



SLOVENSKI STANDARD
SIST EN 14436:2004

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Baker in bakrove zlitine – Elektrolizno pokositren trak

Copper and copper alloys - Electrolytically tinned strip

Kupfer und Kupferlegierungen - Elektrolytisch verzinnte Bänder

Cuivre et alliages de cuivre - Bandes étamées électrolytiquement

Ta slovenski standard je istoveten z: EN 14436:2004

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Copper and copper alloys - Electrolytically tinned strip

Cuivre et alliages de cuivre - Bandes étamées
électrolytiquement

Kupfer und Kupferlegierungen - Elektrolytisch verzinn
Bänder

This European Standard was approved by CEN on 27 May 2004.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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EN 14436:2004 (E)**Foreword**

This document (EN 14436:2004) has been prepared by Technical Committee CEN/TC 133 "Copper and copper alloys", 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of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.

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

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 2 "Rolled flat products" to prepare the following standard:

EN 14436, *Copper and copper alloys — Electrolytically tinned strip.*

This is one of a series of European Standards for copper and copper alloy rolled flat products. Other products are specified as follows:

EN 1172, *Copper and copper alloys — Sheet and strip for building purposes.*

EN 1652, *Copper and copper alloys — Plate, sheet, strip and circles for general purposes.*

EN 1653, *Copper and copper alloys — Plate, sheet and circles for boilers, pressure vessels and hot water storage units.*

EN 1654, *Copper and copper alloys — Strip for springs and connectors.*

EN 1758, *Copper and copper alloys — Strip for lead frames.*

EN 13148, *Copper and copper alloys — Hot-dip tinned strip.*

EN 13599, *Copper and copper alloys — Copper plate, sheet and strip for electrical purposes.*

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0 Introduction

0.1 General

This document covers the requirements relating to metallic strips coated with tin or an alloy of tin, using a continuously applied electrolytic process.

This type of process consists in subjecting the strips to different surface treatment operations in an installation through which they travel, starting from an unwinding system and generally finishing on a winding system.

Certain surface treatment operations may be chemical or thermal (degreasing, pickling, finishing, etc.), but the tin or tin alloy coating is achieved by cathodic electrolysis.

Strips coated using this method are generally intended to be cut and fashioned into individual pieces attached to a system of supporting or pre-assembled strips.

Tin or tin alloy coatings are mainly intended to protect the base metal against corrosion, to facilitate soldering operations, to improve insertion and withdrawal forces of connectors and to reduce contact resistance at electrical connections.

The tin or tin alloy is most often applied directly to the strip. However, in certain usage conditions (temperature higher than 120 °C, for example) the diffusion phenomena can be harmful (for example alteration of solderability). In such cases it is recommended that an appropriate sub-layer be interposed between the base metal and the final coating layer. This sub-layer is itself obtained by electrolysis.

The thickness of the coating and/or the sub-layer depends on the intensity of the electrolysis, as well as the conveying speed in the treatment installation and the lengths of baths.

Controlling these parameters enables the thickness of the coating and/or the sub-layer to be regulated with a precision in the order of several tenths of a micrometre. This thickness can be measured and regulated continuously during the production cycle.

Appropriate technology can be used, if necessary, to obtain different thicknesses of the coating and/or the sub-layer on each side of the strip and/or partial application of a coating and/or sub-layer.

Usually strips are tinned in larger widths and afterwards slit to narrower width specified by the customer. In this case, the final slit product has untinned edges.

0.2 Types of electrolytic tinning process and types of coatings of tin or tin alloy

0.2.1 Process for matt electrolytic coatings

Matt appearance coatings are obtained using baths which do not contain brightening agents. However, all matt coatings baths (except stannate-based baths) contain grain-refining agents or other additives which produce a matt appearance. These products are generally based on organic compounds.

0.2.2 Process for bright electrolytic coatings

Bright (reflective) appearance coatings are obtained using baths containing one or more appropriate brightening agents (brighteners). These products are generally based on organic compounds.

A proportion of this (these) brightener(s) is incorporated into the coating as it is formed. Its presence may prove undesirable with respect to subsequent melting or soldering operations (gas or blister formation on the coating, formation of a heterogeneous structure). It can, on the other hand, be beneficial with respect to friction properties (low-friction contacts).

