



SLOVENSKI STANDARD
SIST EN 13148:2004

01-januar-2004

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Copper and copper alloys - Hot-dip tinned strip

Kupfer und Kupferlegierungen - Feuerverzinnte Bänder

Cuivres et alliages de cuivre - Bandes étamées a chaud

Ta slovenski standard je istoveten z: EN 13148:2001

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ICS:

77.150.30 Bakreni izdelki Copper products

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EUROPEAN STANDARD

EN 13148

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2001

ICS 77.150.30

English version

Copper and copper alloys - Hot-dip tinned strip

Cuivres et alliages de cuivre - Bandes étamées à chaud

Kupfer und Kupferlegierungen - Feuerverzinnte Bänder

This European Standard was approved by CEN on 11 August 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.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by April 2002, and conflicting national standards shall be withdrawn at the latest by April 2002.

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

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

This is one of a series of European Standards for copper and copper alloy rolled flat products. Other products are, or will be, 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.*

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

WI: 00133106 ¹⁾, *Copper and copper alloys — Electrolytically tinned strip.*

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.

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¹⁾ In course of preparation.

Introduction

Hot-dip tinned strip is manufactured by passing strip through a molten bath of tin, tin-lead alloy or other tin alloys. By this process a solid bond is created between the metallic coating and the strip by formation of an intermetallic layer.

The base metal is hot-dip tinned to protect it against corrosion, to facilitate soldering operations, to improve insertion and withdrawal forces of connectors, to reduce contact resistance at electrical junctions and to avoid whisker growth on components. The properties of coatings can be modified by mechanical and/or thermal treatments.

When the strip is emerging from the bath the thickness of the coating is adjusted by partially wiping off the molten film, either by stationary wiping devices or by a flat air jet. The thickness of the coating can be continuously measured and regulated on both sides of the strip during or after the tinning process. Usually strips are tinned in larger widths and slit to narrower width specified by the customer. In this case, the final slit product has untinned edges.

1 Scope

This European Standard specifies:

- the composition and tolerances on dimensions of strip in the thickness range from 0,10 mm up to and including 1,50 mm of copper and copper alloys to be tinned, with tin, a tin-lead alloy or other tin alloys;
- the composition of material normally used for the melt;
- the properties of strip before tinning;
- the properties of hot-dip tinned strip;
- the preferred thicknesses (mean values) and thickness ranges of coatings;
- the edgewise curvature of hot-dip 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

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 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 test 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 7438:2000, *Metallic materials — Bend test (ISO 7438:1985).*

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

NOTE Informative references to documents used in the preparation of this standard, and cited at the appropriate places in the text, are listed in the bibliography.

3 Terms and definitions

For the purposes of this standard, 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 hot-dip tinned strip

strip which is tinned with coatings on each face of equal thickness by drawing in an appropriate manner through a bath of any molten tin or tin-lead alloy or other tin alloy

3.3 differentially hot-dip tinned strip

hot-dip tinned strip with coatings on each face of different thicknesses

3.4 partially hot-dip tinned strip

hot-dip tinned strip with coatings on each face of equal thickness, but covering only part of the strip in the longitudinal direction

3.5 base material (of a tinned strip)

that part of the strip which, after the tinning process, 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.

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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.

NOTE Due to solution and/or diffusion processes the composition of the coating can differ from that of the melt.

4.3 Material condition of the hot-dip 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 hot-dip 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.

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4.4 Product

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

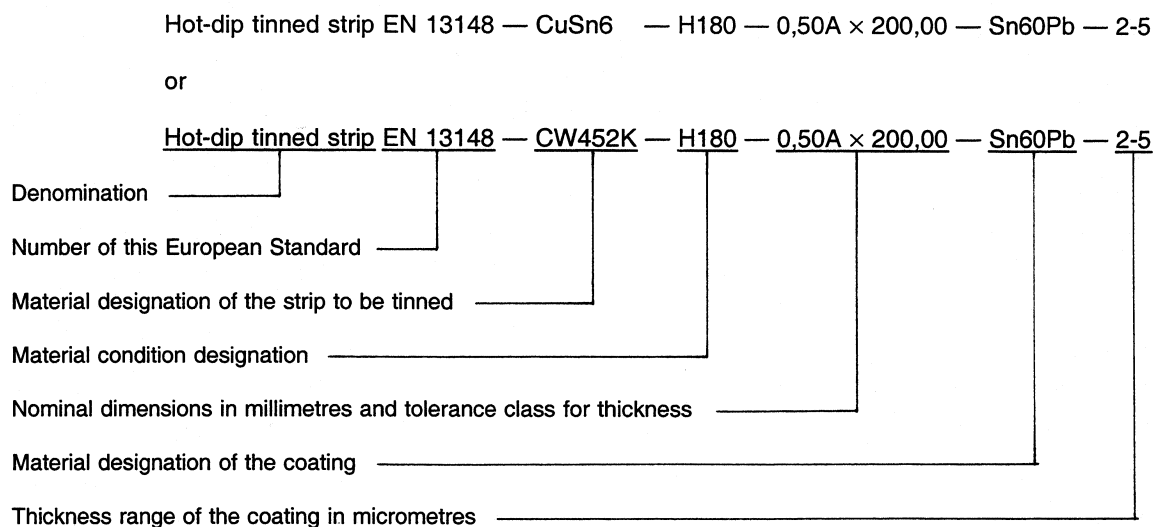
The product designation is no substitute for the full content of the standard.

