SLOVENSKI STANDARD
oSIST prEN 10369-1:2019

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Prednapeta jekla - Zaščitena in obložena vlakna za prednapenjanje - 1. del: Splošno

Prestressing steels - Protected and sheathed strands for prestressing - Part 1: General

Spannstähle - Geschützte und gehüllte Litze zum Vorspannen - Teil 1: Allgemeine Anforderungen

Aciers de précontrainte - Fils protégés et gainés de précontrainte - Partie 1 : Généralités

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Prestressing steels - Protected and sheathed strands for prestressing - Part 1: General requirements

Armatures de précontrainte - Torons protégés gainés pour précontrainte - Partie 1 : Prescriptions générales

Spannstähle - Geschützte und gehüllte Litzen für Vorspannen - Teil 1: Allgemeine Anforderungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 459/SC 4.

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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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 (prEN 10369-1:2019) has been prepared by Technical Committee CEN/TC 459/SC 4 “Concrete reinforcing and prestressing steels”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document has been prepared under a standardization request given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Construction Products Regulation (EU 305/2011).

For relationship with EU EU Construction Products Regulation (EU 305/2011), see informative Annex ZA, which is an integral part of this document.

prEN 10369 consists of three parts under the general title “Prestressing steels — Protected and sheathed strands for prestressing”:

— *Part 1: General requirements*

— *Part 2: Sliding strands*

— *Part 3: Adherent strands*

Whenever approved, the publication of this series of standards will wait until EN 10138-1 and EN 10138-3 and EN 10337 are approved.

1 Scope

This document specifies the requirements for uncoated high strength steel strands or zinc or zinc alloy coated high strength steel strands, encapsulated with a protection product and a sheath[1)].

The intended use of these products is mainly the prestressing of concrete.

NOTE These products can also be used in other stress applications in the construction field (e.g. stay cables for bridges) where the protection of the products is not removed in use.

The standard applies only to products as supplied by the producer.

2 Normative references

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 728, *Plastics piping and ducting systems — Polyolefin pipes and fittings — Determination of oxidation induction time*

EN 10020, *Definition and classification of grades of steel*

prEN 10138-1, *Prestressing steels — Part 1: General requirements*

prEN 10138-3, *Prestressing steels — Part 3: Strand*

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

prEN 10337, *Zinc and zinc alloy coated prestressing steel wires and strands*

prEN 10369-2, *Prestressing steels — Protected and sheathed strands for prestressing — Part 2: Sliding strands*

prEN 10369-3, *Prestressing steels — Protected and sheathed strands for prestressing — Protected and sheathed high strength steel strands — Part 3: Adherent strands*

EN ISO 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals (ISO 175:2010)*

EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1)*

EN ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2)*

EN ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps (ISO 4892-2)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

[1)] The word "sheath" used in the present document does not cover the sheaths as stated in mandate M/115 and specified in EN 523.

EN ISO 10304-1, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 1: Determination of bromide, chloride, fluoride, nitrate, nitrite, phosphate and sulfate (ISO 10304-1)*

EN ISO 10304-4, *Water quality — Determination of dissolved anions by liquid chromatography of ions — Part 4: Determination of chlorate, chloride and chlorite in water with low contamination (ISO 10304-4)*

EN ISO 15630-3, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 3: Prestressing steel (ISO 15630-3)*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method*

ISO 2137, *Petroleum products and lubricants — Determination of cone penetration of lubricating greases and petrolatum*

ISO 2176, *Petroleum products — Lubricating grease — Determination of dropping point*

ISO 2207, *Petroleum waxes — Determination of congealing point*

ISO 6964, *Polyolefin pipes and fittings — Determination of carbon black content by calcination and pyrolysis — Test method*

ISO 18553, *Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds*

BS 2000-121, *Methods of test for petroleum and its products — Determination of oil separation from lubricating grease — Pressure filtration method*

DIN 51451, *Testing of petroleum products and related products — Analysis by infrared spectrometry — General working principles*

NF M 07-023, *Liquid fuels — Determination of chlorides in crude petroleum and petroleum products*

NF T 60-191, *Petroleum products and lubricating greases — Oil separation on storage of grease — Static conditions under pressure*

ASTM D95, *Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation*

ASTM D942, *Standard Test Method for Oxidation Stability of Lubricating Greases by the Oxygen Pressure Vessel Method*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN 10138-1 and prEN 10337 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

3.1
uncoated strand
strand consisting of uncoated high strength steel wires in accordance with prEN 10138-1 and prEN 10138-3

3.2
zinc or zinc alloy coated prestressing strand
strand consisting of zinc or zinc alloy hot-dip coated high strength steel wires in accordance with prEN 10337

3.3
protected and sheathed strand
uncoated or zinc or zinc alloy coated strand encapsulated with a protection product and a sheath

A distinction is made between:

3.3.1
sliding protected and sheathed strand (type S)
protected and sheathed strand for which the protection product allows a movement between the sheath and strand by application of a specified force

3.3.2
adherent protected and sheathed strand (type A)
protected and sheathed strand for which an adherence between the sheath and strand restricts their relative movement until a specified minimum force is reached

3.3.3
protected and double sheathed strand
protected and sheathed strand using double sheathing for both types (S and A)

3.4
protection product
product applied before sheathing to ensure full encapsulation

3.5
sheath
continuous envelope surrounding the strand

3.6
batch of protection material
quantity of grease or wax produced in one manufacturing operation

4 Symbols

The symbols used in this European Standard and the corresponding designations are given in Table 1.