EN 14436:2004 (E)**0.2.3 Process reflow brightened electrolytic coatings**

Reflow brightened coatings are obtained by heating a matt electrolytic coating above its fusion (melting) point for a few seconds, and then cooling it before contact with any element of the installation (guide element, transport element, etc.). The coatings remain bright after cooling.

During this operation, the temperature of the strip reaches levels very close to that of the fused coating.

Different techniques exist for heating the strip as it is in motion after the coating operation: through-type gas furnace, infra-red, induction heating, oil bath, ohmic effect, steam, etc.

In practice, on-strip reflow brightening is not used for coatings of thickness greater than 5 µm (risk of running), nor for coatings which are already bright.

NOTE Electrolytic tin coatings may be subject to spontaneous growth of metallic whiskers (combined effect of humidity and mechanical stress, for example). This phenomenon is highly undesirable for electrotechnical applications (risk of short-circuit). The risk of it occurring can be reduced by reflow brightening, using tin-lead alloy coatings or inserting an appropriate underlayer.

1 Scope

This document specifies:

- the composition and tolerances on dimensions in the thickness range from 0,1 mm up to and including 4 mm of strip of copper and copper alloys to be tinned with tin or a tin-lead alloy or other tin alloys;
- the composition of the material to be used for the coating;
- the properties of strip before tinning;
- the properties of the electrolytically tinned strip;
- the preferred thicknesses (mean values) and thickness ranges of coatings and their eventual sub-layers;
- the types of coating and sub-layer;
- the edgewise curvature of electrolytically tinned strip;
- the sampling procedure;
- the methods of test to be used for verification of conformity to the requirements of this standard;
- the delivery conditions.

2 Normative references

The following referenced documents are indispensable for the application 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 1655, *Copper and copper alloys — Declarations of conformity.*

EN 1976, *Copper and copper alloys — Cast unwrought copper products.*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of testing (at ambient temperature).*

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

EN ISO 2624, *Copper and copper alloys — Estimation of average grain size (ISO 2624:1990).*

EN ISO 2819, *Metallic coatings on metallic substrates — Electrodeposited and chemically deposited coatings — Review of methods available for testing adhesion (ISO 2819:1980).*

EN ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method (ISO 6507-1:1997).*

ISO 1811-2, *Copper and copper alloys — Selection and preparation of samples for chemical analysis — Part 2: Sampling of wrought products and castings.*

ISO 2093, *Electroplated coatings of tin — Specification and test methods.*

ISO 3497, *Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods.*

ISO 7587, *Electroplated coatings of tin-lead alloys — Specification and test methods.*

IEC 60068-2-20, *Environmental testing — Part 2: Test T: Soldering.*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

strip

flat rolled product of rectangular cross-section with uniform thickness manufactured in coils and supplied in as sheared coils or traverse wound coils, usually with slit edges. The thickness does not exceed one tenth of the width

3.2

electrolytically tinned strip

strip which is tinned with coatings on each face of equal thickness by drawing in an appropriate manner through an electrolytic bath

3.3

differentially electrolytically tinned strip

electrolytically tinned strip with coatings on each face of different thicknesses

3.4

partially electrolytically tinned strip

electrolytically tinned strip with coatings on one face or on both faces of equal thickness, but covering only part of the strip in the longitudinal direction

3.5

combined differentially and partially electrolytically tinned strip

combination of 3.3 and 3.4

3.6

base material (of a tinned strip)

that part of the strip which, after the tinning process, does not belong to the metallic coating or in the case of reflow brightened electrolytically tinned strip, that part of the strip which belongs neither to the metallic coating nor to an intermetallic phase and diffusion zone

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4 Designations

4.1 Material of the strip to be tinned

4.1.1 General

The material is designated either by symbol or number (see Tables 1 and 2).

4.1.2 Symbol

The material symbol designation is based on the designation system given in ISO 1190-1.

NOTE Although material symbol designations used in this standard might be the same as those in other standards using the designation system given in ISO 1190-1, the detailed composition requirements are not necessarily the same.

4.1.3 Number

The material number designation is in accordance with the system given in EN 1412.

