

# Steel wire ropes — Safety —

## Part 1: General requirements

The European Standard EN 12385-1:2002 has the status of a  
British Standard

ICS 77.140.65

## National foreword

This British Standard is the official English language version of EN 12385-1:2002. It supersedes BS 302-1:1987 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MHE/2, Wire ropes, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

### Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

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English version

## Steel wire ropes - Safety - Part 1: General requirements

Câbles en acier - Sécurité - Partie 1: Prescriptions  
générales

Drahtseile aus Stahldraht - Sicherheit - Teil 1: Allgemeine  
Anforderungen

This European Standard was approved by CEN on 12 November 2001.

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## Foreword

This document (EN 12385-1:2002) 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of an identical text or by endorsement, at the latest by April 2003, and conflicting national standards shall be withdrawn at the latest by April 2003.

The other Parts of EN 12385 are:

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 10: Spiral ropes for general structural applications

This is the first edition of this Part.

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

## Introduction

This Part of this European Standard has been prepared to support Parts 4 to 10 that concern themselves with the particular requirements for steel wire ropes for use in specific applications. It cannot, therefore, exist alone.

The ropes concerned and the extent to which hazards are covered for specific applications are indicated in the scopes of Parts 4 to 10.

## 1 Scope

This Part specifies the general requirements for the manufacture and testing of steel wire rope, whose particular requirements are specified in the other Parts.

Annex A gives the type testing regimes for rope produced in series.

Annex B gives the testing requirements for wires taken from the rope when specified in other Parts of this standard.

## 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 292-2:1991/A1:1995, *Safety of machinery — Basic concepts, general principles of design — Part 2: Technical principles and specifications.*

EN 1050:1996, *Safety of machinery — Principles for risk assessment.*

EN 10204:1991, *Metallic products — Types of inspection documents.*

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

EN 10264-1:2002, *Steel wire and wire products — Steel wire for ropes — Part 1: General requirements.*

EN 10264-2:2002, *Steel wire and wire products — Steel wire for ropes — Part 2: Cold drawn non-alloyed steel wire for ropes for general applications.*

EN 10264-3, *Steel wire and wire products — Steel wire for ropes — Part 3: Cold drawn and cold shaped non-alloyed steel wire for heavy duty applications.*

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

prEN 12385-3, *Steel wire ropes — Safety — Part 3: Information of use and maintenance.*

EN 13411-4:2002, *Terminations for steel wire ropes — Safety — Part 4: Metal and resin socketing.*

ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system.*

ISO 4345:1988, *Steel wire ropes — Fibre main cores — Specification.*

## 3 Terms and definitions

For the purposes of this part of EN 12385, the terms and definitions in part 2 of EN 12385 shall apply.

## 4 List of hazards

The release of a load due to failure of steel wire ropes puts at risk directly or indirectly the safety or health of those persons within the danger zone.

In order to provide the necessary strength and durability of steel wire ropes, the other Parts of this standard lay down the particular requirements for the materials, manufacture, physical dimensions, mechanical properties and testing to ensure that specified levels of performance are met.

Fatigue failure has not been identified as a hazard for steel wire rope.

Since failure can be caused by the incorrect choice of specification of steel wire ropes, the other Parts of this standard, in association with this Part, give the particular requirements for marking and the information that is required to be stated on the manufacturer's certificate.

The particular hazards for the various rope applications are given in the other Parts.

## 5 Safety requirements and/or measures

### 5.1 Materials

#### 5.1.1 Wire

##### 5.1.1.1 Before ropemaking

All wires of the same size and shape in the same wire layer shall be of the same tensile strength grade.

For intermediate wire tensile strength grades the reverse bend and torsion properties shall be as for the next higher grade.

##### 5.1.1.2 After ropemaking

When other parts of this standard require tests to be carried out on wires taken from the rope, sampling, test methods and acceptance criteria shall be in accordance with annex B.

#### 5.1.2 Core

Fibre cores (FC) shall comply with ISO 4345 unless specified otherwise in the appropriate part of this standard.

Fibre cores (FC) for single layer stranded ropes larger than 8 mm diameter shall be doubly closed

Natural fibre cores (NFC) shall be treated with an impregnating compound to inhibit rotting and decay unless stated that the core is dry.

