SLOVENSKI STANDARD
oSIST prEN 12927:2017

01-september-2017

Varnostne zahteve za žičniške naprave za prevoz oseb – Vrvi

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: **prEN 12927**

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45.100 Oprema za žičnice Cableway equipment

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English Version

Safety requirements for cableway installations designed to carry persons - Ropes

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

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 242.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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European foreword

This document (prEN 12927:2017) 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 document is currently submitted to the CEN Enquiry.

This document will supersede 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.

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 Directives 2000/9/EC

For relationship with EU Directive 2000/9/EC, see informative Annexes ZA and ZB, which are integral parts of this 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. Therefore, especially general chapters like “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 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.

1 Scope

This European Standard 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 standard is not applicable to cableway installations for the transportation of goods nor to lifts.

This standard 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

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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[1], *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 12385-4, *Steel wire ropes - Safety - Part 4: Stranded ropes for general lifting applications*

EN 12385-8:2002, *Steel wire ropes - Safety - Part 8: Stranded hauling and carrying-hauling ropes for cableway installations designed to carry persons*

[1] Currently under revision at Formal Vote stage.

EN 12385-9:2002,*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 12930:2015, *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 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.

NOTE For a better accessibility, some terms and definitions 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

[SOURCE: EN 1907]

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]

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.

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]

3.9
inspection log
collection of the reports of inspections carried out on ropes, end fixings and splices

3.10
installation sheave and roller
wheel with a groove along its edge for holding a rope

3.11
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

3.12
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

3.13
local discontinuity
localised fault or defect on a wire

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

3.14
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

3.15
lubrication agent
product applied to the rope in service in order to protect it against internal wear, corrosion or both

3.16
magnetic rope testing
method of testing based on the detection of the magnetic flux leakage of a magnetized rope

3.17
main body of the rope
whole of the length of the rope excluding any sections within an end fixing or a long splice

3.18
optical inspection device
instrumentation designed to acquire and record images of the surface of a rope

3.19
radiographic inspection
method of testing based on the impression of a film by *X* or gamma rays passing through a wire rope

3.20
reference bendings
total number of bends over sheaves in one complete revolution (unidirectional ropeways) or one complete ride forwards and backwards (reversible ropeways)

3.21
reference length
length of rope over which the value of a specified characteristic is measured or assessed e.g. $6\times d$ (6 × nominal diameter of the rope)

3.22
reference point
one origin chosen on the rope or the installation to locate specific sections on the ropes

3.23
resin filled socket
socket end fixing where a brushed rope end is secured using poured resin or other suitable means

3.24
rope indicator
device inserted into the rope to identify and mark particular rope areas

3.25
rope nominal diameter
(d)
diameter by which the rope is designated

[SOURCE: EN 1907]

3.26
rope signature
signature reflecting the changes in magnetic characteristics of the rope among its length, e.g. differences in magnetic permeability

3.27
rope untwisting
untwisting of a rope in between a pair of clamps to allow internal visual inspection

3.28
slipping force
maximum longitudinal tension force, which can be applied to a clamped rope held, by friction, before its initial slippage

3.29
socket basket
part of the filled socket containing the metal or synthetic resin cone

[SOURCE: EN 1907]

3.30
static bending
rope bending which does not vary significantly during operations

3.31
tail
area in a splice where 1 outer strand (properly wrapped) replaces the rope core

3.32
tensile safety
ratio between the minimum breaking force of the rope and the calculated tension force

[SOURCE: EN 1907]

3.33
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

3.34
tuck
location in a splice where 2 opposite outer strands of a rope enter into the core

3.35
visual inspection
non-destructive test of the state of a component by visual means only, possibly taking into account particular circumstances

3.36
wire break indication
indication from the local discontinuity (*LD*) channel of the test instrument specifically identified as an internal or external wire break type

3.37
wrapping
addition of material to a tail in order to increase its diameter

4 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.

5 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviated terms given in Table 1 apply.

Table 1 — Symbols and abbreviated terms

Symbol	Description
D/d	the pitch diameter of the sheave (*D*) and the nominal rope diameter (*d*)
F_{min}	minimum breaking force of the rope
LD	local discontinuity
LMA	loss of metallic cross-sectional area
MRT	magnetic rope testing
NDT	non-destructive testing
OID	optical inspection device
RT	radiographic inspection
Sf	slipping force
VI	visual inspection

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 decrease 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;

h) deterioration/damaging of the structure of the rope can lead to derailment of the rope or to insufficient connection of the grip.

Concerning storage, handling, transportation and installation (including tensioning, connecting and/or splicing):

i) elevated temperature and inefficient rope protection during storage may lead to corrosion which may lead to rope failure within an inspection period;

j) failure of supporting the reels properly may allow them to unwind ;