



# SLOVENSKI STANDARD SIST EN 12927:2019

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## Nadomešča:

SIST EN 12927-1:2005

SIST EN 12927-2:2005

SIST EN 12927-3:2005

SIST EN 12927-4:2005

SIST EN 12927-5:2005

SIST EN 12927-6:2005

SIST EN 12927-7:2005

SIST EN 12927-8:2005

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**Varnostne zahteve za žičniške naprave za prevoz oseb - Vrvi**

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Safety requirements for cableway installations designed to carry persons - Ropes

Sicherheitsanforderungen an Seilbahnen für den Personenverkehr - Seile

Prescriptions de sécurité des installations à câbles transportant des personnes - Câbles

**Ta slovenski standard je istoveten z: EN 12927:2019**

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## **ICS:**

45.100

Oprema za žičnice

Cableway equipment

**SIST EN 12927:2019**

**en,fr,de**

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EUROPEAN STANDARD

EN 12927

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EUROPÄISCHE NORM

May 2019

ICS 45.100

Supersedes EN 12927-1:2004, EN 12927-2:2004, EN  
12927-3:2004, EN 12927-4:2004, EN 12927-5:2004,  
EN 12927-6:2004, EN 12927-7:2004, EN 12927-  
8:2004

English Version

## Safety requirements for cableway installations designed to carry persons - Ropes

Prescriptions de sécurité des installations à câbles  
transportant des personnes - Câbles

Sicherheitsanforderungen an Seilbahnen für die  
Personenbeförderung - Seile

This European Standard was approved by CEN on 11 February 2019.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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## European foreword

This document (EN 12927:2019) 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 November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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 Regulation (EU) 2016/424.

For relationship with Regulation (EU) 2016/424, see informative Annex ZA, which is an integral part of this document.

This document replaces:

- EN 12927-1:2004: Safety requirements for cableway installations designed to carry persons - Ropes - Part 1: Selection criteria for ropes and their end fixings”
- EN 12927-2:2004: Safety requirements for cableway installations designed to carry persons - Ropes – Part 2: Safety factors
- EN 12927-3:2004: Safety requirements for cableway installations designed to carry persons - Ropes – Part 3: Long splicing of 6 strand hauling, carrying hauling and towing ropes
- EN 12927-4:2004: Safety requirements for cableway installations designed to carry persons - Ropes – Part 4: End fixings
- EN 12927-5:2004: Safety requirements for cableway installations designed to carry persons - Ropes – Part 5: Storage, transportation, installation and tensioning
- EN 12927-6:2004: Safety requirements for cableway installations designed to carry persons - Ropes – Part 6: Discard criteria
- EN 12927-7:2004: Safety requirements for cableway installations designed to carry persons - Ropes – Part 7: Inspection, repair and maintenance
- EN 12927-8:2004: Safety requirements for cableway installations designed to carry persons - Ropes – Part 8: Magnetic rope testing (MRT)

During the systematic review regarding the EN 12927 Part 1 to Part 8, it was decided to merge the 8 parts into one single document.

In comparison to EN 12927, parts 1:2004 to 8:2004, the following major changes have been applied:

- the former parts 1 to 8 have been merged to a single document in order to simplify orientation in working with the standard. Following this principle, the former paragraph-references had to be changed in total.

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Therefore, especially general chapters like “normative references”, “terms and definitions”, “safety principles” and so on, now have been compacted for a better overview;

- ambiguous or unclear details of the former versions have been generally rewritten and improved;
- technical developments since the last versions have been adopted to the actual state of the art, e.g. inclusion of optical inspection devices;
- requirements and descriptions in the scope of inspection methods have been improved and extended to details, especially for visual inspection;
- requirements and descriptions for storage, handling and transportation have been improved and extended to details.

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

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## 1 Scope

This document specifies the safety requirements applicable to:

- Selection criteria for ropes and their end fixings
- Safety factors (excluding brake ropes)
- Discard criteria
- Storage, handling, transportation and installation (including tensioning, connecting and/or splicing)
- Long splicing of 6 strand haulage, carrying-hauling rope and carrying-hauling rope (for ski-tow)
- End fixings
- Maintenance

and the minimum requirements applicable to:

- MRT, visual and radiographic equipment and procedures for the examination of steel wire ropes.

This document is not applicable to cableway installations for the transportation of goods nor to lifts.

This document includes requirements relating to the prevention of accidents and the protection of workers irrespective of the application of national regulations.

