



# SLOVENSKI STANDARD

## SIST EN 12385-6:2004

01-september-2004

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Steel wire ropes - Safety - Part 6: Stranded ropes for mine shafts

Drahtseile aus Stahldraht - Sicherheit - Teil 6: Litzenseile für Schachtförderanlagen des Bergbaus

Câbles en acier - Sécurité - Partie 6: Câbles d'extraction à torons pour puits de mines

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77.140.65	Jeklene žice, jeklene vrvi in verige	Steel wire, wire ropes and link chains
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EUROPEAN STANDARD  
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**Steel wire ropes - Safety - Part 6: Stranded ropes for mine shafts**

Câbles en acier - Sécurité - Partie 6: Câbles d'extraction à  
torons pour puits de mines

Drahtseile aus Stahldraht - Sicherheit - Teil 6: Litzenseile  
für Schachtförderanlagen des Bergbaus

This European Standard was approved by CEN on 3 November 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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## EN 12385-6:2004 (E)

## Foreword

This document EN 12385-6:2004 has been prepared by Technical Committee CEN/TC 168 "Chains, ropes, slings, webbing 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of an identical text or by endorsement, at the latest by August 2004, and conflicting national standards shall be withdrawn at the latest by August 2004.

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 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*

Part 1 provides the general requirements for Parts 4 to 10.

Annexes A, B and C are normative. Annexes D and E are informative.

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

## Introduction

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

Customers, purchasers and users should recognize that ropes for mine shafts are, more often than not, specially designed by the rope manufacturer to meet particular hoisting machinery conditions, and particular attention should be given to the selection of the correct dimension(s) of rope and associated tolerance.

Although tables with factors for the calculation of breaking forces, nominal rope length masses and outer wire diameters for a number of the more common classes of ropes and tables with physical properties of flat ropes are provided, this part of the standard is not limited to those given, providing all the other requirements are met.

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## EN 12385-6:2004 (E)

## 1 Scope

This European Standard specifies the special material, manufacturing and testing requirements for stranded ropes (with round and/or shaped strands) and flat ropes for use as hoist ropes, stage ropes and balance ropes in mine shafts.

It is used in conjunction with EN 12385-1 and EN 12385-2.

NOTE This European Standard can also be used for ropes in other mining applications, e.g. surface mining.

The additional hazards covered by this part of EN 12385 are listed in clause 4.

This part of EN 12385 is applicable to ropes for new installations and ropes that have been manufactured after the publication of this standard. It may also be applied to spare ropes for existing installations

## 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 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.*

DIN 21258, *Preservative compounds for Koepe friction drive winding ropes in mining – Safety requirements and testing.*

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

ISO 3155, *Stranded wire ropes for mine hoisting - Fibre components - Characteristics and tests.*

ISO 3156, *Stranded wire ropes for mine hoisting - Impregnation compounds, lubricants and service dressing - Characteristics and tests.*

## 3 Terms and definitions

For the purpose of this European Standard, the terms and definitions in EN 12385-2 apply together with the following:

### 3.1

#### **calculated rope diameter $d_c$**

theoretical diameter of a stranded rope where all outer strands just touch each other

### 3.2

#### **built-up centre**

centre of a strand comprising a number of small wires manufactured in a separate operation instead of a large disproportional centre wire of a parallel or compound lay construction



## 4 List of hazards

In addition to the hazards listed in clause 4 of EN 12385-1:2002, where applicable, the hazard associated with the uncontrolled relative movements between the rope and the driving sheave shall be taken into account (see 5.2.2, 5.2.3 and 5.3.3 with regard to the associated requirements).

## 5 Safety requirements and/or measures

### 5.1 General

In addition to the requirements given in 5.2 to 5.7, the requirements shall also conform to those given in EN 12385-1.

### 5.2 Materials

#### 5.2.1 Wire

##### 5.2.1.1 Before ropemaking

Round wires, except those which form a built-up centre shall conform to:

- a) EN 10264-3 for hoist ropes and stage ropes; and
- b) EN 10264-2 for balance ropes and the stitching wires of flat hoist ropes.

For a given rope grade, the tensile strength grades of the wires of stranded round ropes and flat ropes shall not exceed the limits given in Table 1.

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**Table 1 — Tensile strength grades of wires in stranded round ropes and flat ropes for a given rope grade**

Rope grade	Tensile strength grade in N/mm <sup>2</sup>	
	minimum	maximum
1180	1180	1370
1270	1180	1370
1370	1180	1570
1570	1370	1770
1670	1570	1860
1770	1570	1960
1860	1670	1960
1960	1770	1960 outer wires; 2160 inner wires

For shaped wires as centre wires, the tensile strength grade shall be less than or equal to 900 N/mm<sup>2</sup>, with a tolerance not greater than that of the round wires of the same nominal metallic cross-section.

