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Steel wire ropes - Safety - Part 10: Spiral ropes for general structural applications

Câbles en acier - Sécurité - Partie 10: Câbles spiraloïdaux pour applications générales de structures

Drahtseile aus Stahldraht - Sicherheit - Teil 10: Spiralseile für den allgemeinen Baubereich

This European Standard was approved by CEN on 3 November 2003 and includes Amendment 1 approved by CEN on 14 February 2008.

Contents

Foreword

This document (EN 12385-10:2003+A1:2008) has been prepared by Technical Committee CEN/TC 168 “Chains, ropes, webbing, slings and accessories - Safety”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2008, and conflicting national standards shall be withdrawn at the latest by September 2008.

This document includes Amendment 1, approved by CEN on 2008-02-14.

This document supersedes EN 12385-10:2003.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ▌A1⟩ ⟨A1▐.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directives, see informative Annexes ZA and ZB, which are integral parts of this document.

The other Parts of this European Standard are:

Part 1: General requirements

Part 2: Definitions, designation and classification

Part 3: Information for use and maintenance

Part 4: Stranded ropes for general lifting applications

Part 5: Stranded ropes for lifts

Part 6: Stranded ropes for mine shafts

Part 7: Locked coil ropes for mine shafts

Part 8: Stranded hauling and carrying-hauling ropes for cableway installations designed to carry persons

Part 9: Locked coil carrying ropes for cableway installations designed to carry persons

Part 1 of this European Standard provides the general requirements for each of the other Parts.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This Part of this European Standard has been prepared to be a harmonized standard to provide one means of conforming to the essential safety requirements of the Machinery Directive.

This European Standard is a type C standard as stated in EN 1070.

During the preparation of this standard, it was assumed that a negotiation would take place between the purchaser and the manufacturer concerning the intended purpose of the rope.

Specifiers, purchasers and users should recognise that spiral ropes for structural purposes are, more often than not, specially designed by the rope manufacturer to meet particular conditions.

1 Scope

This Part of this European Standard specifies the additional materials, manufacturing and testing requirements to those given in Part 1 for spiral ropes incorporating zinc or zinc alloy coated wires for general structural applications.

This standard deals with all significant hazards, hazardous situations and events relevant to spiral ropes for general structural applications, when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see clause 4 of EN 12385-1:2002).

This standard applies to spiral ropes for general structural applications which are manufactured after the date of its publication.

NOTE For information only, typical breaking forces for both full-locked coil rope and spiral strand rope are given in annexes B and C for some of the more common sizes.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 292-1:1991, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology.*

EN 292-2, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*

EN 1070:1998, *Safety of machinery – Terminology.*

EN 10264-1, *Steel wire and wire products – Steel wire for ropes – Part 1: General requirements.*

EN 10264-2, *Steel wire and wire products – Steel wire for ropes – Part 2: Cold drawn non alloy steel wire for ropes for general applications.*

EN 10264-3, *Steel wire and wire products – Steel wire for ropes – Part 3: Round and shaped non alloyed steel wire for high duty applications.*

EN 12385-1:2002, *Steel wire ropes – Safety – Part 1: General requirements.*

EN 12385-2:2002, *Steel wire ropes – Safety – Part 2: Definitions, designation and classification.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 292-1:1991, EN 1070:1998 and EN 12385-2:2002 apply.

4 List of significant hazards

For the purposes of this European Standard, the hazards and associated requirements given in EN 292-2 and EN 12385-1 apply.

5 Safety requirements and/or measures

5.1 General

In addition to the requirements given in 5.2 to 5.6 the requirements shall also conform to those given in Part 1 of this European Standard.

5.2 Wire

5.2.1 General

Wires before ropemaking, shall conform to the requirements given in 5.2.2 and 5.2.3 taking into account the wire, shape and class of coating.

5.2.2 Round wires

Wires of class A coating shall conform to EN 10264-2; or alternatively, in the case of final hot zinc coated wires, meet the diameter, tensile strength and coating requirements given in EN 10264-2 and the ductility and adherence wraps and % total elongation at fracture properties given in annex A of this Part of the standard.

