



# SLOVENSKI STANDARD

SIST EN 12929-1:2005

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Safety requirements for cableway installations designed to carry persons - General requirements - Part 1: Requirements for all installations

Sicherheitsanforderungen für Seilbahnen für den Personenverkehr - Allgemeine Bestimmungen - Teil 1: Anforderungen für alle Anlagen

**STANDARD PREVIEW**

Prescriptions de sécurité pour les installations à câbles transportant des personnes - Dispositions générales - Partie 1 : Prescriptions applicables a toutes les installations

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**Ta slovenski standard je istoveten z: EN 12929-1:2004**

**ICS:**

45.100 U] |^ { æ Á æ Ń } æ^ Cableway equipment

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English version

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This European Standard was approved by CEN on 20 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.

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## Foreword

This document (EN 12929-1:2004) 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of an identical text or by endorsement, at the latest by April 2005, and conflicting national standards shall be withdrawn at the latest by April 2005.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 document contains a bibliography.

EN 12929 with the generic title "*Safety requirements for cableway installations designed to carry persons - General requirements*", is in two parts:

- *Part 1: Requirements for all installations*
- *Part 2: Additional requirements for reversible bicable aerial ropeways without carrier truck brakes*

Part 1 of this document deals with general requirements applicable to all cableway installations designed to carry persons; Part 2 deals with the supplementary requirements applicable to reversible bicable aerial ropeways without carrier truck brakes.

This document forms part of the standards programme approved by the CEN Technical Board on safety requirements for cableway installations designed to carry persons:

- 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.

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- 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.

This series of standards forms a complete set with regard to the design, manufacture, construction, maintenance and operation of all cableway installations for designed to carry persons.

In respect of ski-tows, the drafting of this document 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 the United Kingdom.

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## 1 General

### 1.1 Scope

This part of EN 12929 specifies the safety requirements for general requirements for cableway installations designed to carry persons. These requirements are applied to the various types of installations and their environment.

This document defines general technical characteristics and prescribes design principles and general safety requirements.

It does not deal with details of operation and maintenance, nor with calculations and detailed requirements for the manufacture of components.

This Part 1 does not deal with special requirements applicable to bicable reversible aerial ropeways without carrier truck brakes, which are the subject of Part 2.

It includes requirements relating to the prevention of accidents and the protection of workers.

It does not apply to cableways for the transportation of goods, nor to inclined lifts.

### 1.2 General principles

**1.2.1** Stringent safety requirements are of the utmost importance for the design, construction, installation, maintenance and operation of cableway installations designed to carry persons.

The design, construction, installation, maintenance and operation of cableways shall only be entrusted to contractors and experts who have the necessary knowledge and experience and who can ensure careful execution of the installation and proper management of the operation.

All the components shall be calculated exactly, be of a good mechanical and electrical design and be manufactured from adequate, defect-free materials possessing the required characteristics.

**1.2.2** All components shall be kept in working order and in good condition. Reference is also made to prEN 1709 and prEN 12397.

**1.2.3** In addition to the European Standards specific to cableway installations, the relevant European specifications shall be used for the design, construction, installation, maintenance and operation of cableways.

**1.2.4** This document takes into account, in certain cases, the careless behaviour of passengers. In all cases, use of the cableway in accordance with its intended use is assumed and not misuse of the installation.

### 1.3 Exceptions

**1.3.1** Exceptions to EN 1709, EN 1908, EN 1909, EN 12397, EN 12408, EN 12927 (Parts 1 to 8), EN 12929-2, EN 12930, EN 13107, EN 13223, EN 13243 and prEN 13796 (Parts 1 to 3) are permissible, particularly in the case of innovation, if they are justified by a safety study and offer at least the same level of safety.

**1.3.2** Exceptions to this standard are also permissible in the case of replacement of components in existing installations.

## 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 294, *Safety of machinery – Safety distance to prevent upper limbs coming into contact with danger zones.*

EN 1709, *Safety requirements for cableway installations designed to carry persons – Pre-commissioning inspection, maintenance and 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 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 12927-2, *Safety requirements for cableway installations designed to carry persons – Ropes – Part 2: Safety factors.*

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 12927-7, *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 12929-2, *Safety requirements for cableway installations designed to carry persons – General requirements – Part 2: Additional requirements for jig back 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.*

EN ISO 12100, *Safety of machinery - Basic concepts, general principles for design.*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 1907:2004 and the following apply.

