UDC 669.426-426:679.73 May 1990

Steel wire for wire ropes

DIN 2078

Stahldrähte für Drahtseile

Supersedes March 1978 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

See Explanatory notes for connection with draft International Standard ISO/DIS 2232.2 published by the International Organization for Standardization (ISO).

Dimensions in mm

1 Field of application

This standard specifies requirements for nonstranded round steel wire for wire ropes.

2 Designation

The designation of steel wire for wire ropes shall give in the following order:

the name of product (rope wire);

the number of this standard;

the nominal diameter, in mm;

the type of finish: bright (bk), standard zinc coating (no zn), or heavy zinc coating (di zn);

the nominal tensile strength, in N/mm^2.

Rope wire with a nominal diameter of 1,5 mm, a bright finish (bk) and a nominal tensile strength of 1770 N/mm^2 shall be designated:

Rope wire DIN 2078 – 1,5 – bk 1770

Example of an order for 1000 kg of rope wire with a nominal diameter of 1,5 mm, a bright finish and a nominal tensile strength of 1770 N/mm^2:

1000 kg rope wire DIN 2078 – 1,5 – bk 1770

3 Wire diameter

3.1 Nominal diameter of wire

The nominal diameter of wire, in mm, is that by which the wire is designated. It is subject to the limit deviations given in table 1. In the case of wire with heavy zinc coating, a local increase in thickness is permitted for short lengths unless that would adversely affect the wire performance for a given application.

3.2 Actual diameter

The wire diameter shall be measured in two directions running perpendicular to each other, the mean value determined from these measurements being taken as the actual wire diameter.

3.3 Ovality

The difference between the minimum and maximum wire diameter measured in the same plane shall not exceed 50 % of the range given by the limit deviations in table 1. For wire with heavy zinc coating, larger differences in diameter are permitted for short lengths unless that would adversely affect the wire performance for a given application.

Table 1. **Nominal diameter and limit deviations**

Nominal diameter of wire, d	Limit deviations for	
	bright finish and standard zinc coating	heavy zinc coating
0,2 to less than **0,4**	± 0,01	–
0,4 to less than **0,8**	± 0,015	± 0,03
0,8 to less than **1,0**	± 0,02	± 0,03
1,0 to less than **1,6**	± 0,02	± 0,04
1,6 to less than **2,4**	± 0,03	± 0,05
2,4 to less than **3,7**	± 0,03	± 0,06
3,7 to less than **5,2**	± 0,04	± 0,08
5,2 to **6,0**	± 0,05	± 0,1

4 Zinc coating

The zinc used for zinc coating shall have a purity of 99,9 %, other zinc alloys being subject to agreement. The coating mass per unit area shall be as specified in table 2.

Note that the composition of the zinc deposited on the wire will change during the galvanizing process.

Continued on pages 2 to 5

Table 2. **Zinc coating mass per unit area**

Nominal diameter of wire, d	Minimum zinc coating mass per unit area, in g/m², for	
	standard zinc coating	heavy zinc coating
0,2 to less than 0,25	15	—
0,25 to less than 0,4	20	—
0,4 to less than 0,5	30	75
0,5 to less than 0,6	40	90
0,6 to less than 0,7	50	110
0,7 to less than 0,8	60	120
0,8 to less than 1,0	70	130
1,0 to less than 1,2	80	150
1,2 to less than 1,5	90	165
1,5 to less than 1,9	100	180
1,9 to less than 2,5	110	205
2,5 to less than 3,2	125	230
3,2 to less than 3,7	135	250
3,7 to less than 4,0	135	260
4,0 to less than 4,5	150	270
4,5 to less than 5,5	165	280
5,5 to 6,0	180	280

See DIN 51213 for determination of the zinc coating mass per unit area.

5 Tensile strength

5.1 Nominal tensile strength

The nominal tensile strength in which steel wire is to be supplied shall be subject to the limit deviations given in table 3 as a function of the nominal diameter range.

Table 3. **Limit deviations of tensile strength**

Nominal wire diameter, d	Limit deviation, in N/mm², for a tensile strength, in N/mm², of			
	1370	1570	1770	1960
0,20 to less than 0,50	+ 390			
0,50 to less than 1,00	+ 350			
1,00 to less than 1,50	+ 320			
1,50 to less than 2,00	+ 290			
2,00 to 6,00	+ 260			

5.2 Actual tensile strength

The tensile strength shall be calculated from the breaking force as determined in the tensile test described in DIN 51210 Part 1 or 2 and from the nominal cross-sectional area of the wire.

6 Reverse bend strength and torsional strength

When wire is tested as specified in DIN 51211 (reverse bend test) and DIN 51212 (torsion test), the number of reverse bends and twists which the wire is to withstand without breaking being as specified in tables 5 and 6.

7 Form of supply

The mass and form of wire (e.g. coiled or wound on spools) to be supplied shall be agreed between manufacturer and purchaser. Up to 10% of the production units may have a mass per unit that is less or more than that agreed between both parties.

