



# SLOVENSKI STANDARD

SIST EN 12927-2:2005

01-januar-2005

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Safety requirements for cableway installations designed to carry persons - Ropes - Part 2: Safety factors

Sicherheitsanforderungen für Seilbahnen für den Personenverkehr - Seile - Teil 2: Sicherheitsfaktoren

**ITeh STANDARD PREVIEW**

Prescriptions de sécurité des installations à câbles transportant des personnes - Câbles - Partie 2 : Coefficients de sécurité

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**Ta slovenski standard je istoveten z: EN 12927-2:2004**

**ICS:**

45.100 U] |^{ æÁ æÖã } æ^ Cableway equipment

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ICS 45.100

English version

## Safety requirements for cableway installations designed to carry persons - Ropes - Part 2: Safety factors

Prescriptions de sécurité des installations à câbles  
transportant des personnes - Câbles - Partie 2 :  
Coefficients de sécurité

Sicherheitsanforderungen für Seilbahnen und  
Schleppaufzüge im Personenverkehr - Seile - Teil 2:  
Sicherheitsfaktoren

This European Standard was approved by CEN on 23 August 2004.

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.

CEN members are the national standards bodies of 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 United Kingdom.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (EN 12927-2:2004) has been prepared by Technical Committee CEN/TC 242 "Safety requirements for passenger transportation by rope", 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 2005, and conflicting national standards shall be withdrawn at the latest by April 2005.

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 Directive(s), see informative Annex ZA, which is an integral part of this document.

This EN 12927 includes the following parts under the general title " Safety requirements for cableway installations designed to carry persons – Ropes" :

- *Part 1: Selection criteria for ropes and their end fixings*
- *Part 2: Safety factors*
- *Part 3: Long splicing of 6 strand hauling, carrying-hauling and towing ropes*
- *Part 4: End fixings*
- *Part 5: Storage, transportation handling and tensioning*
- *Part 6: Discard criteria*
- *Part 7: Inspection, repair and maintenance*
- *Part 8: Magnetic rope testing (MRT).*

This European Standard forms part of the standards programme adopted by the CEN Technical Board in relation of safety requirements for passenger transportation by rope. This programme includes the following standards:

- 1) *Safety requirements for cableway installations designed to carry persons - Terminology*
- 2) *Safety requirements for cableway installations designed to carry persons - General requirements*
- 3) *Safety requirements for cableway installations designed to carry persons – Calculations*
- 4) *Safety requirements for cableway installations designed to carry persons - Ropes*
- 5) *Safety requirements for cableway installations designed to carry persons - Tensioning devices*
- 6) *Safety requirements for cableway installations designed to carry persons - Drive systems and other mechanical equipment*
- 7) *Safety requirements for cableway installations designed to carry persons – Carriers*
- 8) *Safety requirements for cableway installations designed to carry persons - Electrical equipment other than for drive systems*
- 9) *Safety requirements for cableway installations designed to carry persons - Civil engineering works*

- 10) *Safety requirements for cableway installations designed to carry persons – Pre-commissioning inspection, maintenance and operational inspection and checks*
- 11) *Safety requirements for cableway installations designed to carry persons – Recovery and evacuation*
- 12) *Safety requirements for cableway installations designed to carry persons - Operation*
- 13) *Safety requirements for cableway installations designed to carry persons - Quality assurance*

Together these form a series of standards regarding design, manufacture, production, maintenance and operation of all installations for passenger transportation by rope. In respect of ski-tows, the drafting of this European Standard has been guided by the works of the International Organisation for Transportation by rope (OITAF).

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 United Kingdom

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## 1 Scope

This part of EN 12927 specifies the safety requirements applicable for safety factors for steel wire ropes (tensile safety factor, bending ratio and transverse force factors) for installations for passenger transportation by rope. This standard is applicable to the various types of installations and takes into account their environment.

This part of EN 12927 does not apply to brake ropes.

Some requirements concern synthetic ropes.

The requirements relating to the protection of workers are not included in this standard.

It does not apply to ropes for installations used for the transportation of goods, nor to inclined lifts.

## 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 1709, *Safety requirements for cableway installations designed to carry persons - Pre-commissioning inspection, maintenance, operational inspection and checks.*

prEN 1907:2004, *Safety requirements for cableway installations designed to carry persons – Terminology.*

EN 1908, *Safety requirements for cableway installations designed to carry persons – Tensioning devices.*

EN 1909, *Safety requirements for cableway installations designed to carry persons - Recovery and evacuation.*

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

EN 12397, *Safety requirements for cableway installations designed to carry persons – Operation.*

EN 12408, *Safety requirements for cableway installations designed to carry persons - Quality assurance.*

EN 12927-1, *Safety requirements for cableway installations designed to carry persons – Ropes – Part 1: Selection criteria for ropes and their end fixings.*

EN 12927-3, *Safety requirements for cableway installations designed to carry persons – Ropes – Part 3: Long splicing of 6 strand hauling, carrying-hauling and towing ropes.*

