SLOVENSKI STANDARD
SIST EN 1891:1999

01-julij-1999

Osebna varovalna oprema za zaščito pred padci z višine – Oplaščene statične vrvi

Personal protective equipment for the prevention of falls from a height - Low stretch kernmantel ropes

Persönliche Schutzausrüstung zur Verhinderung von Abstürzen - Kernmantelseile mit geringer Dehnung

Equipement de protection individuelle pour la prévention des chutes de hauteur - Cordes tressées gainées a faible coefficient d'allongement

Ta slovenski standard je istoveten z: **EN 1891:1998**

ICS:

13.340.60	Zaščita pred padci in zdrsi	Protection against falling and slipping

SIST EN 1891:1999 **en**

EUROPEAN STANDARD
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Descriptors: personal protective equipment, accident prevention, protection against fall, ropes, textiles, definitions, specifications, characteristics, elongation, sliding, tests, marking, information

English version

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 160 "Protection against falls from height including working belts", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by October 1998, and conflicting national standards shall be withdrawn at the latest by October 1998.

This European Standard 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 standard.

The annex A is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

0 Introduction

Ropes for use in rope access, rescue and in speleology are used in similar ways and therefore require the same characteristics. They are used in combination with ascending, descending and safety devices for work positioning in rope access; lowering or raising casualties in rescue; as a means of ascent, descent and horizontal motion in speleology. The characteristics required are low extension during normal working procedure but with the capacity to withstand forces generated by a fall. Some energy absorption of these impact forces is also desirable, the amount usually a compromise with the acceptable extension during normal working practice.

1 Scope

This European Standard applies to low stretch textile ropes of kernmantel construction from 8,5 mm to 16 mm diameter, for use by persons in rope access including all kinds of work positioning and restraint; for rescue and in speleology. Two types of low stretch kernmantel rope are defined: A and B. The European Standard specifies requirements, testing, marking and information to be supplied by the manufacturer including instructions for use of such low stretch kernmantel ropes.

NOTE 1: It is possible that rope not conforming to this European Standard may also be suitable for the activities described above.

NOTE 2: Ropes used for protection during any free climbing activity in rope access, rescue or speleology should take account of other standards, e. g. EN 892. Dynamic mountaineering rope may also be used for protection during rope access and work positioning.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 364:1992	Personal protective equipment against falls from a height - Test methods
EN 365:1992	Personal protective equipment against falls from a height - General requirements for instructions for use and for marking
EN 701:1995	Fibre ropes for general service - General specification
EN 919:1995	Fibre ropes for general service - Determination of certain physical and mechanical properties
EN 892	Mountaineering equipment - Dynamic mountaineering ropes - Safety requirements and test methods

3 Definitions

For the purposes of this European Standard the following definitions shall apply:

3.1 Low stretch kernmantel rope

A textile rope consisting of a core enclosed by a sheath, designed for use by persons in rope access including all kinds of work positioning and restraint; for rescue and speleology.

NOTE: The core is usually the main load bearing element and typically consists of parallel elements which have been drawn and turned together in single or several layers, or of braided elements. The sheath is generally braided and protects the core, for example from external abrasion and ultra violet degradation.

3.2 Rope access

The technique of using ropes, in combination with other devices, for getting to and from the place of work and for work positioning.

3.3 Work positioning

A technique which enables a person to work supported in tension or suspension by personal protective equipment, in such a way that a fall is prevented.

3.4 Type A ropes

Low stretch kernmantel ropes designed for general use by persons in rope access including all kinds of work positioning and restaint; in rescue and in speleology.

3.5 Type B ropes

Low stretch kernmantel ropes of a lower performance than type A ropes, requiring greater care in use.

4 Requirements

4.1 Materials

Materials used in the manufacture of low stretch kernmantel ropes shall be of continuous virgin synthetic fibre. The materials used for the construction of the sheath and the core shall be known to have a melting point > 195 °C.

4.2 Rope diameter *D*

When calculated as the arithmetic mean of the six measurements described in 5.3, the rope diameter *D* shall be a minimum of 8,5 mm and a maximum of 16 mm.

