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Steel wire ropes - Determination of breaking force

钢丝绳 破断拉力测定方法

(ISO 3108:2017, Steel wire ropes - Test method - Determination of measured
breaking force, MOD)

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Steel wire ropes - Determination of breaking force

1 Scope

This document specifies the principles, specimen preparation, test equipment, test procedures, and test reports for the method to determine the breaking tensile force of steel wire ropes.

This document is applicable to the determination of breaking force of various wire rope products.

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 8706, *Steel wire ropes -- Vocabulary, designation and classification* (GB/T 8706-2017, ISO 17893:2004, MOD)

GB/T 16825.1, *Metallic materials -- Calibration and verification of static uniaxial testing machines -- Part 1: Tension/compression testing machines -- Calibration and verification of the force-measuring system* (GB/T 16825.1-2008, ISO 7500-1:2004, IDT)

GB/T 30588, *Terminations for steel wire ropes -- Molten metal socketing*

YB/T 4615, *Steel rope end resin socket*

JJG 139, *Verification regulation of Tension, Compression and Universal Testing Machines*

JJG 475, *Verification Regulation of Electronic Universal Testing Machine*

JJG 1063, *Verification Regulation of Electro-hydraulic Servo Universal Testing Machines*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 8706 as well as the followings apply.

A specimen installation method is to clamp the specimen directly into the appropriate jaws of the tensile testing machine for tensile testing.

3.9 method of wrapping

A specimen installation method that is to directly wrap the specimen in the rope groove of the winding test wheel for tensile testing.

4 Principle

Apply tensile force to the wire rope specimen. Stretch until the wire rope breaks. Determine the breaking tension of the wire rope, or stretch it to the specified tension value.

5 Specimen preparation

5.1 General requirements

5.1.1 The wire rope specimen can be intercepted by grinding wheel cutting, pressure cutting or shear cutting. The specimen taken shall avoid the molten part at the end of the wire rope.

5.1.2 In order to prevent the wire rope from loosening and the geometric position of the strands and wires from changing, sufficient loosening or clamping length shall be reserved at both ends before intercepting the specimen. Tie firmly with low carbon steel wire.

5.1.3 For unused wire ropes, test specimens shall be taken from the wire ropes that are not damaged during visual inspection. The intercepted wire rope specimen shall be straight. There shall be no bending or damage.

5.1.4 For used wire ropes, test specimens shall be taken from the wire ropes confirmed by the relevant parties.

5.1.5 The minimum effective test section length (that is, the distance between the two chucks) shall comply with the requirements in Table 1.

NOTE: For thick-diameter wire ropes, the minimum test section length is generally 6 times the wire rope pitch.

5.1.6 The total length of the specimen is equal to the length of the test section plus the clamping length at both ends of the specimen.

- 1 - Jaw seat;
- 2 - Clamping block;
- 3 - Specimen;
- 4 - Packing;
- d - Nominal diameter of wire rope;
- L - Minimum effective test section length.

Figure 2 -- Schematic diagram of specimen using method of direct gripping

5.5 Method of wrapping

5.5.1 The winding test wheel shall be selected to match the diameter of the wire rope. The ratio of the diameter of the winding test wheel to the diameter of the wire rope shall not be less than 16.

5.5.2 The diameter of the rope groove around the test wheel shall be controlled within the range of 1.06 to 1.10 times the nominal diameter of the wire rope.

5.5.3 The method of wrapping is suitable for wire ropes with a diameter not larger than 20 mm.

6 Test equipment

6.1 This test can be performed on any tensile testing machine that meets the requirements of this document.

6.2 The force measuring system of the testing machine shall comply with the requirements of GB/T 16825.1. Calibrate in accordance with JJG 139, JJG 475 or JJG 1063. Its accuracy shall be grade 1 or better.

6.3 The testing machine shall be equipped with safety protection devices to prevent wires from flying out and injuring people during the test.

7 Test procedures

7.1 Unless otherwise specified, the test is generally conducted at room temperature within the range of 10°C~35°C. For tests with strict temperature requirements, the test temperature shall be 23°C±5°C.

7.2 Mount the specimen on the tensile testing machine. Ensure that the axis of the specimen coincides with the axis of the chuck of the testing machine.

7.3 For tensile specimens produced by method of alloy poured socketing or method of resin pouring, when testing with a vertical tensile testing machine, first place the specimen in the upper and lower jaw seats. Let the specimen in the lower jaw seat hang

Annex A

(informative)

Method of grouting material pouring

A.1 Cement-based grouting material

Cement-based grouting materials are made of raw materials such as cement, aggregates, admixtures and mineral admixtures, which are measured and mixed in proportions in professional chemical plants. Add water or mix the supporting components according to the specified proportion at the place of use. Use it for bolt anchoring, structural reinforcement, prestressed tunnels, etc.

The grouting material used shall comply with the requirements of GB/T 50488.

A.2 Method of grouting material pouring

A.2.1 The mold used for pouring shall be easy to disassemble. The inner surface in contact with the grouting material shall be smooth and clean.

A.2.2 The bundling, end breaking, and surface cleaning of the specimens shall comply with the requirements of 5.2.4.

A.2.3 Place the cleaned broom head into the mold and adjust it. Pour the mixed grouting material into the mold. Use a thin steel rod to pound continuously to remove the air from the pouring body until it is filled. Then place the poured specimen at room temperature for 3h to 4 h before demoulding. Figure 1 is a schematic diagram of the sample prepared using this method.

A.3 Maintenance

A.3.1 After demoulding, the specimens are placed in a high-temperature steam curing box for steam curing. The heating rate shall not be greater than 12°C/h. After the temperature is raised to 80°C, the constant temperature (80°C±5°C) is maintained for more than 48 h until the compressive strength of the specimen cured under the same conditions reaches 80 MPa.

A.3.2 When pouring the steel wire rope, a grouting material specimen (specimen size: 40 mm × 40 mm × 160 mm) is formed at the same time and maintained under the same conditions as the steel wire rope. After the specimen is cured, the compressive strength test is carried out in accordance with the requirements of GB/T 17671. When the strength meets the requirements, a breaking tensile test of the wire rope is carried out.

NOTE 1: Generally, high-strength grouting materials are used to avoid invalid fracture locations affecting the test results.

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