EN 12927-4, *Safety requirements for cableway installations designed to carry persons – Ropes – Part 4: End fixings.*

EN 12927-5, *Safety requirements for cableway installations designed to carry persons – Ropes – Part 5: Storage, transportation, installation and tensioning.*

EN 12927-6, *Safety requirements for cableway installations designed to carry persons - Ropes – Part 6: Discard criteria.*

EN 12929-7, *Safety requirements for cableway installations designed to carry persons – Ropes – Part 7: Inspection, repair and maintenance.*

EN 12927-8, *Safety requirements for cableway installations designed to carry persons – Ropes – Part 8: Magnetic rope testing (MRT).*

EN 12929-1, *Safety requirements for passenger transportation by rope - General requirements - Part 1: Requirements applicable to all installations.*

## EN 12927-2:2004 (E)

EN 12929-2, *Safety requirements for cableway installations designed to carry persons – General requirements – Part 2: Additional requirements for reversible bicable aerial ropeways without carrier truck brakes.*

EN 12930, *Safety requirements for cableway installations designed to carry persons – Calculations.*

EN 13107, *Safety requirements for cableway installations designed to carry persons – Civil engineering works.*

EN 13223, *Safety requirements for cableway installations designed to carry persons – Drive systems and other mechanical equipment.*

EN 13243, *Safety requirements for cableway installations designed to carry persons – Electrical equipment other than for drive systems.*

prEN 13796-1, *Safety requirements for cableway installations designed to carry persons – Carriers – Part 1: Grips, carrier trucks, on-board brakes, cabins, chairs, carriages, maintenance carriers, tow-hangers.*

prEN 13796-2, *Safety requirements for cableway installations designed to carry persons – Carriers – Part 2: Slipping resistance tests for grips.*

prEN 13796-3, *Safety requirements for cableway installations designed to carry persons – Carriers – Part 3: Fatigue testing.*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 1907:2004, EN 12385-2:2002 and the following apply.

#### 3.1

##### **tensile safety factor (TSF)**

ratio between the Minimum Breaking Force (MBF) of the rope and the calculated tension force in the rope (see EN 12930)

#### 3.2

##### **bending ratio (rope)**

ratio between either the pitch diameter of the sheave ( $D$ ) and the nominal rope diameter ( $d$ ) or the pitch radius of the shoe, saddle or roller chain ( $R$ ) and the nominal rope diameter

#### 3.3

##### **transverse force factor**

ratio between the tension force in the rope and the force normal to the rope axis

### 4 General requirements

#### 4.1 Application of this standard

The requirements of this document apply to all installations along with those of EN 1709, EN 1908, EN 1909, EN 12397, EN 12408, EN 12927-1, EN 12927-3, EN 12927-4, EN 12927-5, EN 12927-6, EN 12927-7, EN 12927-8, EN 12929-1, EN 12929-2, EN 12930, EN 13107, EN 13223, EN 13243, prEN 13796-1, prEN 13796-2 and prEN 13796-3.

#### 4.2 Safety principle

##### 4.2.1 General

The safety principles set out in EN 12929-1 apply.



#### 4.2.2 Hazard scenarios

Especially the following event may lead to hazardous situations which may be avoided or limited by the requirements of this document : Excessive working stress in the steel wires may lead to premature fatigue breaks and rope-failure within the inspection intervals given in EN 12927-7.

#### 4.2.3 Safety measures

The risk of a rope failure within the inspection intervals given in EN 12927-7 shall be limited by:

- a) incorporating a tensile safety factor in accordance with this standard into the rope design calculation according to EN 12930;
- b) incorporating a bending ratio in accordance with this standard into the design of sheaves, drums, saddles or any support of ropes where the curvature of the rope is determined only by the curvature of the support; and by
- c) avoiding a bending stress in the steel wires exerted by transverse forces exceeding the allowable bending stress limited by the bending ratio given in this standard.

### 5 Safety requirements

#### 5.1 General

The general requirements shall conform to EN 12929-1.

The additional requirements for calculation shall conform to EN 12930.

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**5.2 Safety factors** <https://standards.iteh.ai/catalog/standards/sist/523360f5-2a92-43a0-8076-6d588998c384/sist-en-12927-2-2005>

#### 5.2.1 Tensile safety factors

##### 5.2.1.1 Carrying ropes

The tensile force shall be calculated in accordance with EN 12930 for the following three conditions and the tensile safety factor shall be at least:

Working condition without carrier track brake in action	3,15
Working condition with carrier track brake in action	2,70
Out of operation with consideration of climatic conditions in accordance with EN 12930	2,25

##### 5.2.1.2 Haul ropes

The tensile force shall be calculated in accordance with EN 12930.

The tensile safety factor shall be at least the following:

Funicular	4,2
Jig-back without carrier track brake	4,50
Jig-back with carrier track brake	3,80
Bicable unidirectional aerial ropeway	4,00

The maximum tensile safety factor shall not exceed 20 for haul rope with long splice.