4.3 Knotability *K*

The rigidity of the low stretch kernmantel rope shall be such that the knotability *K* shall be less than 1,2 when determined in the knot test specified in 5.4.

4.4 Sheath slippage S_s

Sheath slippage S_s in a longitudinal direction relative to the core shall be determined as specified in 5.5. With the rope diameter *D* as specified in 5.3, the sheath slippage for type A ropes shall not exceed 20 mm + 10 (*D* - 9 mm) for ropes up to 12 mm diameter, and 20 mm + 5 (*D* - 12 mm) for ropes with a diameter between 12,1 and 16 mm. For type B ropes the sheath slippage shall not exceed 15 mm. Measurements shall be according to value V in 5.5.6 and shall be reported as a percentage as described in 5.5.6.

4.5 Elongation *E*

When tested as described in 5.6, the elongation *E* shall not exceed 5%.

4.6 Shrinkage *R*

Shrinkage *R* shall be determined as described in 5.7.

4.7 Mass per unit length *M*

The mass per unit length *M* of 1000 mm of low stretch kernmantel rope shall be determined as described in 5.8.

4.8 Mass of the outer sheath material S_p

When tested as described in 5.8, the minimum mass of the material used in the sheath alone, as a percentage of the total mass ot the low stretch kernmantel rope, shall be:

$$S_{min} = \frac{(\frac{D}{2})^2 - (\frac{D-2}{2})^2}{(\frac{D}{2})^2} \cdot 100 \text{ in percentage}$$

which can be simplified to:

$$S_{min} = \frac{4D - 4}{D^2} \cdot 100 \text{ in percentage}$$

where *S* = sheath and *D* = rope diameter as measured in 5.3.

If the construction of the low stretch kernmantel rope is such that separating the sheath an the core is impracticable, an appropriate substitute method of determining the percentage mass of the outer sheath material may be used.

4.9 Mass of the core material *C*

When tested as described in 5.8, the minimum mass of the material used in the core alone, as a percentage of the total mass of the low stretch kernmantel rope, shall be:

for type A ropes:

$$C_{min} = \frac{12}{(\frac{D}{2})^2} \cdot 100 \textit{ in percentage}$$

which can be simplified to:

$$C_{min} = \frac{48}{D^2} \cdot 100 \textit{ in percentage}$$

for type B ropes:

$$C_{min} = \frac{10}{(\frac{D}{2})^2} \cdot 100 \textit{ in percentage}$$

which can be simplified to:

$$C_{min} = \frac{40}{D^2} \cdot 100 \textit{ in percentage}$$

where C = core and D = rope diameter as measured in 5.3.

If the construction of the low stretch kernmantel rope is such that separating the sheath and the core is impracticable, an appropriate substitute method of determining the percentage mass of the core material may be used.

4.10 Fall arrest peak force *F*

When tested as described in 5.9.4, the peak force shall not exceed 6 kN.

4.11 Dynamic performance

When tested as described in 5.9.5, the low stretch kernmantel rope shall withstand five falls without releasing the mass.

4.12 Static strength

4.12.1 Static strength without terminations

When tested according to the appropriate parts of 4.1, 5.1, 6, 8.1, 8.2, 8.5 and 9.5 of EN 919:1995, the low stretch kernmantel rope shall sustain a force of at least 22 kN for type A ropes and at least 18 kN for type B ropes.

4.12.2 Static strength with terminations

Terminations may be made with knots or by other methods. When tested as described in 5.10, the low stretch kernmantel rope including terminations shall sustain a force of ($15\ ^{+0,5}_{0}$) kN for type A ropes and ($12\ ^{+0,5}_{0}$) kN for type B ropes, each for a period of 3 min .

It shall be possible to create a termination (loop) suitable for use as an attachment point anywhere on the low stretch kernmantel rope, for example, a figure of eight knot.

5 Test methods

5.1 Samples

The number and length of rope samples to be tested are noted in each test clause. The samples shall correspond to low stretch kernmantel ropes to be marketed in every respect except for colour, for which there is no requirement.