### 5.2 Rope manufacture

#### 5.2.1 Wire joints

When joints are necessary in wires over 0,4 mm they shall have their ends joined by brazing or welding.

For stranded ropes the minimum distance between joints within one strand shall be  $18 \times$  rope diameter ( $d$ ).

For spiral ropes the minimum distance between joints in any wire layer shall be  $36 \times$  diameter of the wire layer.

If twisting as a joint is performed on wires up to and including 0,4 mm during manufacture, the twist shall be removed from the finished rope.

NOTE 1 Wires up and including 0,4 mm can be joined by twisting or by the ends being simply inserted into the strand's formation.

NOTE 2 When joints in wires before closing are not accepted, this should be the subject of agreement (see introduction) between the purchaser and the manufacturer.

#### 5.2.2 Preformation

Single layer and parallel-closed ropes shall be preformed unless stated by the manufacturer that the rope is non-preformed.

#### 5.2.3 Wire finish

For ropes of bright wire finish, substitution of bright wires by zinc coated wires shall be limited to inner wires, centre wires, filler wires and core wires.

For stranded ropes of zinc coated wire finish, all of the wires shall be zinc coated, including those of any steel core.

Quality B coating as given in EN 10244-2 shall be used for zinc coated wires unless specified otherwise in the appropriate part of this standard.

#### 5.2.4 Rope ends

Rope ends that have no end fittings shall be so secured as to maintain the integrity of the rope and prevent its unlaying.



### 5.3 Physical dimensions

#### 5.3.1 Diameter or width and thickness

The nominal diameter for round ropes or the nominal width and thickness for flat ropes shall be the dimension(s) by which the rope is designated.

#### 5.3.2 Tolerances

When measured in accordance with 6.3 the measured diameter or the measured width and thickness shall not vary from the nominal by more than the tolerance(s) specified in the appropriate part of this standard.

### 5.4 Breaking force

#### 5.4.1 General

The minimum breaking force  $F_{min}$  or, where specified in the other parts of this standard, the minimum aggregate breaking force  $F_{e,min}$  for a given size, grade (where applicable) and construction or class of rope shall be either,

- a) in accordance with the value or calculation given in the appropriate part of this standard; or
- b) as stated by the manufacturer.

When tested in accordance with Method 1 as described in 6.4.1 the measured breaking force  $F_m$  shall be equal to or greater than the minimum breaking force  $F_{min}$ .

When tested in accordance with Method 2 as described in 6.4.2 the measured aggregate breaking force  $F_{e,m}$  shall be equal to or greater than the minimum aggregate breaking force  $F_{e,min}$ .

When tested in accordance with Method 3 as described in 6.4.3 the calculated measured (post-spin) breaking force  $F_{m,c}$  shall be equal to or greater than the minimum breaking force  $F_{min}$ .

Unless specified otherwise in the appropriate part of this standard, breaking force testing shall be in accordance with Table 1.

**NOTE** The requirements for breaking force testing take into account (i) the rope size, (ii) whether or not ropes are produced in series i.e. repeatedly produced, (iii) whether or not the minimum breaking force factor is consistent throughout a sub-group of rope diameters and (iv) whether or not the manufacturer is operating a quality system in accordance with EN ISO 9001 certified by an accredited third party certification body, see 5.4.2.

#### 5.4.2 Ropes produced in series – manufacturer operating a quality system in accordance with EN ISO 9001 certified by an accredited third party certification body

The manufacturer shall record the results from testing in accordance with the sampling and acceptance criteria as detailed in annex A.

Additional production lengths of rope from any size grouping shall be deemed to comply with the breaking force requirements when the manufacturer has satisfactorily completed a) the appropriate type tests, refer annex A and b) a periodic test (see Table 1) in accordance with Method 1 or alternatively, Method 3, as described in 6.4, on a sample from every twentieth production length or after re-starting of production, whichever is the sooner.

If any rope subject to the periodic test fails to meet or exceed the minimum value, testing of a sample from each production length shall continue until the manufacturer satisfies the type testing requirements.

Any increase in breaking force factor for a particular construction shall also require that the type tests are repeated on the modified ropes for each of the size bands. It shall not be necessary to repeat the tests if the same breaking force factor is used for ropes using wires of a lower grade.