#### 3.1

##### **harm (to persons)**

physical injury and/or damage to health

#### 3.2

##### **hazard**

a potential source of harm

#### 3.3

##### **risk**

combination of the probable rate of occurrence of a hazard causing harm and of the degree of severity of the harm

#### 3.4

##### **hazardous situation**

any situation in which a person is exposed to a hazard or hazards

#### 3.5

##### **hazard scenario**

any event which directly gives rise to a hazardous situation

#### 3.6

##### **height above ground**

the distance between the surface of the floor of closed carriers or the seat surface of open carriers and the surface of the ground (without taking into account any covering of snow)

#### 3.7

##### **speed**

speed of the moving cable, measured at the drive sheave  
for self-propelled vehicles, the speed of these on the rope

#### 3.8

##### **safety component**

any basic component, set of components, subassembly or complete assembly of equipment and any device incorporated in the installation for the purpose of ensuring a safety function and identified by the safety

analysis, the failure of which endangers the safety or health of persons, be they users, operating personnel or third parties

### **3.9**

#### **normal operating conditions**

operating conditions are considered as normal when all the following conditions are fulfilled:

- the installation is in working order and the necessary personnel are at their posts;
- the weather, visibility and other external conditions do not require any special precautions to be taken;
- the comfort of the passengers is not impaired;
- the main drive is in use.

## **4 Safety principles**

### **4.1 General safety requirements applicable to the installations and to their components**

This clause sets out general safety requirements for cableway installations designed to carry persons, their subsystems and their components.

#### **4.1.1 General safety principles**

All cableway installations designed to carry persons shall be designed, constructed and operated by applying the following principles in the order indicated:

- a) avoid or at least limit the risks by appropriate design or construction measures;
- b) take the necessary protective measures with respect to remaining risks which cannot be avoided by design and construction measures;
- c) define and make known the precautions to be taken to reduce those risks which it has not been possible to avoid completely by the previous preventative and protective measures.

In the case of installations and components complying with EN 1709, EN 1908, EN 1909, EN 12397, EN 12408, EN 12927 (Parts 1 to 8), EN 12929 (Parts 1 and 2), EN 12930, EN 13107, EN 13223, EN 13243 and prEN 13796 (Parts 1 to 3), it can be assumed that these safety principles are observed.

#### **4.1.2 Possible injuries to persons**

The hazards to be taken into account are those which can in particular result in the following injuries to persons:

- a) injuries caused by falls (including those caused by carriers falling);
- b) bruising, crushing or injury by trapping of persons (other than falls);
- c) impairments to health resulting from extended exposure of persons to adverse weather conditions;
- d) other dangers to health, for example electrocution, burns, inhalation of poisonous gases, etc

### 4.1.3 Hazard scenarios

The following events can give rise to hazardous situations which are avoided or reduced by the safety requirements of this document:

- a) failure (rupture, malfunction or non-functioning) of a component of an installation;
- b) breakdown of functional equilibrium between the components in an installation or between the components and their environment;
- c) incorrect behaviour of persons (passengers, personnel or third parties);
- d) foreseeable external events (for example caused by avalanches, landslides, rock falls, lightning, piste grooming machines, aircraft).

The following events in particular shall be considered:

- failure of or defects in the civil engineering structures;
- defective condition of loading and unloading areas;
- failure of tensioning systems and rope end fixings;
- failure of rope support and guide elements;
- failure of carrier components;
- failure of or defects in drive systems and brakes;
- failure of or defects in control systems and monitoring, safety and signalling devices;
- incorrect behaviour of persons.

Chain reactions which can happen as a result of an event shall be taken into account. On the other hand, the simultaneous occurrence of two independent hazardous situations may be ignored.

## 4.2 Safety requirements applicable to installations

### 4.2.1 General

This document sets out general measures to reduce the hazards listed in 4.1 and to prevent the hazardous situations.

### 4.2.2 Safety study

A safety study shall be presented for each installation project. It shall take into account all the components and their technology, as well as the innovative character, if any, of the installation.

Where a planned installation is similar to an already constructed and well proven installation which has formed the subject of a safety study and for which a list of safety components exists, that study and list of components may be used to justify the planned installation, provided that its environment is taken into account and its compliance with European Standards is demonstrated.

The safety study comprises:

- a safety analysis aimed at identifying all the hazardous situations and assessing the nature and seriousness of the risks;
- a description of the measures provided for in the project to meet the hazardous situations identified in the safety analysis, including the necessary justifications.

For each installation, a list of all the safety components shall be drawn up in accordance with EN 12408.

**4.2.3 Protective measures**

The protective measures referred to in 4.1.1 b) are to be defined and examined in the safety study mentioned in 4.2.2.