Wires of class B coating shall conform to EN 10264-2.

5.2.3 Shaped wires

Wires of class A and B coatings shall conform to EN 10264-3.

5.3 Rope manufacture

5.3.1 Wire joints

There shall be no planned joints in the outer layer of wires in any individual in-service rope length or assembly.

In any individual in-service rope length or assembly, welds of finished wire in the outer layer shall be no closer than 10 lay lengths of each other and no weld shall be within one lay length of the entry point of the rope into the termination.

The tensile strength of the weld shall be at least 50 % of the tensile strength grade of the wire. This shall be verified by testing a sample weld made in accordance with the same method as used to join the wire(s) in the rope.

Outer wire joints shall be protected against corrosion by coating.

5.3.2 Wire finish

The finish of the wires shall be either zinc or zinc alloy coated or a combination of both provided that in any one layer of wires the finish is the same.

NOTE The purchaser should specify any particular wire finish requirements, see Introduction.

5.4 Diameter

5.4.1 Tolerance

When measured in accordance with 6.3.1 of EN 12385-1:2002 the measured diameter shall be within 0 % and +3 % of the nominal diameter.

NOTE Specifiers, purchasers and users should recognize that spiral ropes for structural applications are, more often than not, specially designed by the rope manufacturer to meet particular conditions and particular attention should be given to the selection of the correct size of rope and associated diameter tolerance for compatibility with other components, such as sockets.

5.4.2 Differences between diameter measurements

The difference between any two of the four measurements taken in accordance with 6.3.1 of EN 12385-1:2002 shall not exceed 2 % of the nominal rope diameter.

5.5 Breaking force

The breaking force shall be specified only as minimum breaking force.

The specified minimum breaking force value for a given rope size, construction and grade shall be determined by the rope manufacturer.

NOTE Typical minimum values of breaking force for particular constructions of locked coil and spiral strand are given in annex B and annex C respectively.

The sampling and acceptance criteria for breaking force testing for all sizes of rope shall be in accordance with the alternative requirements given in A.2 of EN 12385-1:2002.

5.6 Designation and classification

Rope designation and classification shall conform to EN 12385-2.

Annex A
(normative)

Ductility and adherence wraps and % total elongation at fracture properties of hot zinc coated round wires

A.1 Ductility wraps

Wires shall be capable of being wrapped in a close helix of at least 4 turns around a mandrel equal in diameter to those values listed in Table A.1 without fracturing.

Table A.1 — Mandrel diameters for ductility wrap test

Wire diameter (mm)		Mandrel diameter (2d = 2 × wire diameter) (mm)			
Including	Excluding	Up to and including wire tensile strength grade 1570 N/mm^2	Up to and including wire tensile strength grade 1670 N/mm^2	Up to and including wire tensile strength grade 1770 N/mm^2	Up to and including wire tensile strength grade 1960 N/mm^2
2,00	2,50	2d	2d	3d	4d
2,50	3,00	2d	2d	3d	4d
3,00	4,00	2d	3d	3d	4d
4,00	5,00	3d	3d	3d	4d
5,00	6,00	3d	3d	3d	4d
6,00	7,00	3d	3d	4d	4d

A.2 Adherence wraps

Wires shall be capable of being wrapped in a close helix of at least 4 turns around a mandrel equal in diameter to those values listed in Table A.2. The coating shall remain firmly adherent without cracking or flaking, such that it cannot be removed by rubbing with the finger.

Table A.2 — Mandrel diameters for adherence wrap test

Wire diameter (mm)		Mandrel diameter (2d = 2 × wire diameter) (mm)			
Including	Excluding	Up to and including wire tensile strength grade 1570 N/mm^2	Up to and including wire tensile strength grade 1670 N/mm^2	Up to and including wire tensile strength grade 1770 N/mm^2	Up to and including wire tensile strength grade 1960 N/mm^2
2,00	2,50	3d	3d	4d	5d
2,50	3,00	4d	4d	4d	5d
3,00	4,00	4d	4d	5d	5d
4,00	5,00	5d	5d	5d	5d
5,00	6,00	5d	5d	5d	5d
6,00	7,00	5d	5d	6d	6d

A.3 Percentage total elongation at fracture (A_t)

The total elongation (elastic and plastic) of the gauge length at fracture, when tested in accordance with the method for tensile strength specified in EN 10264-1, shall be expressed as a percentage of the original gauge length.