National regulations of a building or federal/state nature or which serve to protect particular groups of people remain unaffected.

## 2 Normative references

[SIST EN 12927:2019](https://standards.iteh.ai/catalog/standards/sist/8c7a9d01-9d03-4ff9-8fd7-834c56432e42/sist-en-12927-2019)

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The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1559-2, *Founding — Technical conditions of delivery — Part 2: Additional requirements for steel castings*

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

EN 1907:2017, *Safety requirements for cableway installations designed to carry persons — Terminology*

EN 1908, *Safety requirements of cableway installations designed to carry persons — Tensioning devices*

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

EN 10228-1, *Non-destructive testing of steel forgings — Part 1: Magnetic particle inspection*

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

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

EN 12385-8, *Steel wire ropes — Safety — Part 8: Stranded hauling and carrying-hauling ropes for cableway installations designed to carry persons*

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EN 12385-9, *Steel wire ropes — Safety — Part 9: Locked coil carrying ropes for cableway installations designed to carry persons*

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 12929-1, *Safety requirements for cableway installations designed to carry persons — General requirements — Part 1: Requirements for all installations*

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*

EN 13411-2, *Terminations for steel wire ropes — Safety — Part 2: Splicing of eyes for wire rope slings*

EN 13411-3, *Terminations for steel wire ropes — Safety — Part 3: Ferrules and ferrule-securing*

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

EN 13411-5, *Terminations for steel wire ropes — Safety — Part 5: U-bolt wire rope grips*

EN 13411-6, *Terminations for steel wire ropes — Safety — Part 6: Asymmetric wedge socket*

EN 13411-7, *Terminations for steel wire ropes — Safety — Part 7: Symmetric wedge socket*

EN 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*

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 5579, *Non-destructive testing — Radiographic testing of metallic materials using film and X- or gamma rays — Basic rules (ISO 5579)*

EN ISO 9554, *Fibre ropes — General specifications (ISO 9554)*

EN ISO 10547, *Polyester fibre ropes — Double braid construction (ISO 10547)*

### 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

NOTE For a better accessibility, some terms and definitions have been taken from EN 1907 are repeated in this Clause.

#### 3.1

##### **additional tensioning device**

additional device intended to hold the tension in a rope in case of failure of the main tensioning device

#### 3.2

##### **bolted clamp**

end fixing accessory consisting of two grooved plates bolted together between which the entire rope is pressed and secured by means of bolts

#### 3.3

##### **clamp socket**

socket end fixing where the end of rope is immobilized mechanically

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[SOURCE: EN 1907:2017, 4.3.1.2]

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#### 3.4

##### **diameter ratio**

ratio between the pitch diameter ( $D$ ) f. i. of a sheave, a rope shoe or a roller chain and the nominal diameter of the rope ( $d$ )

[SOURCE: EN 1907:2017, 4.3.4]

#### 3.5

##### **discard criteria**

level of deterioration at which the rope or the end fixing is declared unfit for further service

#### 3.6

##### **drum**

end fixing consisting of a number of dead turns of rope permanently wound around a winch support, the end of the rope being secured by means of a bolted clamp

#### 3.7

##### **efficiency**

ratio between the breaking force of the combination of rope and end fixing, and the minimum breaking force of the rope

Note 1 to entry: It determines the load bearing capacity of the combination with respect to that of the wire rope.

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**3.8  
end fixing  
termination**

component connecting one of the ends of a rope to the component on which the rope pulls

[SOURCE: EN 1907:2017, 4.3]

**3.9  
installation sheave and roller**

wheel with a groove along its edge for holding a rope

**3.10  
installer**

person or organisation responsible for all or part of the installation of a rope, the splicing and the end fixing, the tensioning and the adjustment

**3.11  
lever winch**

end fixing accessory comprising a mechanism actuated by a lever and acting on two sets of jaws alternately gripping the rope and moving it longitudinally

**3.12  
local discontinuity**

localised fault or defect on a wire

EXAMPLE A broken or damaged wire or a corrosion pit on a wire

**3.13  
loss of metallic cross sectional area**

reduction in area expressed as a percentage of the nominal metallic cross sectional area of the new rope, taking into account the effects of broken wires and the effect of corrosion and wear

**3.14  
lubrication agent**

any product applied to the rope in service in order to protect it against internal wear, corrosion or both

**3.15  
magnetic rope testing**

method of testing based on the detection of the magnetic flux leakage of a magnetized rope

**3.16  
main body of the rope**

whole of the length of the rope excluding any sections within an end fixing or a long splice

