

BS EN 10264-4:2012



BSI Standards Publication

# Steel wire and wire products — Steel wire for ropes

Part 4: Stainless steel wire

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**National foreword**

This British Standard is the UK implementation of EN 10264-4:2012. It supersedes BS EN 10264-4:2002, which is withdrawn.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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## Contents

Page

Foreword.....	3
1 Scope .....	4
2 Normative references .....	4
3 Designation of product .....	4
4 General conditions of manufacture .....	4
4.1 Main steel grades and characteristic applications.....	4
4.2 Chemical composition .....	5
4.3 Surface condition.....	5
5 Characteristics and requirements.....	6
5.1 Tensile strength .....	6
5.2 Diameter tolerances .....	6
5.3 Ductility .....	7
5.4 Magnetic permeability .....	7
6 Test methods.....	7
6.1 General.....	7
6.2 Dimension of wire .....	7
6.3 Tensile test .....	7
6.4 Reverse bend test.....	7
6.5 Wrapping test.....	7
6.6 Tensile test on knotted wire .....	8
6.7 Magnetic permeability .....	8

## Foreword

This document (EN 10264-4:2012) 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of an identical text or by endorsement, at the latest by July 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.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 10264-4:2002.

This European Standard for wire for ropes is made up of the following parts:

- *Part 1: General requirements*
- *Part 2: Cold drawn non alloy steel wire for ropes for general applications*
- *Part 3: Round and shaped non alloyed steel wire for high duty applications*
- *Part 4: Stainless steel wire*

This European Standard has been technically revised to incorporate the following changes:

- a) clarification has been given in Table 2 "Chemical analysis in % by mass" because some values are ranges. A note has also been added in order to mention that other steel grades can be agreed between purchaser and supplier;
- b) modification has been made on the maximum value for the tensile strength (see 5.1);
- c) the nominal diameter and the minimum tensile strength given in Table 3 "Tensile strength requirements" have been changed;
- d) a note has been added to allow other diameters or tensile strength than those given in Table 3, subject to an agreement between purchaser and supplier;
- e) the ranges of nominal diameter given in Table 4 "Diameter tolerances" have been clarified.

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, Turkey and the United Kingdom.

## 1 Scope

This part of this European Standard specifies the characteristics of stainless steel wire for the manufacture of ropes that are exposed to corrosion and in some cases to a moderate temperature.

This part of this European Standard specifies the following for stainless steel wire for ropes:

- dimensional tolerances;
- mechanical characteristics;
- requirements relating to the chemical composition of the stainless steel wire;
- conditions to be satisfied by any coating.

## 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 10088-3, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

EN 10095, *Heat resisting steels and nickel alloys*

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

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

ASTM A342, *Standard Test Methods for Permeability of Feebly Magnetic Materials*

## 3 Designation of product

The designation of the product is based on the nominal diameter, chemical composition and minimum tensile strength of the wire.

EXAMPLE Stainless steel wire for rope, diameter 1,5 mm - grade X4CrNi18-12 - strength 1 450 MPa.

**Designation: Wire for rope EN 10264-4—1,5—X4CrNi18-12—1 450.**

NOTE The grade of steel can be designated numerically, see Table 1.

## 4 General conditions of manufacture

### 4.1 Main steel grades and characteristic applications

The grades given in Table 1 are widely used mainly in accordance with EN 10088-3 and EN 10095 with requirements as specified in this part of EN 10264. However, for other specific applications other steel grades specified in EN 10088-3 or EN 10095 may be used with requirements to be agreed between the parties.

Table 1 gives an informative indication of characteristic applications of the mentioned steel grades.

**Table 1 — Main steel grades and characteristic applications**

Grades of steel		Application
Steel number	Steel name	
1.4301	X5CrNi18-10	For general use in a corrosive environment
1.4310	X10CrNi18-8	As 1.4301 for general use for greater mechanical strength
1.4401	X5CrNiMo17-12-2	For highly corrosive environment particularly in marine atmosphere
1.4303	X4CrNi18-12	For low permeability requirements
1.4841	X15CrNiSi25-21	For ropes also subjected to a moderate temperature

## 4.2 Chemical composition

In accordance with EN 10088-3 and EN 10095, the chemical composition of the stainless steels shall comply with Table 2.

**Table 2 — Chemical analysis in % by mass**

Grades of steel		C	Si max.	Mn max.	P max.	S max.	Cr	Mo	Ni	N
Steel number	Steel name									
1.4301	X5CrNi18-10	≤ 0,07	1,00	2,00	0,045	0,015	17,00 to 19,50		8,00 to 10,50	≤ 0,11
1.4310	X10CrNi18-8	0,05 to 0,15	2,00	2,00	0,045	0,015	16,00 to 19,00	≤ 0,80	6,00 to 9,50	≤ 0,11
1.4401	X5CrNiMo17-12-2	≤ 0,07	1,00	2,00	0,045	0,015	16,50 to 18,50	2,00 to 2,50	10,00 to 13,00	≤ 0,11
1.4303	X4CrNi18-12	≤ 0,06	1,00	2,00	0,045	0,015	17,00 to 19,00		11,00 to 13,00	≤ 0,11
1.4841	X15CrNiSi25-21	≤ 0,20	1,50 to 2,50	2,00	0,045	0,030	24,00 to 26,00		19,00 to 22,00	≤ 0,11

NOTE Other steel grades can be agreed between purchaser and supplier.

