YB

FERROUS METALLURGY INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 77.140.65

H 49

YB/T 5359-2020

Replacing YB/T 5359-2010

Compacted strand ropes

压实股钢丝绳

Issued on: December 09, 2020 **Implemented on: April 01, 2021**

Issued by: Ministry of Industry and Information Technology of PRC

Table of Contents

Compacted strand ropes

1 Scope

This standard specifies the definition of terms, classification and marking, ordering content, materials, technical requirements, test methods, inspection rules, acceptance methods, packaging, marking and quality certificates, safe use and maintenance of compacted strand steel wire ropes.

This standard applies to compacted strand steel wire ropes (hereinafter referred to as "wire ropes") for equipment such as mine hoisting, blast furnace hoisting, large casting, oil drilling, large hoisting, ships, offshore facilities, aerial ropeways, construction machinery, lifting machinery.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 228.1 Metallic materials - Tensile testing - Part 1: Method of test at room temperature

GB/T 238 Metallic materials - Wire - Reverse bend test

GB/T 239.1 Metallic materials - Wire - Part 1: Simple torsion test

GB/T 1839 Test method for gravimetric determination of the mass per unit area of galvanized coatings on steel products

GB/T 2104 Steel wire ropes - Packing, marking and certificate - General requirements

GB/T 8358 Steel wire ropes - Determination of breaking force

GB/T 8706 Steel wire ropes - Vocabulary, designation and classification

GB/T 21965 Steel wire ropes - Vocabulary for acceptance and defect

GB/T 29086 Steel wire ropes - Safety - Use and maintenance

NB/SH/T 0387 Grease for steel wire rope

The grease for wire rope shall comply with YB/T 4613 or NB/SH/T 0387 or the requirements agreed upon by the supplier and the buyer.

7 Technical requirements

7.1 Lay of strands

The steel wires in the strands shall be laid evenly and tightly; it shall not have manufacturing defects specified in GB/T 21965.

7.2 Lay of wire ropes

7.2.1 The wire rope shall be laid evenly, tightly and not loose (except for anti-rotation wire ropes, parallel-lay wire ropes, wire ropes with a nominal diameter greater than 80 mm); the wire rope shall not be wavy when unfolded and unloaded.

7.2.2 There shall be no significant difference in the lay length in the same wire rope.

7.2.3 When manufacturing the wire rope, the same layer of wires with the same diameter in the strand shall have the same nominal tensile strength. Wires with different diameters are allowed to use the same nominal tensile strength or wires that meet the requirements of Table 3; however, the minimum breaking tension of the wire rope or the sum of the minimum breaking tension of the wires shall meet the requirements of Appendix A.

7.2.4 The core of the wire rope shall have sufficient support, to ensure that the strands of the outer layer are laid evenly. There shall be a relatively uniform gap between each adjacent outer strand.

7.3 Wire joints

The number of joints of the wires in the wire rope shall be minimized. When the wires in the wire rope need to be jointed, butt welding shall be used (steel wires with a nominal diameter of less than 0.5 mm are allowed to be spliced). During the laying of the strands, the distance between each connection point in the strand shall not be less than 18 times the nominal diameter of the wire rope.

7.4 Greasing of wire rope

Unless otherwise required by the purchaser, the wire rope shall be evenly coated with anti-rust and lubricating grease; when the purchaser requires the wire rope to have friction-increasing properties, the wire rope shall be coated with friction-increasing grease.

7.5 Surface quality of wire rope

The surface of the wire rope shall not have manufacturing defects in GB/T 21965.

7.6 Structure of wire rope

The structure of the wire rope shall comply with the structure specified in Appendix A. Other structures may also be used after consultation between the supplier and the buyer. In the case where the purchaser only specifies the type of wire rope, the structure of the wire rope shall be determined by the manufacturer according to the requirements. Usually the purchaser specifies the structure or type of the wire rope.

7.7 Grade of wire rope

The grade of wire rope shall comply with the provisions of Appendix A. Other grades of wire rope that meet the requirements may also be used, after consultation between the supplier and the buyer.

7.8 Surface state of wire rope

The surface state of the wire rope may be smooth or coated. Steel wire ropes made of coated steel wires can use Grade A, Grade AB, Grade B coated steel wires in YB/T 5343; however, the coating levels of steel wires of the same diameter in the same layer shall be the same. All steel wires in the coated steel wire rope shall be coated. The coating level of the steel wire rope is determined by the coating level of the outer steel wire in the outer strand.

7.9 Direction and type of lay of steel wire ropes

The lay direction and type of steel wire ropes shall be one of a) to d) and determined by the purchaser; the parallel-lay compacted steel wire ropes, 4×K19 categories, 4×K36 categories shall be ordinary lay.

a) Right-hand ordinary lay (sZ);

b) Left-hand ordinary lay (zS);

c) Right-hand lang lay (zZ);

d) Left-hand lang lay (sS).

Note: The lay direction and type of the inner layer of the anti-rotation wire rope are determined by the supplier.

7.10 Nominal diameter

The nominal diameter is the nominal diameter of the wire rope and shall be determined by the supplier and the buyer when signing the contract. The nominal diameters of the wire ropes listed in Appendix A are typical nominal diameters. The nominal diameters of the wire ropes not listed are agreed upon by the supplier and the buyer and are implemented in accordance with this standard.

be divided by the actual measured length of the wire rope. The unit measured weight of the wire rope is expressed in kg/m.

