BS EN 10257-2:2011

BSI Standards Publication

Zinc or zinc alloy coated non-alloy steel wire for armouring either power cables or telecommunication cables

Part 2: Submarine cables

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National foreword

This British Standard is the UK implementation of EN 10257-2:2011. It supersedes BS EN 10257-2:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/106, Wire Rod and Wire.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

Zinc or zinc alloy coated non-alloy steel wire for armouring either power cables or telecommunication cables - Part 2: Submarine cables

Fils en acier non allié revêtus de zinc ou d'alliage de zinc pour l'armure des câbles destinés au transport d'énergie ou aux télécommunications - Partie 2: Câbles sous-marins

Mit Zink oder Zinklegierung überzogener unlegierter Stahldraht zur Bewehrung von Strom- und Fernmeldekabeln- - Teil 2: Unterseekabel

This European Standard was approved by CEN on 10 September 2011.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 10257-2:2011) has been prepared by Technical Committee ECISS/TC 106 “Wire rod and wires”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10257-2:1998.

The European Standard will comprise the following parts:

— *Part 1: Land cables*;

— *Part 2: Submarine cables*.

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, Croatia, 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 the United Kingdom.

1 Scope

This European Standard specifies requirements for the properties of non-alloy zinc or zinc alloy coated steel wires used for the armouring of either submarine power or telecommunication cables.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10021, *General technical delivery conditions for steel products*

EN 10204, *Metallic products — Types of inspection documents*

EN 10218-1, *Steel wire and wire products — General — Part 1: Test methods*

EN 10218-2:1996, *Steel wire and wire products — General — Part 2: Wire dimensions and tolerances*

EN 10244-1, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 1: General principles*

EN 10244-2:2009, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc alloy coatings*

EN ISO 16120-1, *Non-alloy steel wire rod for conversion to wire - Part 1: General requirements (ISO 16120-1:2011)*

EN ISO 16120-2, *Non-alloy steel wire rod for conversion to wire - Part 2: Specific requirements for general-purpose wire rod (ISO 16120-2:2011)*

EN ISO 16120-3, *Non-alloy steel wire rod for conversion to wire - Part 3: Specific requirements for rimmed and rimmed substitute, low-carbon steel wire rod (ISO 16120-3:2011)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
coil
reel
spool
continuous length of wire wound in approximately concentric rings

3.2
batch
quantity of finished wire presented for examination and tested at any one time

4 Information to be supplied by the purchaser

When ordering wire to this European Standard, the purchaser shall specify:

a) the designation (see Clause 5);

b) the quantity in appropriate units;

c) the unit weight of coils (kg);

d) instructions for strapping and packaging;

e) surface condition (see Clause 7.3);

f) agreed quality characteristics (see Clause 8);

g) inspection document requirements.

And if required:

h) coating uniformity;

i) identity for traceability.

5 Designation

The steel wire for submarine cable shall be designated by:

a) number of this European Standard i.e. EN 10257-2;

b) tensile strength grade;

c) nominal wire diameter;

d) wire coating type.

EXAMPLE Wire for submarine cable to EN 10257-2, grade 85, 2,24 mm diameter zinc coated to EN 10244-2:2009, class A.

EN 10257-2 - 85 - 2,24 Zn EN 10244-2:2009, class A.

6 Manufacture

6.1 Non-alloy steel

The steel wire shall be cold drawn from plain carbon steel rod produced to EN ISO 16120-1, EN ISO 16120-2 or EN ISO 16120-3 and capable of achieving the physical properties required by this standard. The steel rod shall be capable of being satisfactorily butt-welded.

6.2 Welds in coils

For grades 34 and 65 only, one dressed weld per coil shall be allowed after drawing and before coating. Such a weld shall not be less than 100 m from either end of the coil.

No weld shall be made after drawing on grades 85, 105, 125, 145 and 165.

7 Requirements

7.1 Mechanical properties

7.1.1 Tensile strength

The tensile strength of the wires measured on the actual diameter shall be as given in Table 1 for the appropriate grade.