NOTE This test may be carried out as part of the wire tensile test.

The % elongation tests shall be carried out over a gauge length of 250 mm to achieve the minimum values given in Table A.3.

Table A.3 — Percentage total elongation at fracture

Wire diameter mm		Percentage total elongation at fracture			
Including	Excluding	Up to and including wire tensile strength grade 1570 N/mm^2	Up to and including wire tensile strength grade 1670 N/mm^2	Up to and including wire tensile strength grade 1770 N/mm^2	Up to and including wire tensile strength grade 1960 N/mm^2
2,00	2,50	4,0	3,5	3,0	3,0
2,50	3,00	4,0	4,0	3,0	3,0
3,00	4,00	4,0	4,0	3,0	3,0
4,00	5,00	4,0	4,0	3,0	3,0
5,00	6,00	4,0	4,0	3,5	3,5
6,00	7,00	4,0	4,0	3,5	3,5

Annex B
(informative)

Typical breaking forces and approximate nominal length masses for full-locked coil rope

Table B.1 — Rope with one layer of full-lock wires

Nominal rope diameter	Approximate nominal length mass[1)2)]	Nominal metallic cross-sectional area[2)]	Minimum breaking force[2)]			
			Rope grade 1370	Rope grade 1470	Rope grade 1570	Rope grade 1670
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)	(kN)
20	227	254	321	344	368	391
21	251	281	354	379	405	431
22	275	308	388	416	445	473
23	301	337	424	455	486	517
24	327	366	462	496	529	563
25	355	398	501	538	574	611
26	384	430	542	582	621	661
27	414	464	585	627	670	713
28	445	499	629	675	720	766
29	478	535	674	724	773	822
30	511	573	722	774	827	880
31	546	611	771	827	883	939
32	582	651	821	881	941	1 000
33	619	693	873	937	1 000	1 060
34	657	735	927	995	1 060	1 130
35	696	779	982	1 050	1 130	1 200
36	736	824	1 040	1 120	1 190	1 270
37	778	871	1 100	1 180	1 260	1 340
38	820	919	1 160	1 240	1 330	1 410
39	864	968	1 220	1 310	1 400	1 490
40	909	1 020	1 280	1 380	1 470	1 560

[1)] The length mass will be increased by approximately 8 % when the rope is preserved with a compound or blocking agent during manufacture.
[2)] In the case of ropes with a parallel lay centre of round wires, the nominal metallic cross-sectional area, minimum breaking force and approximate nominal length mass should be increased by approximately 4,5 %.

Table B.2 — Rope with two layers of full-lock wires

Nominal rope diameter	Approximate nominal length mass[1)2)]	Nominal metallic cross-sectional area[2)]	Minimum breaking force[2)]			
			Rope grade 1370	Rope grade 1470	Rope grade 1570	Rope grade 1670
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)	(kN)
25	368	412	520	558	596	634
26	398	446	562	603	644	685
27	429	481	606	650	695	738
28	462	517	652	700	747	795
29	495	555	699	750	801	852
30	530	594	748	803	858	912
31	566	634	799	857	916	974
32	603	676	851	914	976	1 040
33	642	718	906	972	1 040	1 100
34	681	763	961	1 030	1 100	1 170
35	722	808	1 020	1 090	1 170	1 240
36	764	855	1 080	1 160	1 230	1 310
37	807	903	1 140	1 220	1 300	1 390
38	851	953	1 200	1 290	1 380	1 460
39	896	1 000	1 260	1 360	1 450	1 540
40	943	1 060	1 330	1 430	1 520	1 620
41	990	1 110	1 400	1 500	1 600	1 700
42	1 040	1 160	1 470	1 570	1 680	1 790
43	1 090	1 220	1 540	1 650	1 760	1 870
44	1 140	1 280	1 610	1 730	1 840	1 960
45	1 190	1 340	1 680	1 810	1 930	2 050
46	1 250	1 400	1 760	1 830	2 020	2 140
47	1 300	1 460	1 840	1 970	2 110	2 240
48	1 360	1 520	1 920	2 060	2 200	2 340
49	1 410	1 580	2 000	2 140	2 290	2 430
50	1 470	1 650	2 080	2 230	2 380	2 530
51	1 530	1 720	2 160	2 320	2 480	2 640
52	1 590	1 780	2 250	2 410	2 580	2 740
53	1 650	1 850	2 340	2 510	2 680	2 850
54	1 720	1 920	2 420	2 600	2 780	2 960
55	1 780	2 000	2 520	2 700	2 880	3 070
56	1 850	2 070	2 610	2 800	2 990	3 180
57	1 910	2 140	2 700	2 900	3 100	3 290
58	1 980	2 220	2 800	3 000	3 210	3 410
59	2 050	2 300	2 890	3 110	3 320	3 530
60	2 120	2 380	2 990	3 210	3 430	3 650