8.4 Rope core of the wire rope

The compliance of the rope core shall be verified visually.

8.5 Greasing of wire rope

Verify the compliance of greasing by visual inspection.

8.6 Structure and grade of wire rope

Verify the structure of wire rope by visual inspection; verify the grade of wire rope by checking the minimum breaking force value or the sum of minimum breaking force of wire rope in the quality certificate; determine whether it complies with the standard according to Appendix A of this standard or the agreement between the two parties.

8.7 The wire rope is not loose

Untie the two symmetrical strands at one end of the wire rope, which are about two lay lengths long. When the two strands return to their original position, they shall not spread out again.

8.8 Surface quality of wire rope

The surface quality of wire rope and its strands shall be verified by visual inspection.

8.9 Determination of breaking force

8.9.1 Method 1 - Measured breaking force

8.9.1.1 The method for determining the actual breaking force of wire rope shall be in accordance with GB/T 8358.

8.9.1.2 When the measured breaking force reaches or exceeds the minimum breaking force of the wire rope and the wire rope has not broken, the test can be ended; it can be determined that the wire rope meets the minimum breaking force requirement.

8.9.1.3 If the measured breaking force does not reach the minimum breaking force of the wire rope in the first breaking force test, three additional tests are allowed. Once one test reaches or exceeds the minimum breaking force of the wire rope, it can be determined that the wire rope meets the minimum breaking force requirement.

8.9.1.4 When the wire rope breaks within a length range of 6 times the wire rope diameter from the clamp and the breaking force does not reach the minimum breaking force value specified in the standard, the test is invalid and the sample can be re-tested, but it cannot be regarded as one of the four tests.

8.9.2 Method 2 - Sum of measured breaking forces of steel wires

Tensile test is performed on a single steel wire; the breaking forces of the single steel wires after strand split are added together to obtain the sum of the measured breaking forces of the steel wires. The sum of the breaking forces of the steel wires in the wire rope is determined as follows:

a) When all the steel wires in the wire rope are tested, the measured breaking forces of each steel wire are added together.

b) When only a portion of the steel wires in the wire rope are tested, the sum of the breaking forces of the steel wires is calculated according to formula (3).

$$F=F_0+F_1N_1+F_2N_2+F_3N_3+\cdots+F_nN_n \quad \cdots\cdots(3)$$

Where:

F - Sum of breaking tensions of steel wire;

F_1, F_2, F_3, ⋯, F_n - Sum of the measured breaking tension of steel wire in one strand with the same structure and the same diameter and the calculated breaking force of the steel wire not participating in the test;

F_0 - The calculated breaking force of the steel core in the wire rope is the sum of the calculated breaking force determined by multiplying the area of the steel wire diameter before laying by the nominal tensile strength of the steel wire;

N_1, N_2, N_3, ⋯, N_n - The number of strands with the same structure and the same diameter in the wire rope.

8.9.3 Method 3 - Calculation of the measured breaking tension

Divide the total measured breaking tension of the steel wire by the coefficients given in the Tables in Appendix A.

When the calculated measured breaking force is less than the specified minimum breaking force of the wire rope, the test can be carried out again according to Method 1.

If the measured breaking force still cannot meet the specified minimum breaking tension of the wire rope, the rated breaking tension can be reduced to less than the measured value, then the test can be repeated according to method 1. In this case, the wire rope grade can be reduced according to the reduced breaking tension, or it can be redesigned.

Note: The breaking force value determined by this method is called "calculated breaking force".

8.10 Test of strand split wire

9.1.3 The choice of the above two inspection methods shall be selected by negotiation between the supplier and the buyer. If not specified in the order contract, it shall be decided by the supplier.

9.2 Performance assessment of wire ropes

9.2.1 According to the breaking tensile force or the total breaking tensile force of the wire rope, the wire rope grade shall be assessed according to Appendix A.

9.2.2 The wire rope grade used for rope making shall comply with the provisions of Table 3.

9.2.3 The tensile strength, repeated bending and torsion values of the strand split steel wire shall be assessed according to the nominal diameter of the round steel wire before the steel wire is laid and the nominal tensile strength grade of the steel wire.

9.3 Judgment rules and retest

9.3.1 Wire rope for strand split test

If one or more test items do not meet the specified requirements, the same wire rope shall be resampled for 100% strand split retest of the unqualified items of the unqualified wire rope; the unqualified items shall be evaluated according to the 100% split test specified in Table 9. If the retest results meet the specified requirements, the batch (or strip) of wire ropes will still be qualified.

If the sum of the measured breaking tensile forces of the wire ropes is unqualified, the retest shall be carried out according to method 1. If the retest results meet the specified requirements, the batch (or strip) of wire ropes will still be qualified.

9.3.2 Wire ropes tested in group batches

Wire ropes that fail the retest shall be removed from the batch of wire ropes. When there are more than 3 wire ropes in a batch, the other wire ropes in the batch shall be subject to additional tests according to the number of samples specified in Table 10. If the additional tests are qualified, the remaining wire ropes in the batch shall be qualified.

If one or more additional test results do not meet the specified requirements, the remaining wire ropes in the batch shall be sampled and tested one by one.

When a wire rope is cut into several strips for delivery, one strip is selected for sampling and testing. If it is qualified, the remaining strips are exempted from testing. Otherwise, samples shall be taken one by one for testing.

9.4 Arbitration test

When the supplier and the buyer have disputes over the test results, arbitration tests shall be conducted at a testing agency recognized by both parties with wire rope

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------