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High strength steel wire strand for building structures

建筑结构用高强度钢绞线

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High strength steel wire strand for building structures

1 Scope

This Standard specifies the terms and definitions, classification and designation, order content, material, technical requirements, inspection methods, inspection rules, marking, packing, certificate, transportation, and storage of high strength steel wire strand (hereinafter referred to as steel wire strand) for building structures.

This Standard is applicable to steel wire strand for building structures with a nominal tensile strength of not less than 1570 MPa.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

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 2976 Metallic materials - Wire - Wrapping test

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

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

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

GB/T 24191 Steel wire ropes - Determination of the actual modulus of elasticity

YB/T 4541 Zinc-5% aluminum-mixed mischmetal alloy-coated steel wire for building engineering

YB/T 5343-2015 Steel wire for ropes

3 Terms and definitions

The terms and definitions defined in GB/T 8706 and the following apply to this document.

3.1 High strength steel wire strand

A steel wire strand made of several steel wires with a nominal tensile strength of not less than 1570 MPa.

3.2 Effective cross-section area of steel wire strand

The sum of cross-section areas of all steel wires calculated from the nominal diameter of a single steel wire.

4 Classification and designation

4.1 Classification

4.1.1 Classification according to the cross-section structural form of steel wire strand

The steel wire strands, according to the cross-section structural form, are classified into 1×7, 1×19, 1×37, and 1×n. The schematic diagrams and parameters of the typical structures are shown in Table 1. According to the agreement between the supplier and the purchaser, steel wire strands of other structures and specifications may be manufactured.

4.2.2 Designation examples

Example 1: TAKE galvanized steel wire strand in conformity with GB/T 33026-2017, with a nominal diameter of φ52 mm, a steel wire strand structure of 1×127, and nominal tensile strength of 1670 MPa as an example. It is designated as:

Zn 52/1670/1×127-GB/T 33026-2017

Example 2: TAKE zinc-5% aluminum-mischmetal alloy-coated steel wire strand in conformity with GB/T 33026-2017, with a nominal diameter of φ52 mm, a steel wire strand structure of 1×127, and nominal tensile strength of 1570 MPa as an example. It is designated as:

Zn-5%Al-RE 52/1570/1×127-GB/T 33026-2017

5 Order content

The contract for ordering in accordance with this Standard shall mainly include the following contents:

a) This Standard number;

b) Product name;

c) Coating of steel wire;

d) Structure (code);

e) Nominal diameter;

f) Nominal tensile strength level;

g) Quantity (length or mass);

h) Other requirements.

6 Material

6.1 Galvanized steel wire for steel wire strands shall comply with the relevant provisions of Class A of general-purpose steel wire in YB/T 5343-2015.

6.2 Zinc-5% aluminum-mischmetal alloy-coated steel wire for steel wire strands shall comply with the relevant provisions of YB/T 4541.

7 Technical requirements

7.1 Twisting

7.1.1 The steel wire for steel wire strands shall be steel wire of the same nominal diameter (other than the center wire), the same nominal tensile strength, and the same coating category.

7.1.2 When the steel wire strands are twisted, the twist direction of adjacent layers shall be opposite; the outer layer should be right-twisted.

7.1.3 The lay length of outer layer of steel wire strand is 8~13 times the nominal diameter of the steel wire strand.

7.1.4 The distance between any two welded joints of steel wire in steel wire strand products shall not be less than 50 m. The joints shall be anti-corrosion treated. There shall be no welded joints within one lay length of the two ends. The tensile strength of the welding position shall not be less than 50% of the nominal tensile strength of the steel wire of corresponding level. The outer steel wire shall not have any form of steel wire joint.

7.2 Appearance

7.2.1 The surface of steel wire strands shall be neat and tidy, arranged neatly, without cross-dislocation, and shall not have defects such as scratches, rust, hard bending.

7.2.2 The surface of the steel wire of steel wire strands shall be smooth and clean. There shall be no folding, skip plating, cracks, pitting, scratches, or other surface defects which affect the use.

7.2.3 The steel wire strands shall have a uniform color. The surface color of zinc-5% aluminum-mischmetal alloy-coated steel wire strand, after exposure to air, is allowed to change.

7.3 Dimensions

7.3.1 Allowable deviation of length

The allowable deviation of length of steel wire strand is 0~+5% of the order length.

7.3.2 Allowable deviation of diameter

The allowable deviation of diameter of steel wire strand is 0~+3% of the nominal diameter. The ratio OF the difference between the two measurement results at

8.3.1 Modulus of elasticity

The modulus of elasticity of steel wire strand shall be measured in accordance with GB/T 24191.