Table 1 — Breaking force testing requirements

Rope diameter	Minimum breaking force factor	Manufacturer operating a quality system in accordance with EN ISO 9001 certified by an accredited third party certification body	Manufacturer <b>NOT</b> operating a quality system in accordance with EN ISO 9001 certified by an accredited third party certification body
Up to and including 60 mm	Same factor throughout a sub-group of rope diameters	<p>Breaking force test in accordance with Method 1 on a sample from each production length; or, if produced in series,</p> <p>Type testing in accordance with A.1.1 plus periodic breaking force test in accordance with Method 1 or Method 3 on a sample from every twentieth production length relating to the sub-group of rope diameters</p>	Breaking force test in accordance with Method 1 on a sample from each production length
	Different factor throughout a sub-group of rope diameters	<p>Breaking force test in accordance with Method 1 on a sample from each production length; or, if produced in series,</p> <p>Type testing in accordance with A.1.2 plus periodic breaking force test in accordance with Method 1 or Method 3 on a sample from every twentieth production length of a given rope diameter and construction</p>	
Over 60 mm		<p>Breaking force test in accordance with Method 1, Method 2 or Method 3 on a sample from each production length, or, either</p> <p>a) if produced in a series, type testing in accordance with A.2 plus periodic breaking force test in accordance with Method 1, Method 2 or Method 3 on a sample from every twentieth production length; or</p> <p>b) if produced for supply as a set of ropes of the same design for a specific installation the alternative breaking force testing and sampling as also given in A.2.</p>	Breaking force test in accordance with Method 1 or Method 2 on a sample from each production length

NOTE Breaking force type testing demonstrates that a steel wire rope produced in series and certified by the manufacturer as conforming to one of the other parts, possesses the minimum breaking force stated by the manufacturer. The purpose of these tests is to prove the design, material and method of manufacture.

## 5.5 Length

For those ropes not intended by the manufacturer to form part of an assembly, the measured length of rope supplied shall, under no load, be the nominal length subject to the following tolerances:

- |  |               |
|--|---------------|
| a) Up to and including 400 m:              | 0 % to + 5 %  |
| b) Over 400 m up to and including 1 000 m: | 0 m to + 20 m |
| c) Over 1 000 m:                           | 0 % to + 2 %  |

## 6 Verification of safety requirements and/or measures

### 6.1 Materials

#### 6.1.1 Wire

Compliance with the wire requirements shall be through a visual verification of the inspection documents supplied with the wire.

#### 6.1.2 Core

Compliance with the material and type of core shall be through a visual verification of the inspection documents supplied with the core.

### 6.2 Rope manufacture

#### 6.2.1 Wire joints

Compliance with the requirements for wire joints shall be through a visual verification.

#### 6.2.2 Preformation

Compliance with the requirements for preformation shall be through a visual verification.

#### 6.2.3 Wire finish

Compliance with the requirements for wire finish shall be through a visual verification.

#### 6.2.4 Rope ends

Compliance with the requirements for the rope ends shall be through a visual verification.

## 6.3 Dimensions

### 6.3.1 Round ropes

Diameter measurements shall be taken on a straight portion of the rope, either under no tension or a tension not exceeding 5 % of the minimum breaking force, at two positions spaced at least one metre apart. At each position two measurements, at right angles, of the circumscribed circle diameter shall be taken. The measuring equipment shall cover at least two strands.

The average of these four measurements shall be within the tolerance given in the appropriate part of this standard.

The maximum deviation of the measuring equipment shall not be greater than  $\pm 0,02$  mm for ropes up to and including 25 mm diameter,  $\pm 0,05$  mm for ropes over 25 mm and up to and including 100 mm and  $\pm 0,1$  mm for ropes over 100 mm diameter.

### 6.3.2 Flat ropes

Measurements for width and thickness shall be taken on a straight portion of rope, either without tension or a tension not exceeding 5 % of the minimum breaking force of the rope, at two positions spaced at least one metre apart and at each position the width and thickness shall be measured.

The average of the two width measurements and the average of the two thickness measurements shall be within the tolerance given in the appropriate part of this standard.