Table 1 — Tensile strength of wire grades

Grade	Tensile strength range N/mm^2
34	$340 < R_m \leq 540$
65	$650 < R_m \leq 850$
85	$850 < R_m \leq 1\,050$
105	$1\,050 < R_m \leq 1\,250$
125	$1\,250 < R_m \leq 1\,450$
145	$1\,450 < R_m \leq 1\,650$
165	$1\,650 < R_m \leq 1\,900$

NOTE 1 If other minima are ordered a 200 N/mm^2 range shall apply.

NOTE 2 If tensile strength minima are ordered other than those specified and the tensile strength of the ordered grade is less than or equal to 100 N/mm^2 above the minimum tensile strength of the nearest lower specified grade then the properties of that grade shall apply. If the minimum tensile strength of the required grade is more than 100 N/mm^2 above the minimum tensile strength of the nearest lower specified grade then the higher grade properties shall apply.

7.1.2 Elongation

Elongation measured after fracture shall be not less than that given in Tables 2, 3 or 4 for the grade and diameter of wire being tested.

7.1.3 Torsion

When tested in accordance with 10.3.1, the wire shall withstand without breaking not less than the minimum number of turns given in Tables 2, 3 and 4 for the wire being tested.

7.1.4 Steel ductility wrap test

When subjected to a steel ductility wrap test, test samples of grade 85, 105, 125, or 145 shall withstand being closely wrapped by 8 turns around their own diameter. A test sample of grade 165 shall withstand being closely wrapped around two times its own diameter. No sign of fracture of the base metal shall be evident.

7.2 Nominal diameters and tolerances

The preferred nominal diameters of finished wire and the tolerances on diameter shall be as specified in Tables 2, 3 and 4, depending on the tensile grades.

The tolerances correspond to T1 of EN 10218-2:1996, Table 1.

It is recognized that thick coatings, obtained in the hot dip process, may not be entirely free from surface irregularities, and, provided the latter do not go beyond the limits of good practice (i.e. isolated and not of a repetitive nature), they shall not be a cause for rejection. Persistent lumpy galvanizing or bambooing shall be cause for rejection.

Table 2 — Preferred nominal diameters, tolerances and mechanical properties of grade 34 steel wire

Nominal wire diameter mm	**Tolerance on diameter** mm	**Minimum elongation on gauge length** L_0 = 250 mm %	**Torsion test minimum number of turns[a] on gauge length** L_0 = 150 mm
3,35	± 0,07		18
4,00	± 0,07		15
4,25	± 0,08		14
4,50	± 0,08	10	13
4,75	± 0,08		13
5,00	± 0,08		12
5,30	± 0,09		11
5,6	± 0,09		11
6,0	± 0,09		10
6,3	± 0,09	10	10
6,7	± 0,10		9
7,1	± 0,10		8
7,5	± 0,10		8
8,0	± 0,10	10	8
8,5	± 0,12		7

[a] Based on 40 turns in a length of 100 wire diameters.

NOTE 1 For intermediate sizes the properties to be achieved shall be those for the next larger size listed.

NOTE 2 Grade 34 steel wire may in time exhibit changes in mechanical properties after manufacture, particularly tensile strength and elongation. These changes result from a phenomenon known as strain ageing or strain age hardening, and lead to an increase in tensile strength and a decrease in elongation, compared to the wire immediately after coating with zinc.

It is customary to carry out tests immediately after manufacture. At ordinary temperatures, strain ageing may proceed slowly. Therefore, results of tests performed by the purchaser may be at variance with those reported by the supplier.

Table 3 — Preferred nominal diameters, tolerances and mechanical properties of grade 65 steel wire

Nominal diameter mm	Tolerance on diameter mm	Minimum elongation on 250 mm gauge length %	Torsion test minimum number of turns[a] on 150 mm gauge length
2,65	± 0,06	5	12
3,35	± 0,07	6	10
4,25	± 0,08	6	8
5,00	± 0,08	6	7
[a] Based on 23 turns in a length of 100 wire diameters.			
NOTE For intermediate sizes the properties to be achieved are those of the next larger size listed.			

