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FERROUS METALLURGY INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

YB/T 5343-2015

Replacing YB/T 5343-2009

Steel wire for ropes

制绳用圆钢丝

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Foreword

This Standard is drafted according to the rules provided in GB/T 1.1-2009.

This Standard replaces YB/T 5343-2009 "*Steel Wire for Ropes*"; compared with YB/T 5343-2009, the main changes are as follows:

- The standard name "*Steel Wire for Ropes*" is revised as "*Steel Wire for Ropes*".
- It is specified that this Standard is applicable to smooth and coated steel wires with circular cross sections for all kinds of steel wire ropes (excluding steel wire ropes for elevator).
- The classification is according to the surface state, use, nominal diameter and nominal tensile strength of the steel wire.
- The nominal diameter range of the steel wire is expanded to $0.08\text{mm} \leq d \leq 6.00\text{mm}$ from the original $0.15\text{mm} \leq d < 4.4\text{mm}$.
- $0.08\text{mm} \leq d < 0.20\text{mm}$ and tolerance $\pm 0.005\text{mm}$ are added in the nominal diameter column of Table 1 Diameter Tolerance; the original $0.15\text{mm} \leq d < 0.30\text{mm}$ and $0.30\text{mm} \leq d < 0.60\text{mm}$ are modified to be $0.20\text{mm} \leq d < 0.40\text{mm}$ and $0.40\text{mm} \leq d < 0.60\text{mm}$; $d < 0.40\text{mm}$ Level A coating tolerance is deleted.
- The nominal tensile strength given by use in Table 2 is modified to be by surface state, nominal diameter of the steel wire and use purpose (important use in Table 2, general use in Table 3). For important use smooth and Level B's nominal tensile strength $< 4.0\text{mm}$, 2160MPa is added; the nominal tensile strength of 1960MPa is increased from $\leq 4.4\text{mm}$ to $< 5.4\text{mm}$. For the nominal tensile strength $< 0.2\text{mm}$ of general use smooth and Level B coated steel wire: 2000MPa, 2500MPa, 3000MPa, 3500MPa are added. 1180MPa of nominal tensile strength for general use is added. The nominal tensile strength corresponds to the nominal diameter of the steel wire; different steel wire diameters correspond to different nominal tensile strengths.
- For steel wires with diameter less than 0.2mm, the tolerance of the nominal tensile strength shall be negotiated by both parties.
- The minimum number of torsion and the minimum number of repeated bending for the expanded steel wire diameter and the increased nominal tensile strength in Table 5 ~ Table 8 are given. The number of repeated bending of the steel wire with diameter greater than 5.0mm shall be negotiated by both parties.
- 5.6 "Other requirements" is canceled, the contents of this clause are revised to "Note: The number of repeated bending and the number of torsion of other

nominal tensile strengths shall be negotiated by both parties" and are included in the corresponding Table 5 ~ Table 8.

- 5.7 "Quality of zinc coating" is revised to be "Coating quality".
- 6 "Test method" is revised to be "Inspection and test".
- 6.1 Test items, methods and sampling positions are divided into 6.1 Inspection and 6.2 Test; the test items are divided into 3 items - diameter, ellipticity, shape; the surface quality is included into Table 11, and the inspection methods and quantity are given. 6.2 Test items, methods and sampling positions are included into Table 12.
- 6.3 Sampling quantity is listed in a single row. It is stipulated that the number of samples shall be taken according to the number of each batch of steel wires; the sampling quantity and determination rules are given in Table 13. The calculation method of the number of each batch of steel wires is given in Annex A.

This Standard was proposed by China Iron and Steel Industry Association.

This Standard shall be under the jurisdiction of National Steel Standardization Technical Committee (SAC/TC183).

Drafting organizations of this Standard: Ansteel Wire Rope Co., Ltd., Guizhou Wire Rope Incorporated Company, Hubei Fuxing Science and Technology Co., Ltd., China Metallurgical Information and Standardization Institute.

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The previous versions replaced by this Standard are as follows:

- YB/T 5343-2006, YB/T 5343-2009.

Steel Wire for Ropes

1 Scope

This Standard specifies the classification, dimension, shape, and tolerance, technical requirements, inspection and test methods, packaging, marking and quality certificate of steel wires for ropes.