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

- denomination (Hot-dip tinned strip or Differentially hot-dip tinned strip or Partially hot-dip tinned strip);
- number of this European Standard (EN 13148);
- material designation of the strip to be tinned, either symbol or number (see Tables 1 and 2);
- material condition designation of the hot-dip 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 6);
- coating type, Sn or Sn60Pb (see Table 3) or for non-standardized coatings the supplier's designation;
- for hot-dip tinned strip, the preferred thickness or thickness range of the coating (see Table 5);
- for differentially hot-dip tinned strip, the preferred thicknesses or the thickness ranges of the coatings on each face (see Table 5), which shall be identified by marking one face A and the other B;
- for partially hot-dip tinned strip, the number of a dimensioned drawing including the preferred thicknesses or the thickness ranges of the coating (see Table 5).

The derivation of a product designation is shown in the following examples:

EXAMPLE 1 Hot-dip tinned strip conforming to this standard, in material of the strip to be tinned designated either CuSn6 or CW452K, in material condition H180, nominal thickness 0,50 mm, tolerance class A, nominal width 200,00 mm, coating type Sn60Pb, thickness range 2 µm to 5 µm, shall be designated as follows:

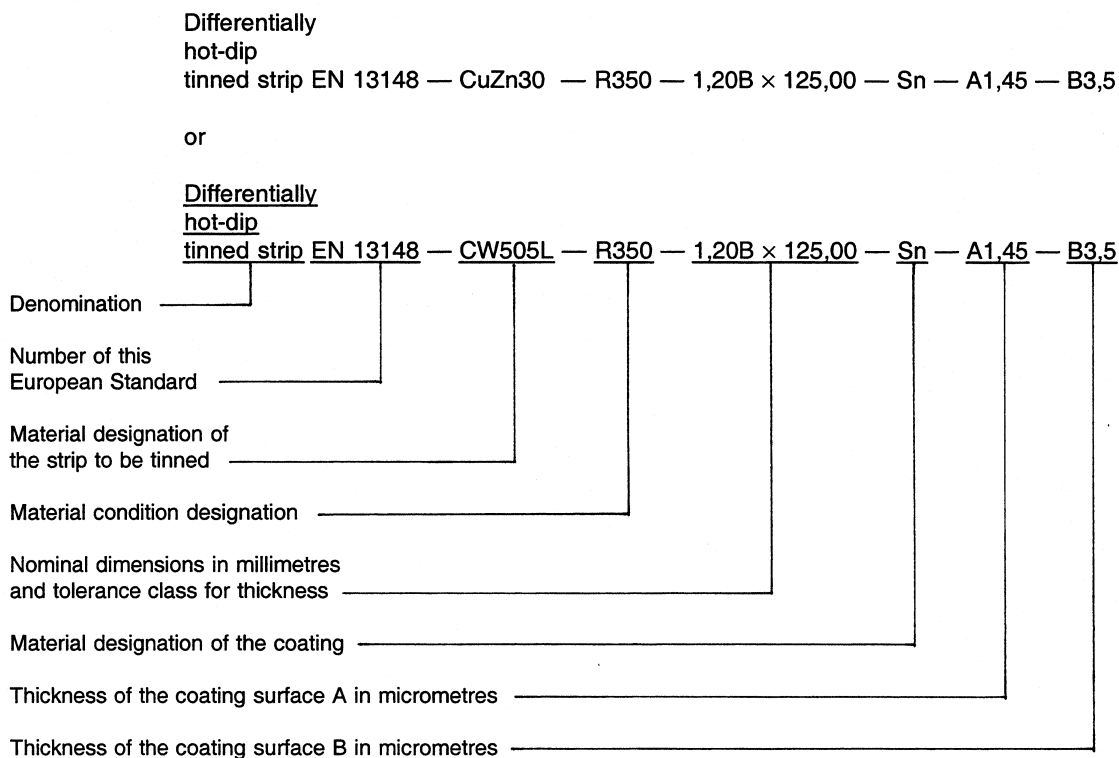


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EXAMPLE 2 Differentially hot-dip tinned strip conforming to this standard, in material of the strip to be tinned designated either CuZn30 or CW505L, in material condition R350, nominal thickness 1,20 mm, tolerance class B, nominal width 125,00 mm, coating type Sn, thickness (mean value) surface A 1,45 µm, thickness (mean value) surface B 3,5 µm, shall be designated as follows:

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EXAMPLE 3 Partially hot-dip tinned strip, conforming to this standard, in material of the strip to be tinned designated either CuSn4 or CW450K, in material condition R610, nominal thickness 0,60 mm, tolerance class A, nominal width 54,00 mm, coating type Sn60Pb, drawing number W38501, shall be designated as follows:

Partially
hot-dip
tinned strip EN 13148 — CuSn4 — R610 — 0,60A × 54,00 — Sn60Pb — W38501

or

Partially
hot-dip
tinned strip EN 13148 — CW450K — R610 — 0,60A × 54,00 — Sn60Pb — W38501

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 (Hot-dip tinned strip or Differentially hot-dip tinned strip or Partially hot-dip tinned strip);
- c) number of this European Standard (EN 13148);
- d) material designation of the strip to be tinned (see Tables 1 and 2);
- e) material condition designation of the hot-dip 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 6);
- h) nominal width of the hot-dip tinned strip;
- i) coating type, e.g. Sn or Sn60Pb (see Table 3) or for non-standardized coatings the supplier's designation;
- j) thickness of the coating:
 - hot-dip tinned strip (see 3.2): mean value of coating thickness or thickness range (see Table 5);