In particular, monitoring devices are required as protective measures to detect and correct the hazardous situations listed below. Table 1 below indicates the standards which deal with each of these hazardous situations.

**Table 1 – List of hazardous situations**

Type of installations	Hazardous situation	Standards
All installations except ski-tows	inadmissible variation in the tensioning force of the moving ropes (except for tensioning by counterweights)	EN 1908 EN 13243
	arrival at the end positions of the tensioning devices	EN 1908 EN 13223
	inadmissible exceeding of running speed	EN 13223
	runback	EN 13223
	abrupt change in the drive torque beyond the limit values for the installation	EN 13223 EN 13243
	failure of doors of closed carriers to lock before exit from the station	EN 13223 EN 13243
	inadvertent start-up	EN 13243
Funicular railways and bicable aerial ropeways	incorrect position of the haul rope relative to its supports or to the track rope (for example crossing of the hauling rope and track rope, derailment)	EN 12929-1 EN 13223 EN 13243
	inadmissible reduction in the haul rope tension (except for unidirectional continuous movement bicable installations)	EN 12929-1 EN 13223 EN 13243
Funicular railways	inadmissible over-speed and/or runback of carriages	EN 13223
Monocable aerial ropeways	derailment of the carrying hauling rope at towers and at rollers in the stations having a similar function to line rollers	EN 12929-1 EN 13223 EN 13243
Funicular railways, reversible (jigback) and pulsed movement aerial ropeway installations	failure to slow down on approach to stations or at other points of the line.	EN 13223
	overrunning of end points at the end of the line	EN 13223 EN 13243
Installations with detachable grip carriers	failure of grips to attach to or detach from the rope	prEN 13796-1 EN 13223
	carrier cadencing failures	prEN 13796-1 EN 13223
	incorrect progression of carriers in the station	prEN 13796-1 EN 13223
Fixed grip chairlifts	overrunning of unloading area by occupied carriers (with the exception of intermediate stations)	EN 12929 EN 13223

Table 1 (continued)

Ski-tows	inadmissible variation in the tension in the towing rope (except for tensioning by counterweights)	EN 1908 EN 13223
	inadvertent start-up	EN 13243
	overrunning of unloading area by a skier	EN 13223
	(apart from telescopic rod ski-tows) abrupt change in the drive torque beyond the limit values characteristic for normal operating conditions	EN 13223 EN 13243
	incomplete retraction of a tow-hanger	EN 13223
	derailment of the towing rope at towers and at rollers in the station having a similar function to line rollers	EN 12929-1 EN 13223 EN 13243

### 4.3 General requirements for the safety of workers

**4.3.1** Cableways shall be designed and constructed so that operation and maintenance work are possible without exposing personnel respecting the instructions in force to any risk.

Cableways shall be designed and constructed so as to reduce essential maintenance operations as much as possible. Components requiring regular maintenance shall be positioned so that they are easily accessible.

NOTE With regard to greasing, for example, the requirement for reduction of maintenance is met if the technical design and construction avoids manual greasing as far as possible (for example by using permanently lubricated roller or ball bearings or a centralized power-operated greasing system).

**4.3.2** In working areas and passages, as well as in the vicinity of elevated maintenance points, danger areas from mechanical equipment and carriers are to be avoided by taking suitable precautions in design and construction.

If danger areas cannot be avoided by these measures, safety shall be ensured by guards complying with EN ISO 12100. For requirements for the design and arrangement of guards, reference shall be made to EN 294.

NOTE Danger areas are, for example, those areas where there is a danger of crushing, shearing, entanglement or entrapment; they are avoided when, for example, the minimum distances recommended in EN 349 to avoid the crushing of parts of the body are observed. Guards may include, for example, enclosures, fences and barriers.

For elevated maintenance points, guards at places where there may be entrapment by the rope may be dispensed with.

For the purposes of this document:

- working and circulation areas include work positions at floor level and passageways for the personnel. Work positions at floor level include, for example, passenger loading and unloading areas and control stations;
- elevated maintenance points are positions which are not directly accessible from the ground and from which maintenance operations on electrical or mechanical components of the installation and on the carriers are carried out.

Direct access to components means, for example, being able to reach them without needing to use ladders.

**4.3.3** Maintenance switches shall be made available to the personnel. The provisions of EN 13243 apply.

**4.3.4** With regard to the arrangement of the emergency stop buttons which shall be available to the personnel and if necessary the passengers, the provisions of EN 13243 apply.