Table 4 — Preferred nominal diameters, tolerances and mechanical properties of grades 85, 105, 125, 145 and 165 steel wire

Nominal wire diameter mm	Tolerance on diameter mm	Minimum elongation on 250 mm gauge length %					Torsion test on 150 mm gauge length			
		Grade					Minimum number of turns[a]			
		85	105	125	145	165	grades 85 and 105	grade 125	grade 145	grade 165
2,12		5	4,5	4	3	2,5	16	14	12	10
2,24	± 0,06	5	4,5	4	3	2,5	15	13	11	9
2,36		5	4,5	4,5	3	2,5	15	13	11	9
2,50		5	5	5	3	2,5	14	12	10	8
2,65	± 0,06	5	5	5	3,5	3	13	11	9	8
2,80		5	5	5	3,5	3	12	11	9	7
3,15		5	5	5	3,5	3	11	9	8	7
3,35	± 0,07	5	5	5	4	3,5	10	9	7	6
3,55		5	5	5	4	3,5	10	8	7	6
4,00		5	5	5	4	4	9	7	6	4
5,00	± 0,08	5	5	5	4	4	8	6	5	4
5,30	± 0,09	5	5	-	-	-	7	-	-	-
6,00		5	5	-	-	-	6	-	-	-
[a] Based on 23 turns in a length of 100 wire diameters for grades 85 + 105. Based on 20 turns in a length of 100 wire diameters for grade 125. Based on 17 turns in a length of 100 wire diameters for grade 145. Based on 14 turns in a length of 100 wire diameters for grade 165.										
NOTE For intermediate sizes the elongation value to be achieved shall be those of the next larger size listed. But for torsion values they shall be proportionally based on [a] and rounded to the next lower figure.										

7.3 Coating, adhesion and surface finish

The wire shall be zinc or zinc alloy coated either by the hot dip or the electrolytic process, in accordance with EN 10244-2:2009 (Table 1 and Table 2), class A. The coating shall conform to the adherence test of EN 10244-1 and EN 10244-2. If required, the uniformity shall conform to EN 10244-2.

NOTE The finished wire should be free from any defects likely to cause breakages in subsequent manufacturing processes or service, or likely to adversely affect the finished cables. The wire is usually supplied as zinc or zinc alloy coated. Additionally further coatings with a special finish (e.g. wax or surface compatible with bitumen) may be supplied by agreement between manufacturer and customer.

8 Sampling and testing

The manufacturer shall be responsible for the control of product quality by the application of statistical methods of sampling and analysis of results or, alternatively, by sampling and testing for the agreed quality characteristics at a rate of one roll/reel in 50.

9 Inspection and documentation

Unless otherwise agreed at time of enquiry and order, non-specific testing and inspection and inspection documentation shall be provided according to the requirements of EN 10204 and EN 10021.

10 Methods of test

10.1 Diameter measurement

The diameter of the zinc or zinc alloy coated test piece shall be determined with a micrometer by taking two measurements at right angles to each other at three places, choosing smooth zones, along a length of not less than 250 mm. The average of the six measurements shall be taken as the actual diameter of the galvanized wire test piece.

10.2 Tensile and elongation tests

10.2.1 The test shall be carried out in accordance with EN 10218-1, with a test length between the grips sufficient to accommodate a gauge length of 250 mm.

10.2.2 The tensile strength shall be calculated on the actual diameter of the coated wire, as determined in 10.1.

10.2.3 The elongation shall be measured on the 250 mm gauge length after the fractured ends have been fitted together. Where the fracture during testing does not occur in the middle 80 % portion of the gauge length and the elongation specification is not met, it is permissible to repeat the test.

10.3 Torsion test

10.3.1 The test shall be carried out in accordance with EN 10218-1. The ends of the test piece shall be gripped in two vices so that its longitudinal axes are coincident with that of the vices. The distance between the vices shall be 150 mm.

10.3.2 When tested in the manner described in 10.3.1, the wire shall withstand, without breaking, not less than the minimum number of turns appropriate to the wire being tested, as given in Tables 2, 3 and 4.

10.4 Steel ductility wrap test

This test applies to grades 85, 105, 125, 145 and 165 only.

10.5 Coating test

The wire shall be tested in accordance with the methods of test given in EN 10244-1 and EN 10244-2.

11 Packing and identification

The wire manufacturer shall ensure that every coil is securely tied and shall attach to every coil a weather resistant label or labels on which shall be shown the wire manufacturer's name, the coil or batch number, the size of the wire, the number of this European Standard, and such other markings as may be agreed upon between the wire manufacturer and the purchaser.

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