 - differentially hot-dip tinned strip (see 3.3): mean value of coating thickness or thickness range (see Table 5) of each face, identified A and B, and the positions of those faces relative to the coil or spool;
 - partially hot-dip tinned strip (see 3.4): the number of a fully dimensioned and toleranced drawing which shall accompany the order;

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

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

- k) whether tinned edges are required (see 6.3.2) and if so, tolerances on width shall be agreed between the purchaser and the supplier;
- l) whether the strip shall meet edgewise curvature requirements (see 6.4 and Table 8);
- m) whether special requirements for appearance of the surface shall be met (bright, dull) (see 6.5.2);
- n) 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;

- o) 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;
- p) 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;
- q) spool size: type or dimensions;
- r) whether a declaration of conformity is required (see 9.1);
- s) whether an inspection document is required, and if so, which type (see 9.2);
- t) whether there are any special requirements for marking, packaging or labelling (see clause 10).

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

EXAMPLE Ordering details for 1 200 kg hot-dip tinned strip conforming to EN 13148, 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, mean value of thickness of the coating 1,45 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 Hot-dip tinned strip EN 13148 — CuZn37 — R480 — 0,40C × 160,00 — Sn — 1,45
 — 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 Hot-dip tinned strip EN 13148 — CW508L — R480 — 0,40C × 160,00 — Sn — 1,45
 — 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

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6.1 Composition

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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 i)].

6.2 Mechanical properties and grain size of the base material

The mechanical properties and the grain size, if required, shall conform to the appropriate requirements given in Table 4. The tests shall be carried out in accordance with 8.2 to 8.4.

6.3 Dimensions and tolerances

6.3.1 Tolerances on thickness

The thickness of strip before tinning shall conform to the appropriate tolerances given in Table 6. The thickness of tinned strip shall conform to the appropriate combination of tolerances for the thickness of the strip given in Table 6 and the thickness range of the coatings ordered, for both faces, given in Table 5.

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NOTE The minimum thickness of the tinned strip is equal to the minimum thickness of the strip before tinning plus the minimum thickness of the coating on each face. The maximum thickness of the tinned strip is equal to the maximum thickness of the strip before tinning plus the maximum thickness of the coating on each face.

For partially hot-dip tinned strip it can be the case that in the non-coated parts max. 0,03 mm of the base material is removed.