[1)] The length mass will be increased by approximately 6,5 % when the rope is preserved with a compound or blocking agent during manufacture.
[2)] In the case of ropes with a parallel lay centre of round wires, the nominal metallic cross-sectional area, minimum breaking force and approximate nominal length mass should be increased by approximately 2 %.

Table B.3 — Rope with three and more layers of full-lock wires

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force		
			Rope grade 1370	Rope grade 1470	Rope grade 1570
(mm)	(kg/100m)	(mm^2)	(KN)	(KN)	(KN)
40	976	1 090	1 380	1 480	1 580
41	1 030	1 150	1 450	1 550	1 660
42	1 080	1 210	1 520	1 630	1 740
43	1 130	1 260	1 590	1 710	1 820
44	1 180	1 320	1 670	1 790	1 910
45	1 240	1 380	1 740	1 870	2 000
46	1 290	1 450	1 820	1 960	2 090
47	1 350	1 510	1 900	2 040	2 180
48	1 410	1 570	1 980	2 130	2 270
49	1 470	1 640	2 070	2 220	2 370
50	1 530	1 710	2 150	2 310	2 470
51	1 610	1 800	2 270	2 430	2 600
52	1 670	1 870	2 360	2 530	2 700
53	1 730	1 940	2 450	2 630	2 800
54	1 800	2 020	2 540	2 730	2 910
55	1 870	2 090	2 640	2 830	3 020
56	1 940	2 170	2 730	2 930	3 130
57	2 010	2 250	2 830	3 040	3 240
58	2 080	2 330	2 930	3 140	3 360
59	2 150	2 410	3 030	3 250	3 480
60	2 220	2 490	3 140	3 360	3 590
61	2 300	2 570	3 240	3 480	3 710
62	2 370	2 660	3 350	3 590	3 840
63	2 450	2 740	3 460	3 710	3 960
64	2 530	2 830	3 570	3 830	4 090
65	2 610	2 920	3 680	3 950	4 220
66	2 690	3 010	3 790	4 070	4 350
67	2 770	3 100	3 910	4 200	4 480
68	2 850	3 200	4 030	4 320	4 620
69	2 940	3 290	4 150	4 450	4 750
70	3 020	3 390	4 270	4 580	4 890
71	3 110	3 480	4 390	4 710	5 030
72	3 200	3 580	4 520	4 850	5 180
73	3 290	3 680	4 640	4 980	5 320
74	3 380	3 780	4 770	5 120	5 470
75	3 470	3 890	4 900	5 260	5 620
76	3 560	3 990	5 030	5 400	5 770
77	3 660	4 100	5 160	5 540	5 920
78	3 760	4 200	5 300	5 690	6 070
79	3 850	4 310	5 440	5 830	6 230
80	3 950	4 420	5 580	5 980	6 390
81	4 050	4 530	5 720	6 130	6 550
82	4 150	4 650	5 860	6 290	6 710
83	4 250	4 760	6 000	6 440	6 880
84	4 350	4 880	6 150	6 600	7 040

[1)] The length mass will be increased by approximately 5% when the rope is preserved with a compound or blocking agent during manufacture.

