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Cold-reduced electrolytic tinfoil

Fer-blanc électrolytique laminé à froid

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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Cold-reduced electrolytic tinplate

1 Scope

This International Standard specifies requirements for single and double cold-reduced low-carbon mild steel electrolytic tinplate in the form of sheets or coils.

In general, single cold-reduced tinplate is specified in nominal thicknesses that are multiples of 0,005 mm, from 0,15 mm up to and including 0,60mm. Double cold-reduced tinplate is specified in nominal thicknesses that are multiples of 0,005 mm, from 0,10 mm up to and including 0,36mm.

This International Standard applies to coils and sheets cut from coils in nominal minimum rolling widths of 600 mm¹⁾.

In addition, the general technical delivery requirements of ISO 404 are applicable.

2 Normative references

The following referenced documents are indispensable for the application of this International Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 404, *Steel and steel products – General technical delivery condition*

ISO 4288, *Geometrical Product Specifications (GPS) – Surface texture : Profile method – Rule and procedures for the assessment of surface texture*

ISO 6508-1:2005, *Metallic materials – Rockwell hardness test – Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*.

ISO 6892-1:2009, *Metallic materials – Tensile testing – Part 1: Method of test at room temperature*.

ISO/TR 9769, *Steel and iron – Review of available methods of analysis*

ISO 10474, *Steel and steel products – Inspection documents*

ISO 11951, *Cold-reduced blackplate in coil form for the production of electrolytic tinplate or electrolytic chromium / chromium oxide-coated steel*

3 Definitions

For the purposes of this International Standard, the following definitions apply:

1) Nominal minimum rolling widths of 500 mm may be applied by agreement between the purchaser and the manufacturer.

3.1

blackplate

cold-reduced low-carbon mild steel, applied for manufacturing electrolytic tinplate (refer to ISO 11951)

3.2

electrolytic tinplate

cold-reduced low-carbon steel sheet or coil coated on both surfaces with tin that is applied in continuous electrolytic operation.

3.3

differentially coated electrolytic tinplate

cold-reduced electrolytic tinplate, one surface of which carries a heavier tin coating than the other.

3.4

single cold-reduced

term used to describe those products in which the blackplate has been reduced to the desired thickness in a cold-reduction mill and subsequently annealed and temper rolled.

3.5

double cold-reduced

term used to describe those products in which the blackplate has had a second major reduction after annealing.

3.6

standard grade tinplate sheet

material in sheet form which is the product of line inspection. It is suitable, under normal conditions of storage, for established lacquering and printing over the entire sheet and is:

- a) free from surface imperfections which render the material unsuitable for the intended use;
- b) free from damage which render the material unsuitable for the intended use;
- c) compliant to the requirements as specified in this International Standard.

3.7

batch annealed; box annealed (BA)

annealed by the process in which the cold-reduced strip is annealed in coil form, within a protective atmosphere, for a predetermined time-temperature cycle.

3.8

continuously annealed (CA)

annealed by the process in which cold-reduced coils are unwound and annealed in strip form within a protective atmosphere.

3.9

finish

surface appearance of tinplate, determined by the surface roughness (R_a) of the steel base together with the conditioning of the tin coating which can be either flow-melted or unflow-melted.

3.9.1

bright finish

finish resulting from the use of temper-mill work rolls that have been ground to a low roughness together with a flow-melted tin coating.

3.9.2

stone finish

finish on flow-melted tinplate characterized by a directional pattern, resulting from the use of final-mill work rolls that have been ground to a higher level of roughness than those used for the smooth finish, together with a flow-melted tin coating.

3.9.3**silver finish**

finish resulting from the use of temper-mill work rolls with dull surface textured by Shot Blast, EDT(Electro Discharge Texturing), EBT (Electron Beam Texturing) and so on, together with a flow-melted tin coating.

3.9.4**matt finish**

finish resulting from the use of temper-mill work rolls with dull surface textured by Shot Blast, EDT(Electro Discharge Texturing), EBT (Electron Beam Texturing) and so on, together with an unflow-melted tin coating.

3.10**coil**

rolled flat strip product which is wound into regularly superimposed laps so as to form a coil with almost flat sides.

3.11**longitudinal bow; line bow**

residual curvature in the strip remaining along the direction of rolling.

3.12**transverse bow; cross bow**

mode of curvature in the sheet such that the distance between its edges parallel to the direction of rolling is less than the sheet width.

3.13**centre fullness; centre buckle, full centre**

intermittent vertical displacement or wave in the strip occurring other than at the edges (see Figure 8).

3.14**edge wave**

intermittent vertical displacement occurring at the strip edge when the strip is laid on a flat surface.

3.15**feather edge; transverse thickness profile**

variation in thickness, characterized by a reduction in thickness close to the edges, at right angles to the direction of rolling.

3.16**Edge camber**

deviation of edge of coil from a straight line forming its chord.

3.17**burr**

metal displaced beyond the plane of the surface of the strip by shearing action.

3.18**rolling width**

width of the rolled strip perpendicular to the direction of rolling.

3.19**pallet**

base platform on which a coil is placed to facilitate ready transportation.

3.20**stillage platform**

base platform on which sheets are stacked to facilitate packing and ready transportation.

3.21

consignment

quantity of material of the same specification made available for dispatch at the same time.

3.22

bulk package; bulk

packaging unit comprising a stillage platform, the sheets and packaging material.

3.23

line inspection

final inspection of the finished product performed by instruments and/or visual examination at normal production-line speeds.

3.24

anvil effect

effect which a hard anvil can produce on the numerical hardness value obtained when a hardness test is performed on very thin sheet supported on such an anvil.

4 Classification

Steel grades for this International Standard are generally classified as non-alloy quality steels.

