



# SLOVENSKI STANDARD

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Nadomešča:

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**Varnostne zahteve za žičniške naprave za prevoz oseb - Vozila - 1. del: Prižemke, tekala, vrvne zavore, kabine, sedeži, vozički, vozila za vzdrževanje, vlačila**

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

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Sicherheitsanforderungen an Seilbahnen für den Personenverkehr - Fahrzeuge - Teil 1: Befestigungen am Seil, Laufwerken, Fangbremsen, Kabinen, Sesseln, Wagen, Instandhaltungsfahrzeugen, Schleppgehängen

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Prescriptions de sécurité pour les installations à câbles transportant des personnes - Véhicules - Partie 1: Attaches, chariots, freins embarqués, cabines, sièges, voitures, véhicule de maintenance, agrès

**Ta slovenski standard je istoveten z: EN 13796-1:2017**

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**ICS:**

45.100

Oprema za žičnice

Cableway equipment

**SIST EN 13796-1:2017**

**en,fr,de**

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English Version

**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**

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This European Standard was approved by CEN on 8 December 2014.

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## European foreword

This European Standard (EN 13796-1:2017) 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an identical text or by endorsement, by September 2017 at the latest, and all conflicting national standards shall be withdrawn no later than September 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights or similar rights. CEN and/or CENELEC shall not be held responsible for identifying all or some of these patent rights.

This document supersedes EN 13796-1:2005.

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 2000/9/EC.

For the relationship with EU Directive 2000/9/EC, see informative Annex ZA, which is an integral part of this document.

EN 13796 comprises the following parts under the general title *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*
- *Part 2: Slipping resistance test for grips*
- *Part 3: Fatigue tests.*

The main changes to the previous edition of EN 13796-1 are the following:

- in 6.2.3, the subclause has been reorganized to clarify its application, and the force coefficient values for verifying the effects of wind have been changed;
- in 6.2.15, 11.2.1.1, 11.2.1.2 and 12.1.2, the calculation of the walls and the definition of the loads to be taken into consideration for this calculation have been changed to take account of service experience and so as not to differentiate the dimensioning of the walls based on the position of the passengers (seated or standing);
- in 6.3.3.2.2 a) 2) and 6.3.3.2.3, clarifications of the dynamic stresses have been provided to be taken into account when carriers pass through stations;
- addition of 6.7 concerning fire prevention and firefighting;
- in 7.2.2.3, the subclause was rewritten to clarify its application;
- in 7.3.4, the tolerances on the geometry of the grooves of the haulage rope fixing drum are made consistent with those relating to the rope diameters defined in EN 12385-8;
- in 7.4.2.3, the taper angle values have been changed to comply with the values in the EN 12927 series;

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- in 7.6.2.6, the tolerances on the geometry of the chapeau de gendarme drum grooves have been changed to comply with 7.2.3.1;
- in 9.3, the conditions for verifying the load on one of the wheels of a chassis of a funicular railway have been clarified, so that they are not limited solely to braking with the on-board brake;
- in 10.1 a), determination of the triggering threshold for the on-board brake in the event of failure of a haulage rope is clarified;
- in 11.2.1.1, a requirement was added regarding the material used for the glazing of the cabins, which shall not be dangerous in the event of breakage;
- in 11.4.1.2, a clarification regarding chairs has been added for the transport of persons with reduced mobility with their specific equipment;
- in 12.1.3, a paragraph has been added regarding accessibility for wheelchair passengers in order to be consistent with 11.2.1.4;
- in Annex ZA, the table has been supplemented.