The measuring device shall be capable of being read to 0,1 mm and shall be accurate to 0,01 mm.

## 6.4 Breaking force

### 6.4.1 Method 1 – Measured breaking force $F_m$

#### 6.4.1.1 General

The method shall be in accordance with 6.4.1.2. The rope shall be deemed to have satisfied the breaking force requirement when the measured breaking force  $F_m$  reaches or exceeds the minimum value.

The testing machine shall comply with ISO 7500-1.

The minimum free test length, excluding terminations, shall be in accordance with Table 2.

**Table 2 — Test lengths**

Nominal rope diameter ( $d$ ) (mm)	Minimum test length	
	Stranded rope (mm)	Spiral rope (mm)
Up to and including 6	300	500
Over 6 up to and including 20	600	1 000
Over 20 up to and including 60	$30 \times d$	$50 \times d$
Over 60	3 m	

The selected test piece shall have its ends secured to ensure that the rope does not visibly unravel.

#### 6.4.1.2 Method of test

Mount and secure the test piece in the machine so as to ensure that all the wires in the rope are subjected to the force during the test. If sockets or cones are used, the method of socketing shall be in accordance with EN 13411-4.

After 80 % of the minimum breaking force  $F_{\min}$  has been applied, the force shall be increased at a rate of not more than 0,5 % of the minimum breaking force per second.

NOTE Cyclic loading can be applied up to 40 % of the minimum breaking force of the rope. This should be recorded in the technical file.

The measured breaking force value  $F_m$  is reached when no further increase in applied force is possible and the rope is broken.

The test may be terminated without breaking the rope when the minimum breaking force value is achieved or exceeded.

The test may be discounted where the rope fracture occurs within a distance of six rope diameters from the base of the grip or the termination and the minimum breaking force has not been achieved.

#### 6.4.2 Method 2 – Measured aggregate breaking force $F_{e,m}$

Unless specified otherwise in the appropriate part of this standard, the measured aggregate breaking force  $F_{e,m}$  shall be determined by adding together the breaking forces of all the individual wires from the rope after they have been tested in accordance with the wire tensile test specified in EN 10264-1.

#### 6.4.3 Method 3 – Calculated measured (post-spin) breaking force $F_{m,c}$

Add together the breaking forces of individual wires after they have been removed from the rope, i.e. measured aggregate breaking force  $F_{e,m}$  in accordance with Method 2, and multiply this value by either a) the spinning loss factor  $k$ , as given in the other parts of this standard or b) the partial spinning loss factor obtained from the results of type testing.

When the calculated measured (post spin) breaking force  $F_{m,c}$  fails to meet the minimum breaking force value  $F_{\min}$  another test, using Method 1, shall be carried out.

In the case of failure to meet the intended minimum breaking force value when tested in accordance with method 1, type testing in accordance with annex A shall be repeated.

## 7 Information for use

### 7.1 Instructions

Instructions on handling, storing and cutting shall accompany the rope, see also prEN 12385-3.

### 7.2 Certificate

#### 7.2.1 General

A certificate shall confirm conformance to the appropriate part of this standard.

NOTE This is equivalent to inspection document 2.1 or 2.2 as described in EN 10204.

The certificate shall give at least the following information:

- a) certificate number;
- b) name and address of the manufacturer or his authorized representative;
- c) quantity and nominal length of rope;
- d) standard to which the rope conforms, e.g. EN 12385-4;
- e) rope designation in accordance with EN 12385-2;
- f) minimum breaking force (parts 4, 5, 6, 7, 8, 9 & 10) or minimum aggregate breaking force (part 6);
- g) date of issue of the certificate and authentication;

The certificate number shall enable traceability of the rope.

#### 7.2.2 Test results

When test results are given the certificate shall additionally give either or both of the following:

- a) Measured dimension(s) of rope -  
measured diameter of rope (mm); or  
measured width and thickness (mm x mm).
- b) Measured breaking force of rope -  
measured breaking force of rope  $F_m$  (kN); or  
measured aggregate breaking force of rope  $F_{e,m}$  (kN); or  
calculated measured (post-spin) breaking force of rope  $F_{m,c}$  (kN).

