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**Koppar och kopparlegeringar – Elektrolytiskt  
förtenta band**

**Copper and copper alloys – Electrolytically  
tinned strip**

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## Copper and copper alloys - Electrolytically tinned strip

Cuivre et alliages de cuivre - Bandes étamées  
électrolytiquement

Kupfer und Kupferlegierungen - Elektrolytisch verzinnnte  
Bänder

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

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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of an identical text or by endorsement, at the latest by February 2005, and conflicting national standards shall be withdrawn at the latest by February 2005.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.*

## 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).

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### 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