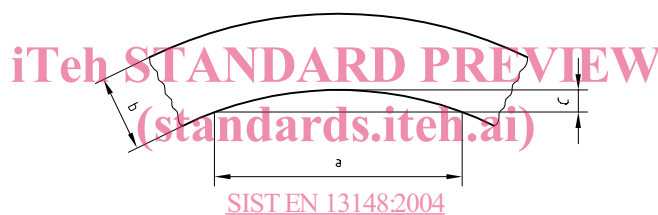
6.3.2 Tolerances on widths

Generally the edges of a supplied strip are not tinned, because a strip is normally tinned in a larger width and slit to the ordered width after hot-dip tinning. In this case the same tolerances as for strip before tinning shall apply as given in Table 7. When strip with coated edges is ordered, the tolerance on width shall be agreed between the purchaser and the supplier.

6.4 Edgewise curvature c

For the straightness of the longitudinal edge, which unless otherwise agreed between the purchaser and the supplier shall be based on a measuring length of 1 000 mm, the edgewise curvature c (see Figure 1) shall not exceed the values given in Table 8.

If the purchaser and the supplier agree on a measuring length of 2 000 mm, the edgewise curvature c shall not exceed the values given in Table 8 multiplied by 4.



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Key

- a measuring length
- b strip width
- c edgewise curvature

Figure 1 — Edgewise curvature c

6.5 Properties of the coating

6.5.1 Condition

The products shall be clean and free from injurious defects which shall be specified by agreement between the purchaser and the supplier at the time of enquiry and order. A thin film of lubricant or interleaved paper may be present to avoid surface damage.

6.5.2 Appearance

The appearance depends on the cooling condition of the liquid film, the coating type and the technique used to remove the excess molten metal. The appearance of the surface may be either bright or dull or a combination of both. The appearance of the coating does not affect the suitability of the coating. If there are special requirements for appearance of the coating, they shall be agreed between the purchaser and the supplier.

6.5.3 Solderability

If solderability is required, the acceptance criteria shall be agreed between the purchaser and the supplier. The test shall be carried out in accordance with annex A.

6.5.4 Adhesion

If verification of the coating adhesion is required, the acceptance criteria shall be agreed between the purchaser and the supplier. The tests shall be carried out in accordance with 8.7.

7 Sampling

7.1 General

When required (e.g. if necessary in accordance with specified procedures of a supplier's quality system, or when the purchaser requests inspection documents with test results, or for use in cases of dispute), an inspection lot shall be sampled in accordance with 7.2 and 7.3.

7.2 Analysis of the base material

The sampling rate shall be in accordance with ISO 1811-2. A test sample, depending on the analytical technique to be employed, shall be prepared from each sampling unit and used for the determination of the composition.

NOTE 1 When preparing the test sample, care should be taken to avoid contaminating or overheating the test sample. Carbide tipped tools are recommended; steel tools, if used, should be made of magnetic material to assist in the subsequent removal of extraneous iron. If the test samples are in finely divided form (e.g. drillings, millings), they should be treated carefully with a strong magnet to remove any particles of iron introduced during preparation.

NOTE 2 In cases of dispute concerning the results of analysis, the full procedure given in ISO 1811-2 should be followed.

NOTE 3 Results may be used from analyses carried out at an earlier stage of manufacturing the product, e.g. at the casting or master coil stage, if the material identity is maintained and if the quality system of the manufacturer is certified as conforming to EN ISO 9001 or equivalent.

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7.3 Tensile, hardness, grain size and technological tests

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The sampling rate shall be one test sample per master coil. Sampling units shall be selected from the hot-dip tinned products. The test samples shall be cut from the sampling units. Test samples, and test pieces prepared from them, shall not be subjected to any further treatment, other than any machining operations necessary in the preparation of the test pieces, except in the case of tensile or hardness tests when the coating and any intermetallic layers shall be removed without deleteriously affecting the base material, e.g. etching is recommended.

8 Test methods

8.1 Analysis of the base material

Analysis shall be carried out on the test pieces, or test portions, prepared from the test samples obtained in accordance with 7.2. Except in cases of dispute, the analytical methods used shall be at the discretion of the supplier. For expression of results, the rounding rules given in 8.10 shall be used.

NOTE In cases of dispute concerning the results of analysis, the methods of analysis to be used should be in accordance with the appropriate ISO standards.

8.2 Tensile test of the base material

The tensile properties shall be determined in accordance with EN 10002-1 on the test pieces prepared from the test samples obtained in accordance with 7.3.

8.3 Hardness test of the base material

The Vickers hardness shall be determined in accordance with EN ISO 6507-1 using a suitable test force selected from those given, on the test pieces prepared from the test samples obtained in accordance with 7.3.