NOTE Together with the information as given in 7.2.1, this is equivalent to inspection document 2.3 or 3.1B as described in EN 10204.

### 7.3 Packaging and marking

#### 7.3.1 Packaging

Ropes shall be supplied on reels.

#### 7.3.2 Marking

The manufacturer's name and address and certificate number shall be legibly and durably marked on a tag attached to the reel.

**Annex A**  
**(normative)**  
**Sampling and acceptance criteria for type testing of ropes produced in series**

**A.1 Sizes up to and including 60 mm diameter**

**A.1.1 Ropes having same minimum breaking force factor throughout a sub-group of rope diameters**

The manufacturer shall divide the intended size range into sub groups based on the following:

- nominal diameter up to and including 6 mm;
- over 6 mm up to and including 12 mm;
- over 12 mm up to and including 24 mm;
- over 24 mm up to and including 48 mm;
- over 48 mm up to and including 60 mm.

For each of the sub groups representing the intended size range and having the same construction, grade and minimum breaking force factor, the manufacturer shall perform a breaking force test in accordance with 6.4.1 on a sample from each of three separate production lengths of rope of different nominal diameters.

If all three samples pass the test, all rope sizes within that sub group of that particular rope construction, grade and minimum breaking force factor shall be deemed to have satisfied the type testing requirements; otherwise, breaking force testing shall continue on a sample from each consecutive production length of rope within that sub-group until the above requirements are met.

**A.1.2 Ropes having different minimum breaking force factors throughout a sub-group of rope diameters**

The manufacturer shall perform a breaking force test in accordance with 6.4.1 on a sample from each of three separate production lengths of rope of the same nominal diameter.

If all three samples pass the test, that rope diameter and construction having that particular minimum breaking force factor shall be deemed to have satisfied the breaking force type testing requirements.

If one of the samples fails the test, the tests shall be repeated until the measured breaking forces  $F_m$  of three consecutive production lengths of that rope diameter and construction meet or exceed the minimum breaking force value  $F_{min}$ .

## A.2 Sizes over 60 mm diameter

For each rope of a given diameter, construction and minimum breaking force or minimum aggregate breaking force, the manufacturer shall perform a breaking force test in accordance with 6.4.1 or 6.4.2 respectively, on a sample from each of three separate production lengths.

If all samples pass the test, that rope diameter and construction having that particular minimum breaking force or minimum aggregate breaking force shall be deemed to have satisfied the breaking force type testing requirements.

If one sample fails the test, the tests shall be repeated until the measured breaking forces or measured aggregate breaking forces of three consecutive production lengths of that rope diameter and construction meet or exceed the minimum breaking force or minimum aggregate breaking force value respectively.

Alternatively, where the manufacturer intends to produce multiple production lengths of the same rope on the same closing machine with the same machine settings to the same rope design, sampling and breaking force testing may be in accordance with the following:

$\sqrt{N}-1$  rounded down to the next whole number with a minimum of 1

where  $N$  = number of production lengths (i.e. closer loadings)

The ropes shall be deemed to comply if the measured breaking force(s), or measured aggregate breaking force(s), when tested in accordance with 6.4.1 or 6.4.2 respectively, meet or exceed the minimum value.

If one of the samples fails the test, tests shall be carried out on a sample from each of the remaining production lengths.

Only those ropes that pass the test shall be deemed to have satisfied the breaking force requirement.



## **Annex B** (normative)

### **Testing requirements for wires taken from the rope when specified in other Parts of this standard**

#### **B.1 General**

Sampling of the wires, test methods and acceptance criteria shall be in accordance with B.2 and B.3 unless specified otherwise in the other parts of this standard.

#### **B.2 Sampling**

##### **B.2.1 Stranded rope**

For each layer of strands, including those in the core, one strand of each diameter and construction within that layer shall be selected. If there are more than eight strands of the same diameter and construction in one layer, the wires from two strands of that diameter and construction shall be selected.

Samples shall not include filler, centre wires or the wires of built up centres unless specified otherwise in the other parts of this standard.

##### **B.2.2 Spiral rope**

Test pieces shall be obtained by gathering into groups the wires from each layer. A group shall consist only of wires of the same type and size from a particular wire layer. 25 % of the wires from each group, with a minimum of three, shall be randomly selected.