Table B.3 — Rope with three and more layers of full-lock wires (*continued*)

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force		
			Rope grade 1370	Rope grade 1470	Rope grade 1570
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)
85	4 460	4 990	6 290	6 750	7 210
86	4 560	5 110	6 440	6 910	7 380
87	4 670	5 230	6 590	7 070	7 560
88	4 780	5 350	6 750	7 240	7 730
89	4 890	5 470	6 900	7 400	7 910
90	5 000	5 600	7 060	7 570	8 090
91	5 180	5 790	7 300	7 830	8 360
92	5 300	5 920	7 460	8 000	8 550
93	5 410	6 050	7 620	8 180	8 730
94	5 530	6 180	7 780	8 350	8 920
95	5 650	6 310	7 950	8 530	9 110
96	5 770	6 440	8 120	8 710	9 300
97	5 890	6 580	8 290	8 890	9 500
98	6 010	6 710	8 460	9 080	9 700
99	6 130	6 850	8 630	9 270	9 900
100	6 260	6 990	8 810	9 450	10 100
101	6 380	7 140	8 990	9 640	10 300
102	6 510	7 270	9 170	9 840	10 500
103	6 640	7 420	9 350	10 000	10 700
104	6 770	7 560	9 530	10 200	10 900
105	6 900	7 710	9 710	10 400	11 100
106	7 030	7 850	9 900	10 600	11 300
107	7 160	8 000	10 100	10 800	11 600
108	7 300	8 150	10 300	11 000	11 800
109	7 430	8 300	10 500	11 200	12 000
110	7 570	8 460	10 700	11 400	12 200
111	7 710	8 610	10 900	11 600	12 400
112	7 850	8 770	11 100	11 900	12 700
113	7 990	8 930	11 200	12 100	12 900
114	8 130	9 080	11 400	12 300	13 100
115	8 270	9 240	11 700	12 500	13 400
116	8 420	9 410	11 900	12 700	13 600
117	8 560	9 570	12 100	12 900	13 800
118	8 710	9 730	12 300	13 200	14 100
119	8 860	9 900	12 500	13 400	14 300
120	9 010	10 100	12 700	13 600	14 500
121	9 160	10 200	12 900	13 800	14 800
122	9 310	10 400	13 100	14 100	15 000
123	9 460	10 600	13 300	14 300	15 300
124	9 620	10 700	13 500	14 500	15 500
125	9 780	10 900	13 800	14 800	15 800

[1)] The length mass will be increased by approximately 5% when the rope is preserved with a compound or blocking agent during manufacture.

Table B.3 — Rope with three and more layers of full-lock wires (*continued*)

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force		
			Rope grade 1370	Rope grade 1470	Rope grade 1570
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)
126	10 000	11 200	14 100	15 200	
127	10 200	11 400	14 400	15 400	
128	10 300	11 600	14 600	15 700	
129	10 500	11 800	14 800	15 900	
130	10 700	11 900	15 100	16 200	
131	10 800	12 100	15 300	16 400	
132	11 000	12 300	15 500	16 700	
133	11 200	12 500	15 800	16 900	
134	11 300	12 700	16 000	17 200	
135	11 500	12 900	16 200	17 400	
136	11 700	13 100	16 500	17 700	
137	11 800	13 300	16 700	17 900	
138	12 000	13 500	17 000	18 200	
139	12 200	13 700	17 200	18 500	
140	12 400	13 900	17 500	18 700	
141	12 500	14 100	17 700	19 000	
142	12 700	14 300	18 000	19 300	
143	12 900	14 500	18 200	19 500	
144	13 100	14 700	18 500	19 800	
145	13 300	14 900	18 700	20 100	
146	13 500	15 100	19 000	20 400	
147	13 600	15 300	19 300	20 700	
148	13 800	15 500	19 500	20 900	
149	14 000	15 700	19 800	21 200	
150	14 200	15 900	20 000	21 500	
151	14 400	16 100	20 300	21 800	
152	14 600	16 300	20 600	22 100	
153	14 800	16 500	20 900	22 400	
154	15 000	16 800	21 100	22 700	
155	15 200	17 000	21 400	23 000	
156	15 400	17 200	21 700	23 300	
157	15 600	17 400	22 000	23 600	
158	15 800	17 600	22 200	23 900	
159	16 000	17 900	22 500	24 200	
160	16 200	18 100	22 800	24 500	
161	16 400	18 300	23 100	24 800	
162	16 600	18 600	23 400	25 100	
163	16 800	18 800	23 700	25 400	
164	17 000	19 000	24 000	25 700	
165	17 200	19 200	24 300	26 000	
166	17 400	19 500	24 600	26 300	
167	17 600	19 700	24 800	26 700	
168	17 800	20 000	25 100	27 000	
169	18 000	20 200	25 400	27 300	