7.1 Corrosion protection

It may be agreed that bright and zinc coated wire be supplied oiled to provide protection against flash rust.

7.2 Packaging and marking

Unless otherwise agreed, wire is to be supplied unpacked with the ends lashed at least three times. The packages shall be provided with the following information:

a) nominal diameter;

b) nominal tensile strength;

c) finish.

To permit the nominal tensile strength of the wire to be recognized, the packages shall be colour coded as specified in table 4.

Table 4. **Colour coding**

Nominal tensile strength, in N/mm²	Colour
1370	Brown
1570	White
1770	Green
1960	Yellow

8 Acceptance

The performance of acceptance tests or inspections at the manufacturer's works and, where required, the issue of related certificates shall be in accordance with DIN 50049.

Table 5. **Number of reverse bends and twists for bright wire and wire with standard zinc coating**

Nominal diameter of wire, d [1]	Radius of curvature of supports	Minimum number of reverse bends at a nominal tensile strength, in N/mm² [2], of				Gauge length	Minimum number of twists at a nominal tensile strength, in N/mm² [2], of			
		1370	1570	1770	1960		1370	1570	1770	1960
0,2 to less than 0,5			[3]	[3]	[3]			[3]	[3]	[3]
0,5 to less than 0,55	1,75		15	14	13	100 × d		30	28	25
0,55 to less than 0,6			14	13	12					
0,6 to less than 0,65			12	11	10					
0,65 to less than 0,7			11	10	9					
0,7 to less than 0,75	2,5		17	16	15					
0,75 to less than 0,8			16	15	14					
0,8 to less than 0,85			14	13	12					
0,85 to less than 0,9			13	12	11					
0,9 to less than 0,95			12	11	10					
0,95 to less than 1,0			11	10	9					
1,0 to less than 1,1	3,75		18	17	16			29	26	23
1,1 to less than 1,2			17	16	15					
1,2 to less than 1,3			16	15	14					
1,3 to less than 1,4			14	13	12					
1,4 to less than 1,5			12	11	10					
1,5 to less than 1,6	5		15	14	13			28	25	22
1,6 to less than 1,7			14	13	12					
1,7 to less than 1,8			12	11	11					
1,8 to less than 1,9			11	10	10					
1,9 to less than 2,0			10	9	9					
2,0 to less than 2,1	7,5		16	15	14			27	24	21
2,1 to less than 2,2			15	14	13					
2,2 to less than 2,4			14	13	12					
2,4 to less than 2,5		15	13	12	11		28	26	23	20
2,5 to less than 2,6		14	12	11	10					
2,6 to less than 2,7		12	11	10	9					
2,7 to less than 3,0		11	10	9	8					
3,0 to less than 3,1	10	15	14	13	12		27	25	21	18
3,1 to less than 3,2		14	13	12	11					
3,2 to less than 3,3		13	12	11	10					
3,3 to less than 3,4		12	11	10	9					
3,4 to less than 3,5		11	10	9	8					
3,5 to less than 3,6		10	9	8	7		26	24	20	16
3,6 to less than 3,7		9	8	7	6					
3,7 to less than 3,8		8	7	6	5		25	23	19	15
3,8 to less than 4,0		8	7	6	5		24	22	18	14
4,0 to less than 4,2		8	7	6	5		23	21	17	13
4,2 to less than 4,4	15	11	10	9	8		21	19	15	11
4,4 to less than 4,6		10	9	8	7		20	18	14	10
4,6 to less than 4,8		9	8	8	6		18	16	12	8
4,8 to less than 5,0		8	7	6	5		17	14	11	7
5,0 to less than 5,2		7	6	5	4		17	14	11	7
5,2 to less than 5,4		6	5	4		500 mm	14	12	10	
5,4 to less than 5,6		5	4	3			12	10	8	
5,6 to less than 5,8		5	4	3			10	8	6	
5,8 to 6,0		4	3	3			8	6	6	

[1] This standard does not cover wire of nominal diameter and nominal tensile strength for which no number of reverse bends or twists have been assigned, except for wire for which footnote 3 applies.

[2] For intermediate values of nominal tensile strength, the number of reverse bends and twists shall be that given for the next highest nominal tensile strength.

[3] No particular number of reverse bends and twists has been specified. Instead, the tensile strength of the wire when tested as described in DIN 51214 (test on knotted wire) shall be not less than 50% of the nominal strength specified.