This document forms part of the standards programme approved by the CEN Technical Board (CEN/BT) on safety requirements for cableway installations designed to carry persons. This programme comprises the following standards:

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- EN 1907, *Safety requirements for cableway installations designed to carry persons — Terminology*
  - EN 12929 series, *Safety requirements for cableway installations designed to carry persons — General requirements*
  - EN 12930, *Safety requirements for cableway installations designed to carry persons — Calculations*
  - EN 12927 series, *Safety requirements for cableway installations designed to carry persons — Ropes*
  - EN 1908, *Safety requirements for cableway installations designed to carry persons — Tensioning devices*
  - EN 13223, *Safety requirements for cableway installations designed to carry persons — Drive systems and other mechanical equipment*
  - EN 13796 series, *Safety requirements for cableway installations designed to carry persons — Carriers*
  - EN 13243, *Safety requirements for cableway installations designed to carry persons — Electrical equipment other than for drive systems*
  - EN 13107, *Safety requirements for cableway installations designed to carry persons — Civil engineering works*
  - EN 1709, *Safety requirements for cableway installations designed to carry persons — Pre-commissioning inspection, maintenance and operational inspection and checks*
  - 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*

Together these form a series of standards regarding design, manufacture, construction, maintenance and operation of all cableway installations designed to carry persons.

According to the CEN/CENELEC internal regulations, the national standards organizations of the following countries are required to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, the Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, the Republic of Serbia, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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**EN 13796-1:2017 (E)****1 Scope**

This European Standard specifies the safety requirements applicable to carriers for cableway installations designed to carry persons. It is applicable to the various types of installations and takes into account their environment.

It includes requirements relating to the prevention of accidents and the protection of workers, without affecting the application of national requirements.

National requirements relating to construction law or statutory law, or to the protection of specific groups of people, shall not be affected.

It does not apply to installations for the transportation of goods or to lifts.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable to its application. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 795, *Personal fall protection equipment — Anchor devices*

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

EN 1907, *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 1993-1-9, *Eurocode 3: Design of steel structures — Part 1-9: Fatigue*

EN 1999-1-3, *Eurocode 9: Design of aluminium structures — Part 1-3: Structures susceptible to fatigue*

EN 10025 series, *Hot-rolled products of structural steels*

EN 10083 series, *Quenched and tempered steels*

EN 10204:2004, *Metallic products — Types of inspection documents*

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 series, *Safety requirements for cableway installations designed to carry persons — Ropes*

EN 12929 series, *Safety requirements for cableway installations designed to carry persons — General provisions*

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 installations other than for drive systems*

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

EN 13796-3, *Safety requirements for cableway installations designed to carry persons — Carriers — Part 3: Fatigue testing*

EN ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1)*

EN ISO 898 series, *Mechanical properties of fasteners made of carbon steel and alloy steel (ISO 898 series)*

EN ISO 5817, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817)*

EN ISO 9606-1, *Qualification testing of welders — Fusion welding — Part 1: Steels (ISO 9606-1)*

EN ISO 9606-2, *Qualification testing of welders — Fusion welding — Part 2: Aluminium and aluminium alloys (ISO 9606-2)*

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### 3 Terms and definitions

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

#### 3.1

##### gravitational driving force

$F_T$

$$F_T = m \times g \times \sin \alpha$$

where

$m$  = mass of the vehicle

$g$  = 9,81 m.s<sup>-2</sup>

$\alpha$  = average incline of the track over the relevant section

Note 1 to this clause: For cable cars, this shall be the average of all angles of the cable (carrying hauling rope or carrying cable) uphill and downhill from the vehicle.

#### 3.2

##### slipping resistance force

$F$

characterizes the resistance to slipping provided by a grip.

Note 1 to this clause: A distinction is made between the following slipping resistance forces when they occur:

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- $F_{\text{theo}}$  calculated slipping resistance force;  
 $F_{\text{lab}}$  slipping resistance force determined experimentally in the laboratory on the rope;  
 $F_{\text{eff}}$  slipping resistance force measured on the rope on the installation.

### 3.3 pull-off resistance force

$F_{\text{aus}}$  characterizes the resistance provided by a fixed grip on the rope when a lifting force is exerted normal to the rope axis in a vertical plane (see Figure 1)

