SLOVENSKI STANDARD
SIST EN 10244-1:2002

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Jeklena žica in žični izdelki - Neželezne kovinske prevleke na jekleni žici - 1. del: Splošna načela

Steel wire and wire products - Non-ferrous metallic coatings on steel wire - Part 1: General principles

Stahldraht und Drahterzeugnisse - Überzüge aus Nichteisenmetall auf Stahldraht - Teil 1: Allgemeine Regeln

Fils et produits tréfilés en acier - Revêtements métalliques non ferreux sur fils d'acier - Partie 1: Principes généraux

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ICS:

25.220.40	Kovinske prevleke	Metallic coatings
77.140.65	Jeklene žice, jeklene vrvi in verige	Steel wire, wire ropes and link chains

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EUROPEAN STANDARD

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English version

Steel wire and wire products - Non-ferrous metallic coatings on steel wire - Part 1: General principles

Fils et produits tréfilés en acier - Revêtements métalliques non ferreux sur fils d'acier - Partie 1: Principes généraux

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This European Standard was approved by CEN on 21 January 2001.

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 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 30 "Steel wires", the secretariat of which is held by BSI.

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 September 2001, and conflicting national standards shall be withdrawn at the latest by September 2001.

This European Standard for non-ferrous metallic coating on steel wire is made up of the following parts:

Part 1 : General principles

Part 2 : Zinc and zinc alloy coatings

Part 3 : Aluminium coatings

Part 4 : Tin coatings

Part 5 : Nickel coatings

Part 6 : Copper, bronze and brass coatings

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.

1 Scope

This part of this European standard specifies the requirements for the mass, other properties and testing of non-ferrous metal coatings on steel wire and steel wire products of circular or other cross-section.

This European standard deals with requirements of general application and is of use for those coatings for which no particular requirements have been laid down in the following parts (2 to 6). Deviations are possible, particularly if required for well-defined products. In such cases, appropriate requirements shall be part of the relevant product standard.

2 Normative reference

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 (including amendments).

EN 10021, *General technical delivery requirements for steel and iron products*

EN 10218-1, *Steel wire and wire products — General — Part 1: Test methods*

3 Term and definition

For the purposes of this European standard the following term and definition apply.

3.1
wire with non-ferrous metallic coating
wire to which a non-ferrous metallic coating has been applied. Depending on the metal, the coating may be obtained by dipping in a bath of molten metal, by conversion using a bath of metallic salts in solution, by extrusion, by cladding, by electroplating using an electrolytic solution or by other methods

4 Requirements relating to coating

4.1 Requirements for the specific type of metal and alloy

The type, quality and grade of coating metal or alloy shall be stated at the time of enquiry and order.

4.2 Coating mass

The coating mass shall be explicitly specified, preferably by reference to the appropriate product standard. If not the appropriate part of this standard shall apply.

The mass of the coating shall preferably be expressed as being the mass of coating per unit of surface area of bare wire (g/m^2). Other expressions may be accepted, such as the quantity of coating per unit of weight of coated wire or the thickness of coating. This last is generally expressed as being the minimum required thickness.

NOTE The thickness of the coating may be converted into an equivalent mass per unit of bare wire surface or vice versa on the basis of the specific mass of the coating material (see Table 1).

A coating of 1 micrometer (1µm) gives a diameter of 2 micrometer (2µm) greater.

Table 1 — Coating mass g/m^2 equivalent to a thickness of 1 micrometer(µm)

Metal or alloy	Mass of coating (g/m^2)
Al	2,69
Cu	8,96
Cu-Sn 91-09	8,56
Cu-Zn 63-37	8,47
Ni	8,85
Sn	7,28
Zn	7,14
Zn95Al5	6,58

4.3 Appearance of coating

The coating shall be reasonably smooth, as evenly distributed as industrially practicable and not show discontinuities such as bare patches, dross contamination, etc.