#### **B.3 Test methods and acceptance criteria**

##### **B.3.1 General**

When the same wire fails in more than one test (e.g. torsion and tensile), this is counted as one failure.

###### **B.3.1.1 Stranded ropes**

For each requirement a maximum of 5 % of wires tested, rounded up to the nearest whole number of wires, may lie outside the values specified below.

###### **B.3.1.2 Spiral rope**

Wires from the rope comply if not more than one wire from any group fails any of the tests. If two or more wires from any group fail to pass any of the tests, all of the remaining wires from that group shall be tested in respect of the test in which these wires have failed. If the number of wires that fail these tests is less than two, the wires shall be deemed to comply.

### **B.3.2 Dimension (diameter or height)**

When tested in accordance with the methods specified in EN 10264-1, 5 % of the wires may exceed by up to 50 % the tolerance specified in that standard.

### **B.3.3 Tensile strength**

When tested in accordance with the method specified in EN 10264-1, the measured values shall be in accordance with the values specified in that standard with an expanded tolerance of  $50 \text{ N/mm}^2$  at the lower end.

For ropes with shaped (e.g. triangular) strands the expanded tolerance at the lower end shall be equivalent to 5 % of the tensile strength grade of the wire.

### **B.3.4 Reverse bend**

#### **B.3.4.1 Stranded ropes**

When tested in accordance with the method specified in EN 10264-1, the measured values of round wires of 0,5 mm diameter and larger shall be at least 90 % of the values specified in EN 10264-2 and EN 10264-3, rounded down to the next whole number.

NOTE See B.3.6 for test on wires less than 0,5 mm diameter.

#### **B.3.4.2 Spiral ropes**

When tested in accordance with the method specified in EN 10264-1, the measured values of round and shaped wires shall be at least 75 % of the values specified in EN 10264-2 and EN 10264-3 or the appropriate part of this standard, rounded down to the next whole number.

### **B.3.5 Torsion**

#### **B.3.5.1 Stranded ropes**

When tested in accordance with the method specified in EN 10264-1, the measured values of round wires of 0,5 mm diameter and larger shall be at least 85 % of the values specified in EN 10264-2 and EN 10264-3, rounded down to the next whole number.

NOTE See B.3.6 for test on wires less than 0,5 mm diameter.

#### **B.3.5.2 Spiral ropes**

When tested in accordance with the method specified in EN 10264-1, the measured values of round and shaped wires shall be at least 75 % of the values specified in EN 10264-2 and EN 10264-3, or the appropriate part of this standard, rounded down to the next whole number.

### **B.3.6 Knot**

This test shall be applied to wires smaller than 0,5 mm diameter in substitution for the reverse bend test and torsion test described in B.3.4 and B.3.5.

Each single wire with one simple knot shall withstand without breaking a force of at least 45 % of the force corresponding to the tensile strength grade of the wire.

### B.3.7 Coating

#### B.3.7.1 Stranded ropes

When measured in accordance with the method specified in EN 10264-1, the permissible reduction in the mass of coating (e.g. zinc or Zn 95/Al 5) from the pre-spin (i.e. before ropemaking) minimum values as specified in that standard or the appropriate parts of this standard, shall be not more than the values shown in Table B.1.

Table B.1 — Permissible reduction in mass of zinc coating from minimum value

Minimum mass of coating before rope fabrication g/m <sup>2</sup>	Permissible reduction in mass of coating after rope fabrication g/m <sup>2</sup>
<40	2
40 to < 80	4
80 to < 120	6
120 to < 160	8
160 to < 200	10
200 to < 300	15
300 to < 400	20
≥400	25

#### B.3.7.2 Spiral ropes

When measured in accordance with the method specified in EN 10264-1, the permissible reduction in the mass of coating (e.g. zinc or Zn 95/Al 5) from the pre-spin (i.e. before ropemaking) minimum values as specified in that standard or the appropriate part of this standard shall be not more than 5 % for shaped wires and 7,5 % for round wires.

## Bibliography

EN 12385-4:2002, *Steel wire ropes — Safety — Part 4: Stranded ropes for general lifting applications*

EN ISO 9001, *Quality management systems - Requirements (ISO 9001:2000)*.



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