This Standard is applicable to the smooth and coated steel wires for steel wire ropes (excluding steel wire ropes for elevator).

2 Normative reference

The following documents are essential for the application of this document. For all dated reference documents, only the dated versions are applicable to this document. While for all undated reference documents, the latest versions (including all modifications) 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 mass per unit area of galvanized coatings steel products

GB/T 2103 General requirements for acceptance, packing, marking and quality certification of steel wire

GB/T 2976 Metallic materials - Wire - Wrapping test

GB/T 4354 Hot-rolled quality carbon steel wire rods

YB/T 081 Rule for rounding off of numerical values and judgement of testing values for technical standards of metallurgy

3 Classification

3.1 Classification by surface state of steel wires: smooth and coated. Coated steel wire is divided into three levels: Level B, Level AB and Level A.

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5.2.2 Tolerance

The nominal tensile strength specified in Table 2 and Table 3 is the lower limit of the tensile strength of steel wire, the upper limit is equal to the lower limit plus the tolerance in Table 4.

Table 4 Tolerance of nominal tensile strength

Nominal diameter d / mm	Tolerance of nominal tensile strength / MPa
$0.08 \leq d < 0.20$	*
$0.20 \leq d < 0.50$	390
$0.50 \leq d < 1.00$	350
$1.00 \leq d < 1.50$	320
$1.50 \leq d < 2.00$	290
$2.00 \leq d < 3.50$	260
$3.50 \leq d \leq 6.00$	250
Note: * The tolerance of the nominal tensile strength shall be negotiated by both parties.	

5.3 Torsion

Steel wire with a diameter of not less than 0.50mm shall be tested for torsion, and the minimum number of torsion of the steel wire for important use shall conform to the provisions of Table 5; the minimum number of torsion of the steel wire for general use shall conform to the provisions of Table 6.

5.4 Repeated bending

Steel wire with a diameter of 0.50mm~5.00mm shall be tested for repeated bending. The minimum number of repeated bending of the steel wire for important use shall conform to the provisions of Table 7; and the minimum number of repeated bending of the steel wire for general use shall conform to the provisions of Table 8. The number of repeated bending of the steel wire with a diameter greater than 5.00mm shall be negotiated by both parties.

5.5 Knot tension

Steel wire with a diameter of less than 0.50mm shall be tested for knot tension instead of torsion and repeated bending test, and the knot tensile value shall be greater than 50% of the corresponding tension value of nominal tensile strength.

Table 5 Minimum number of torsion of steel wire for important use

Nominal diameter d	Test gauge jaw	Smooth and Level B	Level AB	Level A
		Nominal tensile strength level MPa		

Table 6 Minimum number of torsion of steel wire for general use

Nominal diameter of steel wire		Test gauge jaw	Smooth and Level B					Level AB				Level A				
			Nominal tensile strength level / MPa													
mm		1180 1370	1470 1570	1670 1770	1870 1960	2060 2160	1180 1370	1470 1570	1670 1770	1870	1960	1180 1370	1470 1570	1670 1770	1870	1960
0.50≤d<1.00	100d	34	30	28	25	22	30	27	25	22	22	23	21	19	17	17
1.00≤d<1.30		33	29	26	23	20	29	26	24	21	21	21	19	17	15	15
1.30≤d<1.80		32	28	25	22	19	28	25	23	20	20	20	18	16	14	14
1.80≤d<2.30		31	27	24	21	18	27	24	22	19	19	18	16	14	12	12
2.30≤d<3.00		29	26	22	19	16	26	23	21	18	18	16	14	11	9	9
3.00≤d<3.50		28	25	21	18	15	25	22	20	17	17	14	12	9	7	7
3.50≤d<3.70		26	23	19	16	13	23	20	18	15	15	12	10	7	6	6
3.70≤d<4.00		25	22	18	14	12	21	19	17	14	14	11	9	6	5	5
4.00≤d<4.20		23	21	17	13	11	20	18	16	13	13	9	7	6	4	4
4.20≤d<4.40		21	19	16	11	10	18	16	14	11	11	9	7	5	3	—
4.40≤d<4.60		20	18	14	10	—	17	15	12	9	—	7	6	5	3	—
4.60≤d<4.80		18	16	12	8	—	15	14	10	6	—	7	6	5	3	—
4.80≤d<5.20		16	14	11	7	—	13	12	9	5	—	7	6	5	2	—
5.20≤d<5.40		14	12	10	7	—	11	10	8	5	—	6	6	4	2	—
5.40≤d<5.60		12	10	8	—	—	9	8	6	—	—	5	4	3	—	—
5.60≤d<5.80	10	8	6	—	—	7	6	4	—	—	3	3	3	—	—	
5.80≤d≤6.00		8	6	6	—	—	5	4	4	—	—	3	3	3	—	—