[1)] The length mass will be increased by approximately 3,5 % when the rope is preserved with a compound or blocking agent during manufacture.

Table B.3 — Rope with three and more layers of full-lock wires (*concluded*)

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force		
			Rope grade 1370	Rope grade 1470	Rope grade 1570
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)
170	18 200	20 400	25 700	27 600	
171	18 500	20 700	26 100	28 000	
172	18 700	20 900	26 400	28 300	
173	18 900	21 200	26 700	28 600	
174	19 100	21 400	27 000	28 900	
175	19 300	21 600	27 300	29 300	
176	19 600	21 900	27 600	29 600	
177	19 800	22 100	27 900	29 900	
178	20 000	22 400	28 200	30 300	
179	20 200	22 600	28 500	30 600	
180	20 500	22 900	28 900	31 000	

[1)] The length mass will be increased by approximately 3,5 % when the rope is preserved with a compound or blocking agent during manufacture.

Annex C
(informative)

Typical breaking forces and nominal length masses for spiral strand rope

Table C.1 — Strand construction 1x7[1)]

Nominal rope diameter	Approximate nominal length mass[2)]	Nominal metallic cross-sectional area	Minimum breaking force		
			Rope grade 1570	Rope grade 1770	Rope grade 1960
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)
2,5	3,06	3,68	5,20	5,86	6,49
3	4,40	5,30	7,49	8,45	9,35
3,5	5,99	7,22	10,2	11,5	12,7
4	7,82	9,42	13,3	15,0	16,6
4,5	9,90	11,9	16,9	19,0	21,0
5	12,2	14,7	20,8	23,5	26,0
6	17,6	21,2	30,0	33,8	37,4
6,4	20,0	24,1	34,1	38,4	42,6
7	24,0	28,9	40,8	46,0	50,9
8	31,3	37,7	53,3	60,1	66,5
9	39,6	47,7	67,4	76,0	84,2
9,5	44,1	53,2	75,1	84,7	93,8
10	48,9	58,9	83,2	93,8	104
11	59,2	71,3	101	114	
12	70,4	84,8	120	135	
13	82,6	99,5	141	159	
14	95,8	115	163	184	
14,5	103	124	175	197	
16	125	151	213	240	

[1)] This construction, which is referred to as a strand, is not strictly a spiral rope (which by definition has at least two layers of wires).
[2)] The length mass will be increased by approximately 9 % when the rope is preserved with a compound or blocking agent during manufacture.

Table C.2 — Spiral strand construction 1x19

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force		
			Rope grade 1570	Rope grade 1770	Rope grade 1960
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)
5	12,1	14,6	20,6	23,3	25,8
6	17,5	21,0	29,7	33,5	37,1
6,4	19,9	23,9	33,8	38,1	42,2
7	23,8	28,6	40,5	45,6	50,5
8	31,0	37,4	52,8	59,6	66,0
9	39,3	47,3	66,9	75,4	83,5
9,5	43,8	52,7	74,5	84,0	93,0
10	48,5	58,4	82,6	93,1	103
11	58,7	70,7	99,9	113	125
12	69,8	84,1	119	134	148
13	82,0	98,8	140	157	174
14	95,1	115	162	182	202
14,5	102	123	174	196	217
16	124	150	211	238	264
18	157	189	268	302	
19	175	211	298	336	
20	194	234	330	372	
22	235	283	400	451	
26	328	395	558	629	
28	380	458	647	730	
29	408	491	694	783	
30	436	526	743	838	

[1)] The length mass will be increased by approximately 9 % when preserved with a compound during manufacture.