Table 1 — Symbols and corresponding designations

Symbol	Unit	Designation
L	mm	Length of the test piece
M_t	g	Total mass of the test piece
M_s	g	Mass of the sheath
M_w	g	Total mass of wires
M_{pl}	g/m	Mass per unit length of the protection product
E	MPa	Modulus of elasticity of the strand
α	°	Angle of bend of the test piece in the test for resistance to rotating bending
D_a	mm	Diameter of the core wire

5 Classification and designation

5.1 Classification

The steels of the constituent strands of protected and sheathed strands covered by this document are classified as special steels according to EN 10020.

5.2 Designation

The designation of the products covered by this standard comprises in the order:

— the description of the product (i.e. protected and sheathed strand);

— the designation of the strand from which the protected and sheathed strand is produced according to the relevant standard in square brackets;

— the symbol of the protection product (+ G for grease; + W for wax);

— the symbol of the type of protected and sheathed strand (S or A, respectively see prEN 10369-2 and prEN 10369-3);

— the colour of the sheath when other than black.

6 Information to be obtained by the manufacturer

The following information shall be obtained by the manufacturer at the time of enquiry and order:

a) designation of the product in accordance with 5.2;

b) the packaging and protection requirements;

c) the requirements concerning information to accompany the delivery (e.g. date of manufacture, delivery note, type of inspection document, see EN 10204, copies of force/extension diagrams);

d) special requirements for labelling.

7 Requirements

7.1 General

7.1.1 Manufacturing process

The strands to be protected and sheathed shall be manufactured in accordance with prEN 10138-1 and prEN 10138-3 or prEN 10337.

The manufacturing method of the protected and sheathed strands shall be at the discretion of the manufacturer provided that the sheath is applied to the protected strand by direct extrusion and all the requirements of this standard are fulfilled.

7.1.2 Requirements for the constituent materials of the protected and sheathed strands

7.1.2.1 Strand

The uncoated strands shall be in accordance with prEN 10138-1 and prEN 10138-3 and be free from rust at the time of application of the protection and sheath.

The zinc or zinc alloy coated prestressing strands shall be in accordance with prEN 10337.

7.1.2.2 Protection product

7.1.2.2.1 General

The protection product is a mineral oil-based grease or a microcrystalline wax.

7.1.2.2.2 Grease

The grease shall meet the requirements given in Table A.1.

7.1.2.2.3 Wax

The wax shall meet the requirements given in Table A.2.

7.1.2.3 Base material of the sheath

The base material of the sheath shall meet the requirements given in Annex B.

7.2 Requirements for the protected and sheathed strands

7.2.1 Standard and special properties

The requirements for the standard and special properties as defined in prEN 10138-1 and prEN 10138-3 or prEN 10337 respectively shall apply.

7.2.2 Overall diameter

The overall diameter of the protected and sheathed strands shall be within a specified range in accordance with the requirements of:

— prEN 10369-2 for sliding protected and sheathed strands (type S), and

— prEN 10369-3 for adherent protected and sheathed strands (type A).

7.2.3 Straightness

The maximum bow height of the protected and sheathed strands from a reference line of 1 m long, measured within the curvature, in its plane, according to EN ISO 15630-3, shall be less than or equal to 25 mm.

7.2.4 Mass of the protection product

The minimum specified value for the mass of grease or wax per metre of strand shall be as given in the relevant requirements of prEN 10369-2 or prEN 10369-3.

The mass per unit length of grease or wax shall be determined according to the procedure described in C.1.

7.2.5 Properties of the sheath

7.2.5.1 Thickness

The minimum thickness of the sheath shall meet the requirements specified in prEN 10369-2 or prEN 10369-3 at any section.

The thickness of the sheath shall be determined according to the procedure described in C.2.

7.2.5.2 Surface conditions

There shall be no trace of protection product at the surface of the sheath.

The sheath shall not show continuous scratches, injuries or craters visible with a normal or corrected vision. Local discontinuities shall not be of a length greater than the maximum overall diameter of the protected and sheathed strand. The thickness of the sheath at a local discontinuity shall not fall below the specified minimum.

7.2.5.3 Mechanical properties

The specified values of mechanical properties of the sheath shall be the minimum specified value of tensile stress at yield, tensile strain at break at 23 °C, determined according to EN ISO 527-1 and EN ISO 527-2 on a specimen 1B with a testing speed of 100 mm/min ± 10 %, and shall meet the requirements specified in prEN 10369-2 or prEN 10369-3.

7.2.5.4 Stress cracking resistance

There shall be neither rupture nor cracking of the sheath, visible under a visual inspection by a person with a normal or corrected vision when tested according to ASTM D1693 in an aqueous solution with 1 % of nonylphenol poly(ethylene-oxy)ethanol.

7.2.5.5 Resistance to aggressive media

The values of the tensile stress at yield and tensile strain at break of the sheath at 23 °C, determined according to EN ISO 527-1 and EN ISO 527-2 on a specimen 1B with a testing speed of 100 mm/min ± 10 %, shall be greater than or equal to 75 % of those specified in prEN 10369-2 or prEN 10369-3, after an exposure of 16 weeks to each of the aggressive media as listed in Table 2.

Table 2 — List of typical aggressive media and test agents

Exposure to	Test agent
Mineral oil	Oil No 3 according to ISO 1817
Acid	10 % sulphuric acid
Base	Saturated calcium hydroxide 40 % sodium hydroxide
Solvents	Blend of acetone: ethanol: n-heptane: toluol, 1:1:1:1 by mass
Salt water	Saturated solution of demineralised tab water and NaCl

The change of the test piece volume after each test shall be lower than or equal to 5 %.