The tensile strength grades of round and shaped wires used to form built-up centres shall be at least 300 N/mm<sup>2</sup>.

For flat ropes, all loadbearing wires shall be of the same tensile strength grade.

For outer wires the maximum tensile strength grade shall be 1960 N/mm<sup>2</sup> for bright and class B zinc-coated wires and 1770 N/mm<sup>2</sup> for class A zinc-coated wires.

For inner wires the maximum tensile strength grade shall be 2160 N/mm<sup>2</sup> for bright and class B zinc-coated wires and 1770 N/mm<sup>2</sup> for class A zinc-coated wires.

The minimum tensile strength grade of stitching wires for flat hoist ropes shall be 1150 N/mm<sup>2</sup>.

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The maximum tensile strength grade of the stitching wires for all flat ropes shall be limited to 75 % of the tensile strength grade of the loadbearing wires. The tensile strength range shall be 300 N/mm<sup>2</sup>.

Reverse bend and torsion requirements are not applicable to stitching wires.

The minimum diameter of the wires, excluding any filler wires and round wires for built-up centres, shall conform to Table 2.

NOTE The approximate outer wire diameters of round-strand round ropes can be calculated with the formulae and factors given in Annex D.

**Table 2 — Minimum wire diameters, excluding round wires for built-up centres and filler wires**

Dimensions in millimetres

Rope type	Rope diameter $d$	Minimum wire diameter
Stranded round ropes	$d \leq 18$	0,5
	$18 < d \leq 25$	0,8
	$d > 25$	1,0
	Minimum wire diameter for stranded round mine hoist ropes: 0,8 mm	
Flat ropes	-	1,0

### 5.2.1.2 After ropemaking

Test methods and acceptance criteria for wires taken from the rope shall meet the requirements for stranded ropes in annex B of EN 12385-1:2002 with the addition that at least 90% of all of the wires tested shall be within the specified values. Filler and centre wires shall also be tested. In the case of built-up centres, either the individual wires or the centre as a whole shall be tested only for tensile strength.

The tensile strength of wires from strands that have been compacted shall be calculated on the basis of their respective nominal diameters before stranding and compacting.

The scope of the sampling depends on whether or not the rope manufacturer operates an independently verified quality management system:

- rope manufacturers operating a quality management system in accordance with EN ISO 9001 certified by an accredited third party certification body shall test the number of specimens given in annex B of EN 12385-1:2002 when the breaking force of the rope is specified as the minimum aggregate breaking force  $F_{e,min}$ . For flat ropes, the wires of one left-hand and one right-hand unit rope shall be tested;
- rope manufacturers NOT operating a quality management system in accordance with EN ISO 9001 certified by an accredited third party certification body shall test all loadbearing wires except those forming the built-up centre for: dimensions, tensile strength, reverse bend and torsion. Built-up centres shall be tested only for tensile strength. A test of the zinc coating shall be carried out on at least 20 % of wires of the same diameter in the same wire layer.

### 5.2.2 Core

Cores shall be one of the following types:

- a) fibre;
- b) fibre, reinforced by non-loadbearing wires;
- c) independent steel wire rope covered with fibre or solid polymer;
- d) independent steel wire rope with fibre or solid polymer covered outer strands, or;
- e) independent steel wire rope with or without fibre or solid polymer inserts.

Fibre cores and fibre inserts shall be free of water-soluble aggressive acids and be made of either new hard fibre (sisal or manila) or man-made fibres. They shall meet the requirements of ISO 3155.

Fibre cores, inserts and coverings shall be impregnated to resist corrosion and rot. If the impregnating agent has to be heated for workability purposes, the temperature shall not reach a value that is liable to damage the fibre.

The new fibrous material for friction hoist ropes shall have an extractable content, including the batch, of a maximum of 5 % of the mass of the dry fibre before ropemaking. The extractable content of the impregnated or lubricated fibrous material before ropemaking shall have a maximum of 25 % of the mass of the dry fibre.

### 5.2.3 Lubricants and impregnating compounds

The lubricant and any impregnating compounds for hoist ropes shall conform to ISO 3156.

For friction hoist ropes, DIN 21258 also applies.

The properties of the friction hoist rope lubricant shall take account of:

- the coefficient of friction between the rope and the drive sheave, and;
- the chemical compatibility of the lubricant with the respective sheave linings.

## 5.3 Rope manufacture

### 5.3.1 Wire joints

The minimum distance between planned wire joints for hoist ropes shall be 36 x nominal rope diameter.

### 5.3.2 Wire finish

Within a rope with zinc-coated wires, wires with both class A and class B finishes may be used provided that wires within the same layer are of the same class of finish. This is valid also for the filler and centre wires of round ropes, as well as for the stitching wires of flat ropes.

NOTE The purchaser should specify any special wire finish requirements.