Table C.3 — Spiral strand construction 1x37

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force		
			Rope grade 1570	Rope grade 1770	Rope grade 1960
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)	(kN)
6	17,4	21,0	29,0	32,7	36,2
6,4	19,8	23,9	33,0	37,2	41,2
7	23,7	28,6	39,5	44,5	49,3
8	31,0	37,3	51,5	58,1	64,3
9	39,2	47,2	65,2	73,5	81,4
9,5	43,7	52,6	72,7	81,9	90,7
10	48,4	58,3	80,5	90,8	101
11	58,5	70,5	97,4	110	122
12	69,7	83,9	116	131	145
13	81,7	98,5	136	153	170
14	94,8	114	158	178	197
14,5	102	123	169	191	211
16	124	149	206	232	257
18	157	189	261	294	326
19	175	210	291	328	363
20	193	233	322	363	402
22	234	282	390	439	486
24	279	336	464	523	579
26	327	394	544	614	
28	379	457	631	712	
29	407	490	677	763	
30	435	524	725	817	
32	495	597	824	930	
34	559	674	931		
35	593	714	986		
36	627	755	1 040		
38	698	842	1 160		
40	774	932	1 290		
42	853	1 030	1 420		

[1)] The length mass will be increased by approximately 9 % when the rope is preserved with a compound during manufacture.

Table C.4 — Spiral strand construction 1x61

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force	
			Rope grade 1570	Rope grade 1770
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)
20	193	233	322	363
22	234	282	389	439
24	278	335	463	522
26	327	393	544	613
28	379	456	630	711
29	406	489	676	762
30	435	524	724	816
32	495	596	823	928
34	558	673	929	1 050
35	592	713	985	1 110
36	626	754	1 040	1 170
38	698	840	1 160	1 310
40	773	931	1 290	1 450
42	852	1 030	1 420	
44	935	1 130	1 560	
45	978	1 180	1 630	
46	1 020	1 230	1 700	
48	1 110	1 340	1 850	
50	1 210	1 450	2 010	
51	1 260	1 510	2 090	
52	1 310	1 570	2 170	
54	1 410	1 700	2 340	

[1)] The length mass will be increased by approximately 9 % when the rope is preserved with a compound during manufacture.

Table C.5 — Spiral strand construction 1x91

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force	
			Rope grade 1570	Rope grade 1770
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)
30	434	522	722	814
32	493	594	821	926
34	557	671	927	1 050
35	590	711	982	1 110
36	624	752	1 040	1 170
38	696	838	1 160	1 310
40	771	929	1 280	1 450
42	850	1 020	1 410	1 590
44	933	1 120	1 550	1 750
45	976	1 180	1 620	1 830
46	1 020	1 230	1 700	1 910
48	1 110	1 340	1 850	2 080
50	1 200	1 450	2 000	2 260
51	1 250	1 510	2 090	2 350
52	1 300	1 570	2 170	2 440
54	1 400	1 690	2 340	
56	1 510	1 820	2 510	
57	1 570	1 890	2 610	
58	1 620	1 950	2 700	
60	1 730	2 090	2 890	
62	1 850	2 230	3 080	
64	1 970	2 380	3 280	
66	2 100	2 530	3 490	

[1)] The length mass will be increased by approximately 9 % when the rope is preserved with a zinc compound during manufacture.