4.4 Special finishes

If the purchaser requires a special finish e.g. wax-coating; agreed upon at the time of enquiry and order or sets out additional requirements for the coating, these special details shall be agreed at the time of enquiry and order. The inspection methods shall be defined at the same time.

4.5 Adherence of coating

The adherence wrapping test shall be carried out in accordance with EN 10218-1 and the coating shall adhere to the steel below the coating. It shall not crack or split to such an extent that slivers of coating can be removed by simply rubbing with the fingers. The flaking or removal during testing of small particles resulting from mechanical polishing of the coating surface or by contact with the forming equipment shall not be considered to be a cause for rejection.

The wrapping test shall be carried out on wire with a nominal diameter of 7,5 mm or less. Unless otherwise specified, the relationship between the diameter of the coiling mandrel and the diameter of the wire shall be in accordance with 5.3.

In the case of a diameter greater than 7,5 mm, the wrapping test shall be replaced by a bending test in which the wire is bent to least 90° around the mandrel.

5 Test conditions

5.1 Selection of samples

5.1.1 The number and the basis for the selection of test pieces shall be defined in the product specification. In the absence of such a standard, the manufacturer and purchaser shall agree between them on the degree of sampling.

5.1.2 When taking the samples, care shall be taken to avoid damaging the surface. Parts of the wire which are visibly damaged shall not be used.

5.1.3 A test piece of a suitable length for the specified tests shall be taken from one or both ends of each coil selected for sampling.

5.2 Determination of mass of coating

5.2.1 Gravimetric method

5.2.1.1 General

The mass of coating shall be determined using a gravimetric method. The metallic coating on a surface of known area is dissolved in a suitable solution to remove the coating completely without attacking the surface of the steel wire. If necessary a suitable inhibitor is added to the solution. The resulting mass loss is determined by weighing the test piece before and after the coating has dissolved.

5.2.1.2 Procedure

If necessary the test piece shall be degreased using an organic solvent which does not attack the coating and the test piece shall then be dried.

Before stripping, the test piece shall be weighed with high accuracy – i.e. better than 1 % of the assumed mass of the coating. The test piece shall be immersed fully in the stripping solution at ambient temperature and left until the coating dissolves completely. A sufficient quantity of solution shall be used to limit any changes in the composition of the stripping solution.

After stripping, the test piece shall be rinsed under running water and, if necessary, brushed to remove any loose substances which may be adhering to the surface; it shall then be plunged into alcohol or any other appropriate solvent, rapidly dried and once again weighed to the accuracy stipulated above.

The surface area of the exposed surface shall then be determined to an accuracy of 1 % by measuring the dimensions of the test piece.

5.2.1.3 Calculation of the coating mass

For the calculation of the coating mass the following symbols are employed:

m_1 : The mass of the sample before chemical stripping expressed in grams

m_2 : The mass of the sample after chemical stripping expressed in grams

A : The coated surface of the sample in mm^2

l : The length of the sample in mm

d : The diameter of the chemically stripped wire (in case of round wire) in mm

Δm : Weight loss of the sample by the chemical stripping

m_A : The mass of coating in g/m^2

The mass of coating on the samples is:

$$\Delta m = m_1 - m_2$$

The mass of coating per unit surface area = $\frac{\Delta m}{A} g/mm^2$

expressed in g/m^2 - this becomes : $m_A = \frac{\Delta m \times 10^6}{A} g/m^2$ (1)

For round wire the surface area can be expressed as

$$A = \pi \times d \times l \quad (2)$$

$$m_2 = \frac{\pi d^2}{4} \times l \times 7{,}85 \times 10^{-3}$$

$$= (\pi \times d \times l)\, d \times 1{,}962 \times 10^{-3} \quad (3)$$

Combining (2) and (3) results in:

$$m_2 = A \times d \times 1{,}962 \times 10^{-3} g \quad (4)$$

$$\text{or } A = \frac{m_2}{1{,}962 \times d \times 10^{-3}} \quad (5)$$