5.2 Conditioning

All the rope samples shall be conditioned in an atmosphere of less than 10% humidity for at least 24 h. The rope samples shall then be stored at a temperature of (20 ± 2) °C and a humidity of (65 ± 5) % for at least 72 h.

Tests shall be carried out at a temperature of (23 ± 5) °C.

5.3 Rope diameter *D*

5.3.1 Sample

One unused rope sample having a minimum length of 3000 mm shall be used for the test.

5.3.2 Procedure

5.3.2.1 Attach one end of the rope sample to a suitable fixture.

5.3.2.2 Apply a load without shock in the form of a mass of (10 ± 0,1) kg, or a corresponding force, at a distance of at least 1300 mm from the attachment point.

5.3.2.3 Continue application of the load described in 5.3.2.2 for (60 ± 15) s. After this loading period, with the load still applied, measure the low stretch kernmantel rope in two directions around the diameter, starting at points 90° apart, at each of three levels approximately 300 mm apart. The contact length of the measuring instrument shall be (50 ± 1) mm. The low stretch kernmantel rope cross- sectional area shall not be subject to any deformation during measurement.

5.3.3 Expression of results

Express the diameter *D* as the arithmetic mean of the six measurements to the nearest 0,1 mm. Confirm that the arithmetic mean of the six measurements is not less than 8,5 mm or greater than 16 mm.

5.4 Knotability *K*

5.4.1 Sample

One unused rope sample having a minimum length of 3000 mm shall be used for the test.

5.4.2 Procedure

5.4.2.1 Make two single overhand knots in the rope sample (250 ± 50) mm apart with the knot loops running in opposite directions.

5.4.2.2 Attach one end of the rope sample to a suitable fixture.

5.4.2.3 Apply a load without shock in the form of a mass of (10 ± 0,1) kg, or a corresponding force, so that the load affects both knots.

5.4.2.4 Continue application of the load described in 5.4.2.3 for (60 ± 15) s.

5.4.2.5 Reduce the load to (1 ± 0,1) kg and then, while still under this load, measure the internal diameter of the knots to the nearest 0,5 mm using a suitable measuring device such as a tapered plug gauge (see figure 1), without allowing an alteration of the free width of the knot by the pressure of the measuring device (see figure 2).

5.4.3 Expression of results

5.4.3.1 Calculate the average of the internal diameters of both knots.

5.4.3.2 Knotability shall thus be calculated from:

$$K = \frac{\textit{average internal diameter of the knots}}{\textit{rope diameter as specified in } 5.3.3}$$

5.5 Sheath slippage S_s

5.5.1 General information

In order to determine sheath slippage, the low stretch kernmantel rope shall be drawn through the apparatus illustrated in figure 3, where the movement is restricted by radial forces. The resulting frictional force on the sheath causes slippage of the sheath relative to the core. The extent of this slippage shall be measured.

5.5.2 Sample

One unused rope sample with a length of (2250 ± 10) mm shall be used for the test.

5.5.3 Preparation

One end of the sheath and core of the rope sample shall be fused (heat sealed) together. The other end shall be cut at right angles to the axis of the low stretch kernmantel rope.

5.5.4 Apparatus

5.5.4.1 The apparatus shall consist of a frame made out of four steel plates each 10 mm thick, kept equal distances apart by three spacers. These spacers shall have rectangular slots in which the 10 mm thick steel plates are able to slide in a radial direction. The spacers shall be arranged in such a way as to allow each of the three inserted plates to slide at an angle of 120° (see figure 3).