Table 7 Minimum number of repeated bending of steel wire for important use (Continued)

Nominal diameter of steel wire	Bending radius	Smooth and Level B				Level AB			Level A		
		Nominal tensile strength level / MPa									
mm		1570	1670 1770	1870 1960	2060 2160	1570	1670 1770	1870	1570	1670 1770	1870
2.60≤d<2.70	7.50	12	11	10	8	11	10	9	9	8	7
2.70≤d<2.80		12	11	10	8	11	10	9	9	8	7
2.80≤d<2.90		11	10	9	7	10	9	8	8	7	6
2.90≤d<3.00		11	10	9	7	10	9	8	8	7	6
3.00≤d<3.10	10.0	14	13	12	—	13	12	11	11	10	9
3.10≤d<3.20		14	13	12	—	13	12	11	11	10	9
3.20≤d<3.30		13	12	11	—	12	11	10	10	9	8
3.30≤d<3.40		13	12	11	—	12	11	10	10	9	8
3.40≤d<3.50		12	11	10	—	11	10	9	9	8	7
3.50≤d<3.60		11	10	9	—	10	9	8	9	8	7
3.60≤d<3.70		10	9	7	—	9	8	7	8	7	6
3.70≤d<3.80		9	8	7	—	8	7	6	8	7	6
3.80≤d<3.90		9	8	6	—	8	7	6	7	6	5
3.90≤d<4.00		8	7	6	—	7	6	6	7	6	5
4.00≤d<4.10	15.0	14	13	12	—	13	12	11	9	8	7
4.10≤d<4.20		13	12	11	—	12	11	10	8	7	6
4.20≤d<4.30		12	11	10	—	11	10	9	8	7	6
4.30≤d<4.40		12	11	10	—	11	10	9	8	7	6
4.40≤d<4.50		10	9	8	—	—	—	—	—	—	—
4.50≤d<4.60		8	7	6	—	—	—	—	—	—	—
4.60≤d<4.70		7	6	4	—	—	—	—	—	—	—
4.70≤d<4.80		6	5	—	—	—	—	—	—	—	—
4.80≤d<4.90		5	4	—	—	—	—	—	—	—	—
4.90≤d≤5.00		4	3	—	—	—	—	—	—	—	—
Note: The number of repeated bending of other nominal tensile strength shall be agreed by both parties.											

Table 8 Minimum number of repeated bending of steel wire for general use (Continued)

Nominal diameter of steel wire	Bending radius	Smooth and Level B					Level AB				Level A				
		Nominal tensile strength level / MPa													
mm		1180 1370	1470 1570	1670 1770	1870 1960	2060 2160	1180 1370	1470 1570	1670 1770	1870 1960	1180 1370	1470 1570	1670 1770	1870	1960
2.00≤d<2.10	7.5	16	15	14	13	12	15	14	13	12	14	12	12	11	11
2.10≤d<2.20		15	14	13	12	11	14	13	12	11	13	11	11	10	10
2.20≤d<2.40		14	13	12	11	10	13	12	11	10	12	10	10	9	9
2.40≤d<2.50		13	12	11	10	9	12	11	10	9	11	10	9	8	8
2.50≤d<2.60		12	11	10	9	8	10	9	9	8	10	9	8	7	7
2.60≤d<2.80		11	10	9	8	7	10	9	8	7	9	9	7	6	6
2.80≤d<3.00		10	9	8	7	6	9	8	7	6	8	8	6	5	5
3.00≤d<3.10	10.0	13	12	11	10	9	13	12	11	10	11	11	9	8	8
3.10≤d<3.20		13	12	11	10	9	12	11	10	9	10	11	8	7	7
3.20≤d<3.40		12	11	10	9	8	11	10	9	8	9	10	7	6	6
3.40≤d<3.50		11	10	9	8	7	9	8	7	6	8	9	6	5	5
3.50≤d<3.70		9	8	8	7	6	8	7	6	5	7	9	5	4	4
3.70≤d<4.00		8	7	6	5	4	7	6	5	4	6	7	4	3	3
4.00≤d<4.20	15.0	13	12	11	10	9	12	11	10	9	10	9	7	6	6
4.20≤d<4.40		12	11	10	9	8	11	10	9	8	9	8	6	5	—
4.40≤d<4.60		10	9	8	7	—	9	8	7	6	6	5	5	4	—
4.60≤d<4.80		9	8	8	6	—	6	5	4	—	—	—	—	—	—
4.80≤d<5.00		8	7	7	5	—	5	4	4	—	—	—	—	—	—
5.0		7	6	6	4	—	4	3	3	—	—	—	—	—	—
Note: The number of repeated bending of other nominal tensile strengths shall be negotiated by both parties.															