8.3.2 Minimum breaking force of steel wire strand

The measured minimum breaking force of steel wire strand shall not be less than 95% of the minimum theoretical breaking force. The measurement shall be carried out in accordance with the provisions of GB/T 8358.

8.4 Dismantle strand wire of steel wire strand

8.4.1 The tensile strength of dismantle strand wire of steel wire strand shall be measured in accordance with the provisions of GB/T 228.1.

8.4.2 The measurement of reverse bend test of dismantle strand wire of steel wire strand shall be carried out in accordance with the provisions of GB/T 238. The measurement of torsion test of dismantle strand wire shall be carried out in accordance with the provisions of GB/T 239.1.

8.4.3 The coating mass of dismantle strand wire of steel wire strand shall be measured in accordance with the provisions of GB/T 1839.

8.4.4 The adhesion of the coating shall be measured in accordance with the provisions of GB/T 2976.

8.4.5 The chemical analysis method for the aluminum content in the steel wire coating is carried out by referring to Appendix B.

9 Inspection rules

9.1 Inspection classification

Product inspection is divided into exit-factory inspection and type inspection.

9.2 Exit-factory inspection

9.2.1 Inspection items

The exit-factory inspection items for steel wire strands shall comply with the requirements of Table 6.

9.3.1 Inspection conditions

In any of the following cases, it shall carry out type inspection.

a) Pattern evaluation for plant transfer production of new products or old products;

b) After formal finalization, when there are major changes in structure, materials, processes, etc.;

c) After normal production, every two years;

d) When the production resumes after suspension of half a year or more;

e) When the exit-factory inspection result is significantly different from the previous type inspection result;

f) When the contract requires the inspection.

9.3.2 Inspection items

The type inspection items of steel wire strand shall comply with the requirements of Table 6.

9.4 Rounding off for numerical values

The rules of rounding off for numerical values and judgement of inspection results of steel wire strand shall comply with the provisions of GB/T 8170.

10 Marking, packing, certificate, transportation, and storage

10.1 Marking, packing, and certificate

10.1.1 The marking, packing, and certificate of steel wire strand shall comply with the provisions of GB/T 2104.

10.1.2 The steel wire strands are packed in coils or in circles. The circle diameter shall not be less than 20 times the nominal diameter of the steel wire strand. The maximum overall dimensions shall meet the requirements of transportation conditions.

10.2 Transportation and storage

10.2.1 During transportation and handling, it shall be protected from moisture and rain, and prevent bumping steel wire strands.

Appendix B

(Informative)

Determination of aluminum content in steel wire coating

B.1 Principle

ADD an excess of EDTA standard solution to a slightly acidic solution, so that elements such as iron, zinc, copper form complex compound with it. Then, in the presence of acetic acid, BOIL to make all of the aluminum also form a complex compound. USE xylenol orange as an indicator. USE a lead nitrate standard solution to back-titrate excess EDTA. ADD fluoride for demasking of the Al-EDTA, releasing the EDTA with an equivalent amount to aluminum. USE lead nitrate standard titration solution to titrate, so that the mass percentage of aluminum is calculated.

B.2 Reagents

B.2.1 Potassium fluoride ($KF \cdot 2H_2O$).

B.2.2 De-plating hydrochloric acid corrosion inhibitor: HCl (1+1) and hexamethylenetetramine (3%) are mixed in equal volume.

B.2.3 Hydrochloric acid (1+1).

B.2.4 Aqueous ammonia (1+1).

B.2.5 Ammonium acetate solution (50%).

B.2.6 Acetic acid-sodium acetate buffer solution (pH=5.5): WEIGH 200 g of sodium acetate (containing 3 crystal water); USE water to dissolve; ADD 9 mL of glacial acetic acid; then USE water to dilute to 1000 mL.

B.2.7 EDTA standard solution, c(EDTA)=0.05 mol/L: WEIGH 19 g of EDTA (containing 2 crystal water) in a 500 mL beaker; ADD water to dissolve; TRANSFER to a 1000 mL volumetric flask; USE water to dilute to the mark.

B.2.8 Lead nitrate standard titration solution, $c[Pb(NO_3)_2]$=0.025 mol/L: WEIGH 8.3 g of lead nitrate; USE water to dissolve; TRANSFER to a 1000 mL volumetric flask; DILUTE to the mark, calibrate.

B.2.9 Congo red test paper.

B.2.10 Xylenol orange indicator (0.25%).

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