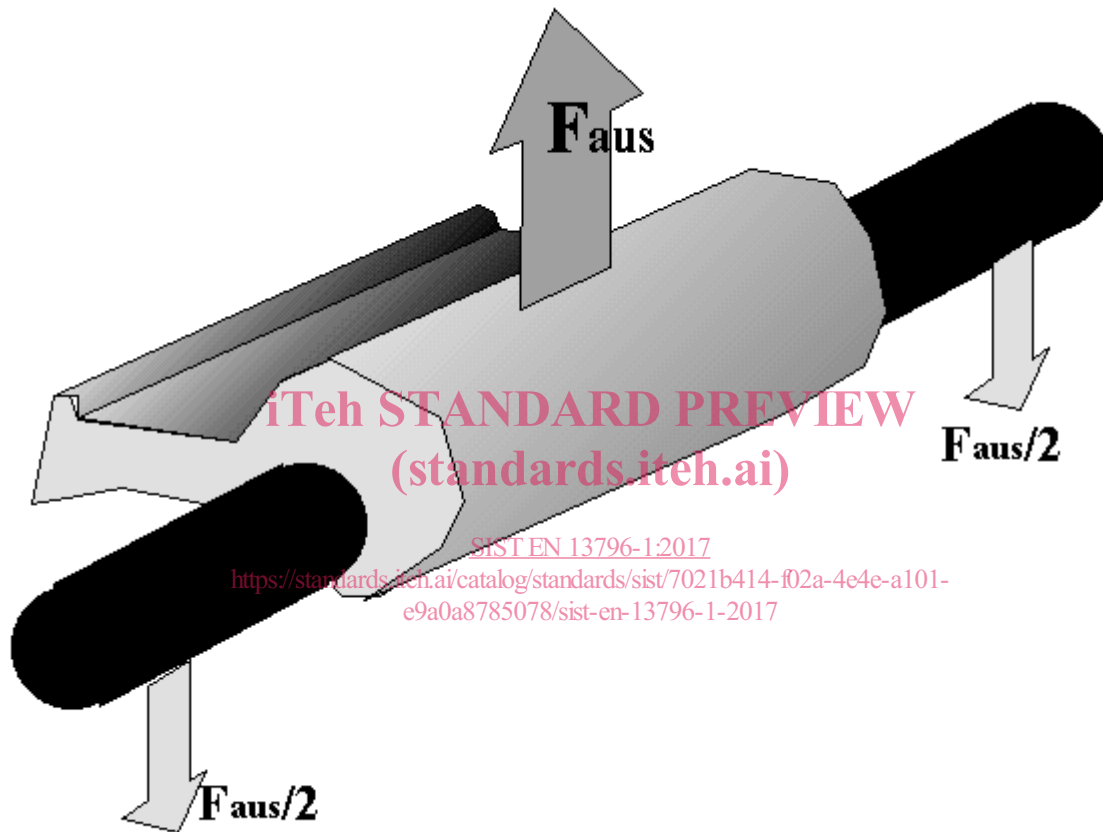


Figure 1 — Pull-off resistance force

### 3.4 gripping force exerted by the jaws

$F_{\text{kl}}$  scalar sum of all the normal forces between the surface of the gripping jaws and the surface of the rope.

### 3.5 funicular railway or aerial ropeway vehicle compartment

passenger compartment, or part of a passenger compartment, in which the walls or other boundary devices are able to withstand the forces  $H_{X1}$  and  $H_{Y1}$  defined in 6.2 imparted by the passengers

## 4 Symbols and abbreviations

$A_{ref}$	reference area for force due to wind	[m <sup>2</sup> ]
$A_X$	force due to impact into buffer	[N]
$d$	rope diameter (nominal)	[m]
$F$	slipping resistance force	[N]
$F_{aus}$	pull-off resistance force	[N]
$F_{eff}$	slipping resistance force measured on the rope on the installation	[N]
$F_{kl}$	gripping force exerted by the jaws	[N]
$F_{lab}$	slipping resistance force determined experimentally in the laboratory	[N]
$F_{theo}$	calculated slipping resistance force	[N]
$F_F$	force due to the springs of a fixed or detachable grip	[N]
$F_N$	action caused by the gradient of the ropes	[N]
$F_S$	force due to the support of a haulage rope	[N]
$F_T$	gravitational driving force	[N]
$F_W$	wind action	[N]
$F_Y$	force transverse to the track	[N]
$G$	self-weight of the carrier with all its accessories	[N]
$H_X$	force due to longitudinal impact	[N or N/m]
$H_Y$	force due to transverse impact	[N or N/m]
$M_Y$	damping moment	[N.m]
$M_Z$	torsional moment about the vertical axis	[N.m]
$N$	number of cycles	[-]
$O$	force to open and close a detachable grip	[N]
$Q$	useful load	[N]
$Q_F$	force due to the action of the on-board brake	[N]
$R$	reaction force on a carrier when entering the station	[N]
$S$	force due to start-up	[N]
$U$	reaction force when passing round a sheave	[N]

