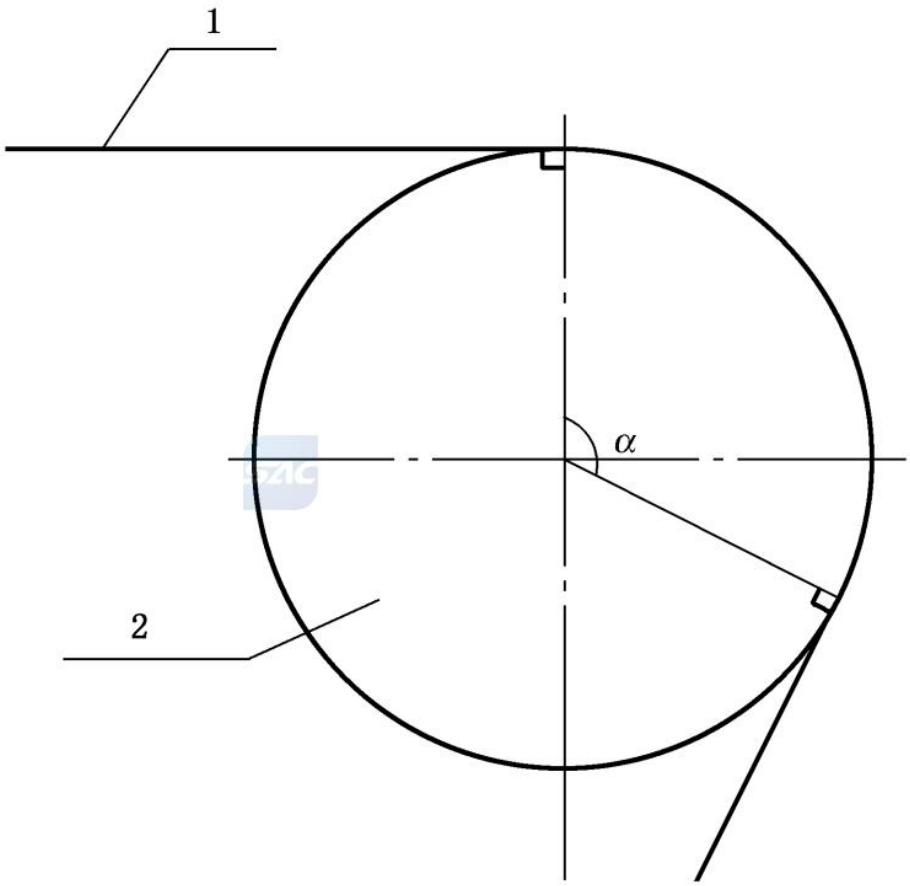
3.10 angle of contact

α

The angle formed by the normals at the two points where the test specimen winds onto and off the testing pulley during plane single and reverse bending fatigue tests.

Note: See Figure 1.

Figure 1 Schematic Diagram of Angle of Contact



Explanation of Index Numbers and Symbols

1 ——— Test specimen

2 ——— Testing pulley

α ——— Angle of contact, unit: degree (°)

3.11 steel wire rope sling

A sling with a steel wire rope as the main body and its ends fixed by specified methods.

Note: Common fixing methods include swaging, casting, splicing, clamping, wedge sleeve fastening, etc.

3.12 ferrule-securing sling

A sling formed by swaging a metal ferrule of a specified length to fix the end of a steel wire rope into a specific connection structure.

Note: The main types of ferrule-securing slings include reverse-folded ferrule-swaged slings, twin-twisted steel ferrule-swaged slings, steel joint-swaged slings, short cylindrical head-swaged slings, swaged endless slings, positioning slings, etc.