Table 10 Ratio of mandrel and diameter of steel wire

Coating Level	Nominal diameter of steel wire / mm	
	$d < 1.50$	$d \geq 1.50$
Level B	2	3
Level AB, Level A	4	6

5.7 Surface quality

The surface of the steel wire shall be smooth and clean, no defects harmful to use such as cracks, knobs, thorns, damages or rust. The coating shall be continuous and uniform.

5.8 Rounding off for values

The rounding off for values shall be carried out according to the provisions of YB/T 081.

6 Inspection and test

6.1 Inspection

6.1.1 Inspection item, method and quantity shall conform to the provisions of Table 11.

Table 11 Inspection item, method and quantity

S/N	Inspection item		Inspection method	Inspection quantity
1	Diameter mm	$d < 0.20$	Measure with a micrometer with a index value of no more than 0.001	Coil by coil or roll by roll
		$d \geq 0.20$	Measure with a micrometer with a index value of no more than 0.01	
2	Ellipticity	$d < 0.20$	Measure with a micrometer with a index value of no more than 0.001	Coil by coil or roll by roll
		$d \geq 0.20$	Measure with a micrometer with a index value of no more than 0.01	
3	Shape and surface quality		Visual inspection	Coil by coil or roll by roll

6.1.2 In case any inspection result does not comply with the provisions, the steel wire coil or roll shall not be delivered.

6.2 Test

Test item, test method and sampling position shall be in accordance with the

provisions of Table 12.

Table 12 Test item, test method and sampling position

S/N	Test item	Test method	Sampling position
1	Tension	GB/T 228.1	Both ends of steel wire coil or one end of spool roll
2	Torsion	GB/T 239.1	
3	Repeated bending	GB/T 238	
4	Knot tension	GB/T 228.1	
5	Coating weight	GB/T 1839	
6	Coating adhesion	GB/T 2976	

6.3 Sampling quantity

6.3.1 The quantity of samples taken and the determination rules shall conform to the provisions of Table 13.

Table 13 Number of samples taken and determination rules

Number of each batch of steel wires N	Number of samples n	Number of unqualified samples allowed
$2 \leq N \leq 15$	8	0
$16 \leq N \leq 50$	13	0
$51 \leq N \leq 90$	20	1
$91 \leq N \leq 150$	32	1
$151 \leq N \leq 280$	50	2
$281 \leq N \leq 500$	80	3

Note 1: Number of batches and samples are defined in Annex A.
Note 2: If the number of each batch of steel wires is less than the number of samples, then each basic unit shall be tested.

6.3.2 If the number of samples tested unqualified is more than the allowable values in Table 13, then all production units shall be sampled to test the unqualified items, while the qualified products can be delivered.

6.3.3 The products unqualified in the initial test shall not be delivered.

7 Packaging, marking and quality certificates

7.1 Appropriate steel wire packaging shall be selected by the supplier in accordance with GB/T 2103; other packaging modes can also be used through consultation between the two parties.

7.2 The markings and the quality certificate of the steel wire shall be in accordance

A.5 Sample

Steel wire with sufficient length to determine a certain characteristic of the steel wire.

A.6 Sampling length

Steel wire with sufficient length sampled to determine all the characteristics of the steel wire.

A.7 Sampling

All the required samples sampled to provide batch information.

A.8 Sample quantity (n)

Sample quantity of tests.

A.9 Defects

Test results not consistent with the requirements of the characteristics.

A.10 Length with defects

Sample length with one or multiple defects.

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