## 4.3 Surface condition

Stainless steel wire for ropes shall be supplied either matt (dry drawn) or shiny (surface condition achieved either by polishing or by wet drawing). If a particular appearance is required, it shall be stipulated at the time of enquiry and order.

As an indication, wire of diameter lower than 0,50 mm is normally wet drawn and supplied shiny while wire with a diameter greater than 1,00 mm is commonly dry drawn and supplied matt. For intermediate sizes there is no preference and it will be pending of the manufacturer.

## 5 Characteristics and requirements

### 5.1 Tensile strength

The wire is characterized by a minimum tensile strength. The minimum tensile strength depends on the steel grade and the diameter of the wire. Table 3 specifies the minimum tensile strength for each steel grade. The maximum value shall not exceed the minimum value plus 20 %.

**Table 3 — Tensile strength requirements**

Nominal diameter <i>d</i> mm	Minimum tensile strength <sup>a</sup> – MPa <sup>b</sup>				
	1.4301	1.4310	1.4303	1.4401	1.4841
	LT <sup>c</sup>	NT <sup>d</sup>			
$d < 0,20$	2 050	2 200	1 600	1 725	1 700
$0,20 \leq d < 0,30$	2 000	2 150	1 575	1 700	1 650
$0,30 \leq d < 0,40$	1 950	2 100	1 550	1 675	1 600
$0,40 \leq d < 0,50$	1 900	2 050	1 550	1 650	1 575
$0,50 \leq d < 0,65$	1 850	2 000	1 525	1 625	1 575
$0,65 \leq d < 0,80$	1 800	1 950	1 525	1 600	1 550
$0,80 \leq d < 1,00$	1 750	1 900	1 500	1 575	1 550
$1,00 \leq d < 1,25$	1 700	1 850	1 475	1 550	1 525
$1,25 \leq d < 1,50$	1 650	1 800	1 450	1 500	1 500
$1,50 \leq d < 1,75$	1 600	1 750	1 425	1 450	1 475
$1,75 \leq d < 2,00$	1 550	1 700	1 400	1 400	1 450
$2,00 \leq d < 2,50$	1 500	1 650	1 350	1 350	1 400
$2,50 \leq d \leq 3,00$	1 450	1 600	1 300	1 300	1 350

NOTE Other diameters or tensile strength can be agreed between purchaser and supplier.

<sup>a</sup> For ropes for specific applications, lower strengths may be requested.

<sup>b</sup> 1 MPa = 1 N/mm<sup>2</sup>.

<sup>c</sup> Low level of tensile strength.

<sup>d</sup> Normal level of tensile strength.

### 5.2 Diameter tolerances

The diameter measured shall comply with the tolerances specified in Table 4. The out of roundness shall not be greater than half the tolerance on diameter.



**Table 4 — Diameter tolerances**

Dimensions in millimetres

Nominal diameter $d$	Tolerance ( $\pm$ )
$0,12 \leq d < 0,22$	0,006
$0,22 \leq d < 0,37$	0,008
$0,37 \leq d < 0,65$	0,010
$0,65 \leq d < 1,01$	0,015
$1,01 \leq d < 1,78$	0,020
$1,78 \leq d < 2,78$	0,025
$2,78 \leq d \leq 3,00$	0,030

### 5.3 Ductility

Because of the specific nature of this material and its deformation structure (by drawing), conventional ductility tests show a wide spread. When they are required, the following ductility tests shall be carried out: reverse bending test, tensile strength test on knotted wire or wrapping test. The parties shall agree upon the required ductility tests and on the minimum required results.

### 5.4 Magnetic permeability

When the grade X4CrNi18-12 (1.4303) is required with a very low permeability (non-magnetic), the magnetic permeability shall be less than 1,05.

The grade X4CrNiMo17-12-2 (1.4401) may also be requested with low permeability. In this case, the requirements shall be agreed between the parties.

## 6 Test methods

### 6.1 General

Tests shall be carried out in accordance with EN 10218-1 and EN 10264-1 with the following observations.

### 6.2 Dimension of wire

The diameter of the wire shall be measured with a micrometer with an accuracy of at least 0,001 mm for dimensions below 0,65 mm. For larger wire, an accuracy of 0,01 mm is acceptable.

### 6.3 Tensile test

The tensile test shall be carried out in accordance with EN 10264-1.

### 6.4 Reverse bend test

The reverse bend test shall be carried out in accordance with EN 10218-1.

### 6.5 Wrapping test

When coiled for 8 turns around a mandrel of equal diameter to the wire, the wire shall show no signs of breaking; the test shall be carried out in accordance with EN 10218-1.

## **6.6 Tensile test on knotted wire**

For diameters  $< 0,50$  mm, the tensile test on knotted wire shall be carried out in accordance with EN 10218-1. The strength is then measured on a wire in which 1 simple knot has been made. This strength is expressed as a percentage of the tensile strength of the unknotted wire.

## **6.7 Magnetic permeability**

Magnetic permeability shall be measured in accordance with ASTM A342 method 4 in a field of 500 to 1 000 Oersted.



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