Dimensions in millimetres

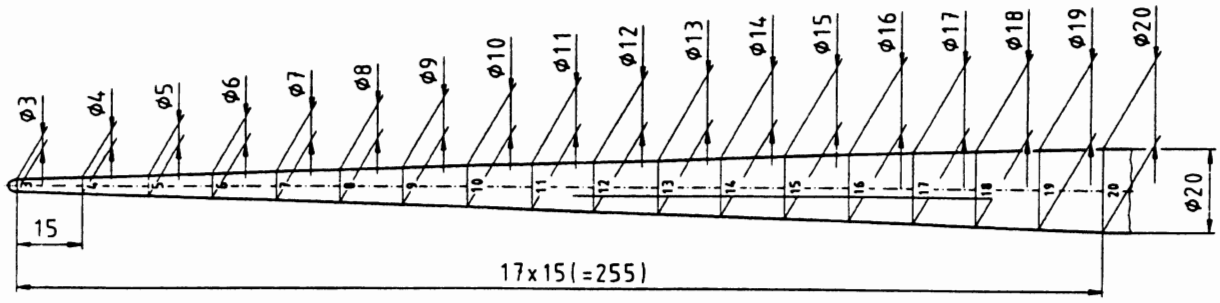
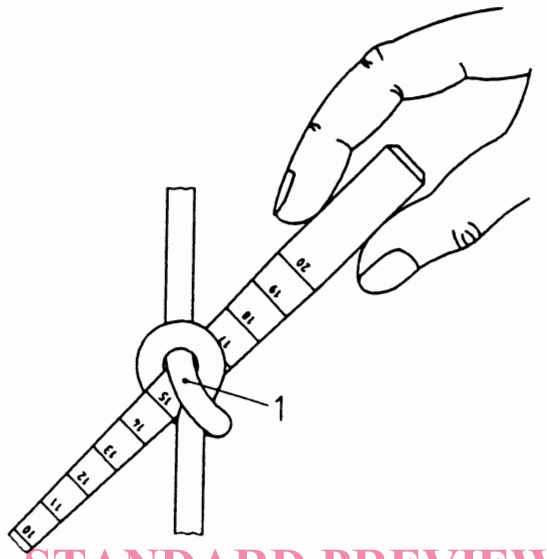


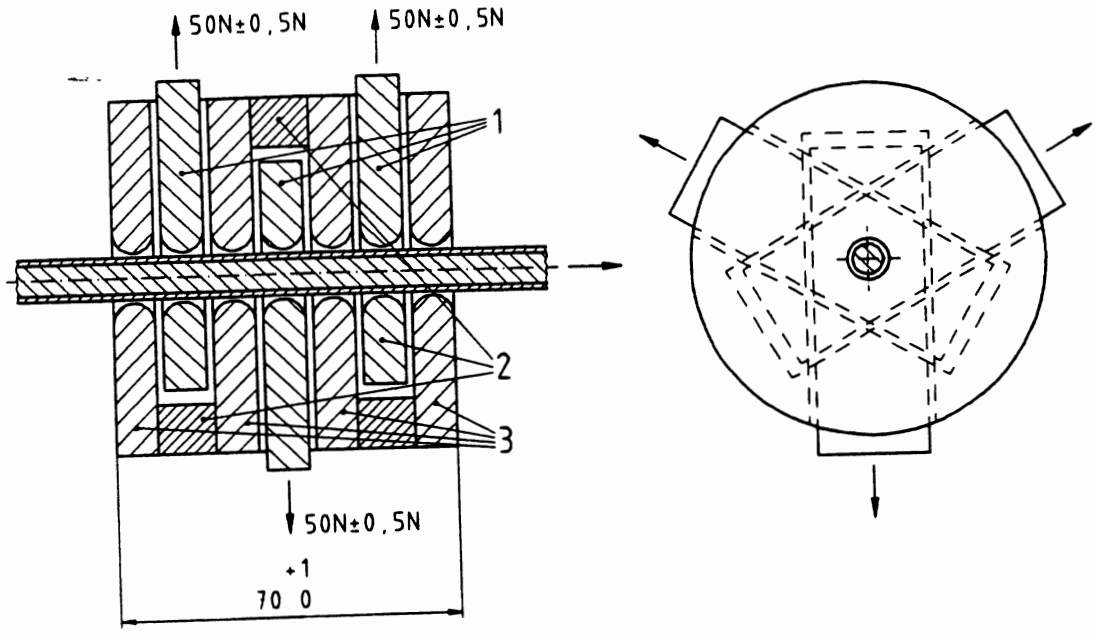
Figure 1: Gauge for determining knotability *K*



1 Measuring point

Figure 2: Determination of knotability *K*

Dimensions in millimetres



1 Moving plates
2 Spaces
3 Fixed plates

Figure 3: Apparatus for the sheath slippage test