Table 6. **Number of reverse bends and twists for wire with heavy zinc coating**

Nominal diameter of wire, d [1]	Radius of curvature of supports	Minimum number of reverse bends at a nominal tensile strength, in N/mm² [2], of				Gauge length	Minimum number of twists at a nominal tensile strength, in N/mm² [2], of			
		1370	1570	1770	1960		1370	1570	1770	1960
0,4 to less than **0,45**			[3]	[3]	[3]			[3]	[3]	[3]
0,45 to less than **0,5**										
0,5 to less than **0,55**			11	10	9					
0,55 to less than **0,6**	1,75		10	9	8					
0,6 to less than **0,65**			8	8	7					
0,65 to less than **0,7**			7	6	5					
0,7 to less than **0,75**			13	12	11			21	19	17
0,75 to less than **0,8**			12	11	10					
0,8 to less than **0,85**	2,5		11	10	9					
0,85 to less than **0,9**			10	9	8					
0,9 to less than **0,95**			9	8	7					
0,95 to less than **1,0**			8	7	6					
1,0 to less than **1,1**			15	12	10			20	18	13
1,1 to less than **1,2**			14	13	11					
1,2 to less than **1,3**	3,75		12	11	9					
1,3 to less than **1,4**			10	8	7					
1,4 to less than **1,5**			8	7	6			18	15	10
1,5 to less than **1,6**			11	10	9					
1,6 to less than **1,7**			10	9	8					
1,7 to less than **1,8**	5		9	8	7					
1,8 to less than **1,9**			8	7	6					
1,9 to less than **2,0**			7	6	5	100 × d		17	14	9
2,0 to less than **2,1**			13	12	11					
2,1 to less than **2,2**			12	11	10					
2,2 to less than **2,4**			11	10	9					
2,4 to less than **2,5**	7,5	11	10	9	8					
2,5 to less than **2,6**		10	9	8	7		18	15	12	7
2,6 to less than **2,7**		9	8	7	6					
2,7 to less than **3,0**		8	7	6	5					
3,0 to less than **3,1**		11	10	9	8					
3,1 to less than **3,2**		10	9	8	7					
3,2 to less than **3,3**		9	8	7	6		13	12	8	5
3,3 to less than **3,4**		9	8	7	6					
3,4 to less than **3,5**	10	8	7	6	5					
3,5 to less than **3,6**		7	6	5	4		11	10	6	5
3,6 to less than **3,7**		6	5	4	3		11	10	6	5
3,7 to less than **3,8**		5	4	3	3		11	7	6	4
3,8 to less than **4,0**		5	4	3	3		10	7	6	4
4,0 to less than **4,2**		5	4	3	3		9	6	6	4
4,2 to less than **4,4**		7	6	5			8	6	5	
4,4 to less than **4,6**		6	5	5			7	6	5	
4,6 to less than **4,8**		6	5	4			6	5	4	
4,8 to less than **5,0**		5	4	4			5	4	3	
5,0 to less than **5,2**	15	4	3	3			5	4	3	
5,2 to less than **5,4**		4	3	3			5	4	3	
5,4 to less than **5,6**		3	2	2			4	3	2	
5,6 to less than **5,8**		3	2	2		500 mm	3	2	2	
5,8 to **6,0**		3	2	2			3	2	2	

For [1] to [3], see page 3.

Standards referred to

DIN 50049	Materials testing certificates
DIN 51210 Part 1	Testing of metallic materials; tensile testing of wire without using an extensometer
DIN 51210 Part 2	Testing of metallic materials; tensile testing of wire using an extensometer
DIN 51211	Testing of metallic materials; reverse bend testing of wire
DIN 51212	Testing of metallic materials; torsion testing of wire
DIN 51213	Testing of metallic coatings on wire; zinc or tin coatings
DIN 51214	Testing of steel; tensile testing of knotted round wire
ISO/DIS 2232.2 : 1988	Round drawn wire for general purpose non-alloy steel wire ropes and for large diameter steel wire ropes; specifications

Previous editions

DIN 2078 Part 1: 12.62; DIN 2078 Part 2: 12.62; DIN 2078: 10.34, 01.43, 10.76, 03.78.

Amendments

The following amendments have been made to the March 1978 edition.

a) The range of nominal wire diameters has been extended to include diameters up to 6 mm.

b) The specifications regarding the tolerance on diameter, the zinc coating, the purity of zinc and the number of reverse bends and twists have been harmonized with ISO/DIS 2232.2.

c) The colour coding for nominal tensile strength 1570 N/mm^2 has been changed.

Explanatory notes

This standard is based on ISO/DIS 2232.2, with which it conforms in the following respects.

The limit deviations specified in table 1 have been adopted from ISO/DIS 2232.2, which gives closer tolerances (by 0,005 mm) compared with the values previously specified for bright or zinc coated wire of diameter smaller than 1,6 mm.

The values of mass of zinc deposited per unit area, as specified in table 2, have also been adopted from ISO/DIS 2232.2, these values being slightly higher for wire with standard zinc coating and a diameter of 0,7 mm or more than those previously specified.

The number of reverse bends and twists specified in tables 5 and 6 as a minimum meet the requirements given in ISO/DIS 2232.2; in cases where the original number was higher, this has not been altered. A decision on further harmonization will not be taken pending the results of European Standardization with regard to wire ropes and rope wire. The same applies to a revision of the test standards referred to.

In table 4, white has been specified instead of red to identify wire of a nominal tensile strength of 1570 N/mm^2, since, in quality control, red is now used to identify lots that have been discarded during internal control.

International Patent Classification

B 21 F
D 07 B 1/06
G 01 B
G 01 N 3/00