4.2 Material for the coating

The coating is designated by the coating type (see Table 3) or, for non-standardized coatings, by the supplier's designation.

4.3 Material condition of the electrolytically tinned strip

For the purposes of this standard, the following designations, which are in accordance with the system given in EN 1173, apply to the electrolytically tinned strip but are actually the material condition designations of the strip before tinning:

- R... Material condition designated by the minimum value of tensile strength requirement for the product with mandatory tensile strength and elongation requirements;
- H... Material condition designated by the minimum value of hardness requirement for the product with mandatory hardness requirements;
- G... Material condition designated by the mid-range value of grain size requirement for the product with mandatory grain size and hardness requirements.

Exact conversion between material conditions designated R..., H... and G... is not possible.

Material condition is designated by only one of the above designations.

4.4 Product

The product designation provides a standardized pattern of designation from which a rapid and unequivocal description of a product is conveyed in communication. It provides mutual comprehension at the international level with regard to products which meet the requirements of the relevant European Standard.

The product designation is no substitute for the full content of the standard.

The product designation for products to this standard shall consist of:

- denomination (electrolytically tinned strip, differentially electrolytically tinned strip, Partially electrolytically tinned strip or combined differentially and partially electrolytically tinned strip);

- number of this European Standard (EN 14436);
- material designation of the strip to be tinned, either symbol or number (see Tables 1 and 2);
- material condition designation of the electrolytically tinned strip (see Table 4);
- nominal dimensions of the strip before tinning (thickness x width);
- tolerance class for the thickness of the strip before tinning (see Table 7);
- sub-layer type, if applicable, Cu or Ni (see Table 6, or ISO 2093, or ISO 7587) or, for non-standardized materials for sub-layers, the supplier's designation;
- recommended thickness of the sub-layer (see Table 6);
- coating type, Snb, Snm, Snf, Sn60Pb, Sn90Pb or Sn95Pb (see Table 3) or for non-standardized coatings the supplier's designation;
- for electrolytically tinned strip, the preferred thickness of the coating (see Table 5);
- for differentially electrolytically tinned strip, the preferred thicknesses of the coating on each face (see Table 5), which shall be identified by marking one face A and the other B;
- for partially or combined differentially and partially electrolytically tinned strip, the number of a dimensioned drawing including the preferred thicknesses of the coating (see Table 5).

The derivation of a product designation is shown in the following example.

EXAMPLE Electrolytically tinned strip conforming to this standard, in material of the strip to be tinned designated either CuZn30 or CW505L, in material condition H150, nominal thickness 0,50 mm, tolerance class A, nominal width 200,00 mm, Cu sub-layer of thickness less than or equal to 1 µm, coating type Sn reflow brightened of thickness from 2 µm to 4 µm, shall be designated as follows:

**Elektrolytically
tinned strip**

EN 14436 — CuZn30 — H150 — 0,50A × 200,00 — Cu1 — Snf2

or

**Elektrolytically
tinned strip**

EN 14436 — CW505L — H150 — 0,50A × 200,00 — Cu1 — Snf2

Denomination

Number of this European Standard

Material designation of the strip to be tinned

Material condition designation

Nominal dimensions in millimetres and tolerance class for thickness

Material designation of the sub-layer and thickness of the sub-layer in micrometres

Material designation of the coating and thickness of the coating in micrometres

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5 Ordering information

In order to facilitate the enquiry, order and confirmation of order procedures between the purchaser and the supplier, the purchaser shall state on his enquiry and order the following information:

- a) quantity of product required (mass);
- b) denomination (electrolytically tinned strip, differentially electrolytically tinned strip, Partially electrolytically tinned strip or combined differentially and partially electrolytically tinned strip);
- c) number of this European Standard (EN 14436);
- d) material designation of the strip to be tinned (see Tables 1 and 2);
- e) material condition designation of the electrolytically tinned strip (see 4.3 and Table 4);
- f) nominal thickness of the strip before tinning. If nominal thickness of the tinned strip is required, it shall be subject to agreement between the purchaser and the supplier;
- g) tolerance class for the thickness of the strip before tinning (see Table 7);
- h) nominal width of the electrolytically tinned strip;
- i) sub-layer type, (see Table 6) and, if not to be left to the discretion of the supplier, the purity and/or for non-standardized materials for sub-layers, the supplier's designation;
- j) sub-layer thickness (see Table 6);
- k) coating type (see Table 3), or, for non-standardized coatings, the supplier's designation;
- l) thickness of the coating (see Table 5):
 - electrolytically tinned strip (see 3.2): thickness of the coating (see Table 5);
 - differentially electrolytically tinned strip (see 3.3): thickness of the coating (see Table 5) of each face;
 - partially, or combined differentially and partially electrolytically tinned strip (see 3.4 and 3.5): the number of a fully dimensioned and toleranced drawing which shall accompany the order.

NOTE 1 It is recommended that the product designation as described in 4.4 is used for items b) to l).

In addition, the purchaser shall also state on the enquiry and order any of the following, if required:

- m) whether tinned edges are required (see 6.3.2) and if so, tolerances on width shall be agreed between the purchaser and the supplier;
- n) whether longitudinal thickness variation of sub-layer or coating is required (see 6.3.3.1);
- o) whether the strip shall meet edgewise curvature requirements (see 6.4 and Table 9);
- p) whether requirements for solderability shall be met (see 6.5.3) and if so, the acceptance criteria shall be agreed between the purchaser and the supplier;
- q) whether special requirements for adhesion of the coating shall be met (see 6.5.4) and if so, the acceptance criteria shall be agreed between the purchaser and the supplier;
- r) whether special requirements for appearance of the surface shall be met (bright, matt) or other requirements (for example, coefficient of friction) (see 6.5.5);
- s) whether coating thickness shall be measured other than along the longitudinal axis of the strip (see 8.8);

- t) coil size requirements: nominal inside diameter in millimetres and maximum outside diameter in millimetres and either maximum mass in kilograms or approximate specific coil mass (mass per width) in kilogram per millimetre;
- u) spool size: type or dimensions;
- v) whether a declaration of conformity is required (see 9.1);
- w) whether an inspection document is required, and if so, which type (see 9.2);
- x) whether there are any special requirements for marking, packaging or labelling (see clause 10).

NOTE 2 To facilitate recycling it is recommended to use material type Sn for the coating.

EXAMPLE Ordering details for 1 200 kg electrolytically tinned strip conforming to EN 14436, in material of the strip to be tinned designated either CuZn37 or CW508L, in material condition R480, nominal thickness 0,40 mm, tolerance class C, nominal width 160,00 mm, coating type Sn bright, thickness of the coating from 3 µm to 6 µm, untinned edges, nominal inside diameter of coil 400 mm, maximum outside diameter of coil 950 mm, approximate specific coil mass (mass per width) 4,5 kg/mm:

1 200 kg electrolytically tinned strip EN 14436 — CuZn37 — R480 — 0,40C x 160,00 — Snb — 3 to 6
 — nominal inside diameter of coil 400 mm
 — maximum outside diameter of coil 950 mm
 — approximate specific coil mass 4,5 kg/mm

or

1 200 kg electrolytically tinned strip EN 14436 — CW508L — R480 — 0,40C x 160,00 — Snb — 3 to 6
 — nominal inside diameter of coil 400 mm
 — maximum outside diameter of coil 950 mm
 — approximate specific coil mass 4,5 kg/mm

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6 Requirements

6.1 Composition

6.1.1 Strip to be tinned

The composition of the strip shall conform to the requirements for the appropriate material given in Tables 1 and 2.

Percentage content of the elements shown as "remainder" (Rem.) is usually calculated by difference from 100 %.

6.1.2 Material for the coating

Unless otherwise specified, the composition of the material for the coating shall conform to the requirements for the appropriate material given in Table 3. Other material for the coating shall conform to the requirements agreed between the purchaser and the supplier [see 5 k)].

6.1.3 Purity of tin and tin alloy coatings resulting from electrolysis

The compositions of tin and tin alloys applied shall be in accordance with Table 3.

If the coating operation is followed by a thermal treatment, purity and composition may be modified with respect to the values given in Table 3. This modification is deliberate in certain applications, for example, where special friction forces are demanded.