## 5 General requirements

### 5.1 Application of the standard

The requirements of this European Standard apply to all cableways for passenger transport along with those of standards EN 1709, EN 1908, EN 1909, EN 12397, EN 12408, EN 12927 series, EN 12929 series, EN 12930, EN 13107, EN 13223, EN 13243, EN 13796-2 and EN 13796-3.

**EN 13796-1:2017 (E)****5.2 Safety principles****5.2.1 General**

The safety principles set out in standard EN 12929-1 apply. In addition, the following hazard scenarios and safety requirements relative to the scope of this European Standard shall be taken into account.

**5.2.2 Hazard scenarios**

The following events may lead to hazardous situations that may be avoided or limited by the safety requirements of this document:

- a) overloading of the carrier;
- b) exceeding the limits of use permitted by the manufacturer;
- c) damage caused by ageing, corrosion, wear, fatigue or deformation;
- d) hooking up and impact (carrier with carrier, carrier with people, carriers with ropes, stations, line structures and external objects);
- e) derailment and deropement when carrier passes;
- f) derailment or instability of the carrier;
- g) failure of the haulage rope or carrying hauling rope where a grip is attached;
- h) failure of the attachment or detachment of a grip;
- i) inadequate resistance to slipping and pull-off of a rope grip;
- j) faulty door operation (unexpected opening, slamming shut);
- k) inadequate protection against passengers and any element falling out of the carrier;
- l) inadequate positioning and difficult access for the maintenance and evacuation personnel;
- m) fire.

**5.2.3 Safety measures**

The safety measures to be taken to eliminate the hazard scenarios listed in 5.2.2 are the following:

- a) checking of the load or limiting the area available to each passenger and systematically informing the passengers of the maximum authorized load;
- b) establishment of an operating manual defining the limits of use;
- c) requirements relating to design and manufacture, to the selection of materials, production checks, type approval tests, pre-commissioning tests and checks during operation;
- d) compliance with space envelopes, monitoring of the maximum permissible wind speed in operation, damping devices on the outside of the carriers;

- e) unrestricted passage of the grips past the rope-catchers;
- f) requirements relating to the guiding and stability of the carriers;
- g) adequate design of the grip to limit the risks of fatigue failure of the haulage rope or carrying hauling rope;
- h) monitoring the attachment and detachment of the carriers, catching a carrier not properly attached to the rope;
- i) monitoring during operation of the gripping force, or of a value representative of this force, of detachable grips;
- j) design of fixed grips to enable their systematic displacement without upsetting the adjustment of the spring force;
- k) periodic checks during operation;
- l) limiting the effect of an impermissible reduction in the gripping force of the grip;
- m) monitoring the closing and locking of the doors prior to departure of the carrier; monitoring of the position and speed of the carriers prior to unlocking and opening of the doors, limiting the closing force of the doors, fitting the edges of the doors with soft material;
- n) use of an efficient safety bar on chairlifts, minimum height of backrests and sides, selection of non-slip materials;
- o) use of handholds and anchorage points for PPE against falls from a height;
- p) use of positions and access allowing personnel to carry out maintenance and evacuation operations;
- q) selection of suitable materials to limit the risks of fire.

## 6 Basic requirements

### 6.1 Technical documents to be supplied

#### 6.1.1 List of safety components

A list of all the safety components deemed necessary through a safety analysis shall be drawn up.

#### 6.1.2 Drawings and parts lists

**6.1.2.1** General arrangement drawings of the carriers with indications of the main dimensions.

**6.1.2.2** Detail drawings with lists of parts and indications of the materials in accordance with 6.4 for:

- all the safety components;
- other elements where necessary for verifying calculations in accordance with 6.3 and for understanding the functioning or for maintenance.