Table C.6 — Spiral strand construction 1x127 to 1x547

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force	
			Rope grade 1570	Rope grade 1770
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)
50	1 200	1 450	2 000	2 260
51	1 250	1 510	2 090	2 350
52	1 300	1 570	2 170	2 440
54	1 400	1 690	2 340	2 640
56	1 510	1 820	2 510	2 840
57	1 570	1 890	2 610	2 940
58	1 620	1 950	2 700	3 040
60	1 730	2 090	2 890	3 250
62	1 850	2 230	3 080	3 480
64	1 970	2 380	3 280	3 700
66	2 100	2 530	3 490	3 940
67	2 160	2 610	3 600	4 060
68	2 230	2 680	3 710	4 180
70	2 360	2 840	3 930	4 430
71	2 430	2 930	4 040	4 560
72	2 500	3 010	4 160	4 690
74	2 640	3 180	4 390	4 950
76	2 780	3 350	4 630	5 220
77	2 860	3 440	4 750	5 360
78	2 930	3 530	4 880	5 500
80	3 080	3 710	5 130	5 790
82	3 240	3 900	5 390	6 080
83	3 320	4 000	5 520	6 230
84	3 400	4 100	5 660	6 380
86	3 560	4 290	5 930	6 690
87	3 650	4 390	6 070	6 840
88	3 730	4 490	6 210	7 000
90	3 900	4 700	6 500	7 320
92	4 080	4 910	6 790	7 650
94	4 260	5 130	7 090	7 990
96	4 440	5 350	7 390	8 330
98	4 630	5 570	7 700	8 680
100	4 820	5 800	8 020	9 040
102	5 010	6040	8 340	9 410
103	5 110	6 160	8 510	9 590
104	5 210	6 280	8 670	9 780
106	5 410	6 520	9 010	10 200
108	5 620	6 770	9 350	10 500
109	5 720	6 900	9 530	10 700
110	5 830	7 020	9 700	10 900

[1)] The length mass will be increased by approximately 9% when preserved with a zinc compound during manufacture.

Table C.6 — Spiral strand construction 1x127 to 1x547 (*concluded*)

Nominal rope diameter	Approximate nominal length mass[1)]	Nominal metallic cross-sectional area	Minimum breaking force	
			Rope grade 1570	Rope grade 1770
(mm)	(kg/100m)	(mm^2)	(kN)	(kN)
112	6 040	7 280	10 100	11 300
114	6 260	7 540	10 400	11 700
115	6 370	7 680	10 600	12 000
116	6 480	7 810	10 800	12 200
118	6 710	8 080	11 200	12 600
120	6 940	8 360	11 500	13 000
122	7 170	8 640	11 900	13 500
124	7 410	8 920	12 300	13 900
126	7 650	9 210	12 700	14 400
128	7 890	9 510	13 100	14 800
130	8 140	9 810	13 600	15 300
132	8 390	10 100	14 000	15 800
134	8 650	10 400	14 400	16 200
135	8 780	10 600	14 600	16 500
136	8 910	10 700	14 800	16 700
138	9 170	11 100	15 300	17 200
140	9 440	11 400	15 700	17 700
141	9 580	11 500	15 900	18 000
142	9 710	11 700	16 200	18 200
144	9 990	12 000	16 600	18 700
146	10 300	12 400	17 100	
147	10 400	12 500	17 300	
148	10 600	12 700	17 600	
150	10 800	13 100	18 000	
152	11 100	13 400	18 500	
154	11 400	13 800	19 000	
156	11 700	14 100	19 500	
158	12 000	14 500	20 000	
160	12 300	14 900	20 500	

[1)] The length mass will be increased by approximately 9% when preserved with a zinc compound during manufacture.

Annex D
(informative)

Information which should be provided with an enquiry or an order

At least the following information should be supplied with an enquiry or order:

a) The rope application;

b) Reference to this standard, i.e. EN 12385-10;

c) Quantity and length;

d) Nominal diameter;

e) Construction;

f) The finish of the wires (i.e. zinc coat or zinc alloy coat and coating class);

g) Direction of lay of the outer wires;

h) Minimum breaking force;

i) The type of lubricant or blocking agent, if any, and whether there are any restrictions on the amount of lubrication;

j) Whether there are any limiting packaging dimensions and weights;

k) Whether the rope is required to be pre-stressed;

l) Whether the rope is required to be covered, and, if so, the material thickness;

m) The type of end connection, e.g. socket;

n) Type of item – if any to be attached to the rope.

Annex ZA
(informative)

[A1] Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 98/37/EC amended by 98/79/CE on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING - Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard. [A1]

Annex ZB
(informative)

A1 Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING - Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard. A1