**3.17  
optical inspection device**

instrumentation designed to acquire and record images of the surface of a rope

**3.18  
radiographic testing**

method of testing based on the impression of a film by X- or gamma rays passing through a wire rope

**3.19****reference bendings**

total number of bends over sheaves in one complete revolution (unidirectional ropeways) or one complete ride forwards and backwards (reversible ropeways)

**3.20****reference length**

length of rope over which the value of a specified characteristic is measured or assessed e.g. 6xd (6 × nominal diameter of the rope)

**3.21****reference point**

origin chosen on the rope or the installation to locate specific sections on the ropes

**3.22****resin filled socket**

socket end fixing where a brushed rope end is secured using poured resin or other suitable means

**3.23****rope indicator**

device inserted into the rope to identify and mark particular rope areas

**3.24****rope nominal diameter****(d)**

diameter by which the rope is designated

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**3.25****rope signature**

reflects the changes in magnetic characteristics of the rope among its length, e.g. differences in magnetic permeability

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**3.26****rope untwisting**

untwisting of a rope in between a pair of clamps to allow internal visual inspection

**3.27****slipping force**

maximum longitudinal tension force, which can be applied to a clamped rope, held by friction, before its initial slippage

**3.28****socket basket**

part of the filled socket containing the metal or synthetic resin cone

[SOURCE: EN 1907:2017, 4.3.1.1.1]

**3.29****static bending**

rope bending which does not vary significantly during operations

**3.30****tail**

area in a splice where 1 outer strand (properly wrapped) replaces the rope core

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## 3.31

**tensile safety**

ratio between the minimum breaking force of the rope and the calculated tension force

[SOURCE: EN 1907:2017, 4.8]

## 3.32

**test head**

device on that part of the test instrument positioned around the rope during testing which generates the magnetising field and contains the detecting or sensing elements

## 3.33

**tuck**

location in a splice where 2 opposite outer strands of a rope enter into the core

## 3.34

**visual inspection**

non-destructive test of the state of a component by visual means only, possibly taking into account particular circumstances

## 3.35

**wire break indication**

indication from the local discontinuity (*LD*) channel of the test instrument specifically identified as an internal or external wire break type

## 3.36

**wrapping**

addition of material to a tail in order to increase its diameter

## 4 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms in Table 1 shall be applied.

**Table 1 — Symbols and abbreviated terms**

Symbol	Description
$D/d$	diameter ratio
$F_{min}$	minimum breaking force of the rope
<i>LD</i>	local discontinuity
<i>LMA</i>	loss of metallic cross-sectional area
<i>MRT</i>	magnetic rope testing
<i>NDT</i>	non-destructive testing
<i>OID</i>	optical inspection device
<i>RT</i>	radiographic testing
<i>VI</i>	visual inspection

## 5 Requirements

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

## 6 Safety principles

### 6.1 General

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

If ropes of different productions are required to be spliced together, they shall have the same basic design characteristics as agreed by a competent person. Rope repairs using ropes or strands of different production batches are allowed.

Irrespective of whether the rope is inspected by MRT or visual means, the same wire broken in several places over the stated reference length shall be regarded as a single broken wire.

Loose wires and wires repaired by welding, brazing or gluing shall be regarded as broken wires.

Ropes shall be discarded if their condition cannot, or can no longer, be assessed with the methods of inspection which are mentioned in this standard.

### 6.2 Hazard scenarios

The following events can give rise to hazardous situations which may be avoided or reduced by the safety requirements of this standard.

Concerning selection criteria for ropes and their end fixings:

- a) the breakage of a rope or the failure of an end fixing may lead to the following hazardous situations:
- 1) falling down of rope with the risk of carrier crash and the risk of impact to persons;
  - 2) release of the elastic potential energy of a tensioned or extended rope.
- b) deterioration/damages of the structure of the rope can lead to the following hazardous situations:
- 1) derailment of rope;
  - 2) derailment of carrier truck.
- c) the rotation of the rope around its axis in low level ski-tow systems can create a dangerous situation for the user.
- d) vibrations may lead to premature failures of parts of the installation.

Concerning safety factors:

- e) excessive working stresses in the wires may lead to premature fatigue breaks and rope-failure within the stated inspection intervals.

Concerning discard criteria:

- f) excessive loss of the metallic cross sectional area may lead to the breakage of the rope;
- g) fatigue breaks, loose wires, corrosion and wear may lead to a failure of end fixings and of ropes;