5 Information to be supplied by the purchaser

5.1 Designation

For the purposes of this International Standard, tinplate is designated in terms of a steel grade classification based either on the Rockwell HR30Tm hardness values or on the tensile properties. For the hardness requirement, the steel grade designations are given in Table A.1 for single cold-reduced tinplate and in Table A.2 for double cold-reduced tinplate. For the tensile properties requirement, the steel grade designations are given in Table B.1.

Tinplate covered by this International Standard shall be designated by the following characteristics in the given sequence:

- a) the number of this International Standard;
- b) the steel grade designation in accordance with Table A.1, Table A.2 or Table B.1;
- c) the type of annealing used by the manufacturer (see 6.2);
- d) the type of finish (see 6.3);
- e) the coating masses and their combinations, D or S (for differentially coated), together with numbers representing the nominal coating mass on each surface (see clause 11);
- f) the dimensions, in millimetres:
 - for coils, thickness x width;
 - for sheets, thickness x width x length.

NOTE 1 By agreement, the symbol " x C" after width may be designated for coils.

NOTE 2 By agreement, the symbol "w" may be designated after number of width to show the rolling width.

EXAMPLE

Single cold-reduced tinplate sheet, in accordance with this International Standard, steel grade T61, continuously annealed (CA), stone finish, equally coated with a coating mass of 2,8 g/m², with a thickness of 0,22 mm, a width of 800 mm and a length of 900 mm shall be designated:

ISO 11949 – T61 - CA - stone - 2,8/2,8 - 0,22 x 800 x 900

Double cold-reduced tinplate coil, in accordance with this International Standard, steel grade T75, continuously annealed (CA), stone finish, differentially coated with coating masses of 8,4 g/m² and 5,6 g/m², with marking on 5.6 g/m² side, with a thickness of 0,18 mm and a width of 750 mm shall be designated:

ISO 11949 – T75 - CA - stone - 8,4/D5,6 - 0,18 x 750

Tinplate coil, in accordance with this International Standard, steel grade TH415, continuously annealed (CA), stone finish (ST), differentially coated with a coating mass of 2,8 g/m² and 5,6 g/m², with marking on 5.6 g/m² side, with a thickness of 0,20 mm, a width of 750 mm shall be designated:

ISO 11949 - TH415 - CA - ST - 2,8/D5,6 - 0,20 x 750 x C

Tinplate sheet, in accordance with this International Standard, steel grade TS520, batch annealed (BA), differentially coated with coating masses of 5,6 g/m² and 8,4 g/m², with single line marked on 5.6 g/m² side, with a thickness of 0,14 mm, a rolling width of 844 mm and a length of 755 mm shall be designated:

ISO11949 – TS520 - BA - stone - S5,6/8,4 – 0,14 x 844w x 755

5.2 Mandatory information

The following information shall be given in the enquiry and order to assist the manufacturer in supplying the correct material:

- a) the designation as given in 5.1;
- b) the quantity, expressed on an area or mass basis;
- c) marking requirements for differentially coated tinplate (see clause 11);
- d) end use;
- e) any further special requirements.

NOTE Appropriate classifications are suitable for shaping operations such as stamping, drawing, folding, beading and bending, and assembly work such as joint forming, soldering and welding. The end use should be borne in mind when the steel grade is selected.

5.3 Options

In addition to the information in 5.2, the purchaser may wish to provide further information to the manufacturer to ensure that the order requirements are consistent with the end use of the product.

The purchaser shall inform the manufacturer of any modifications to his fabrication operations that will significantly affect the way in which the tinplate is used.

NOTE When ordering double cold-reduced tinplate, the purpose of manufacture for which the material is intended should be stated. It should be noted that double cold-reduced tinplate is relatively less ductile than single cold-reduced tinplate and has very distinct directional properties, so for some uses, for example for built-up can bodies, the direction of rolling should be stated. When double cold-reduced tinplate is used for built-up can bodies, the direction of rolling should be around the circumference of the can so as to minimize the hazard of flange cracking.

6 Manufacturing features

6.1 Manufacture

Continuously cast, fully-killed steel is applied except when otherwise specified. The examples of the steel types of tinfoil are shown in Annex C.

The steel type of tinfoil shall be designed to secure food safety if tinfoil is used for food application. The purchasers should be aware of existing national regulations which may impose limitations on some elements.

The purity of tin used to produce the coating shall be not less than 99,85 %(mass fraction).

The methods of manufacture of tinfoil are the province of the manufacturer and are not specified in this International Standard.

6.2 Annealing

Annealing of tinfoil shall be either batch annealing (BA) or continuous annealing(CA), and shall be specified by the purchaser at the time of enquiry and order.

6.3 Finish

Tinfoil is usually available in the finishes as indicated in Table 1.

Table 1 — Typical finishes for tinfoil

Tinfoil finish	Code ^{a)}	Blackplate		Flow-melted
		finish	Surface roughness ^{b)} <i>Ra</i> µm	
Bright	BT	Smooth	≤0,35	Yes
Fine stone	FS	Fine stone	0,25 – 0,45	Yes
Stone	ST	Stone	0,35 – 0,60	Yes
Silver	AM	Matt	≥ 0,90	Yes
Matt	MM	Matt		No

^{a)} By agreement between the purchaser and the manufacture, another code system may be applied.

^{b)} Values of surface roughness in this table are not normative. The values are reference to classify the finishes.

NOTE 1 The appearance is governed by

- a) the surface characteristics of the blackplate principally result from controlled preparation of the work rolls used during the final stages of temper rolling;
- b) the mass of the coating applied;
- c) whether the tin layer is flow-melted or unflow-melted.

NOTE 2 Double cold-reduced tinfoil is usually supplied with a stone finish and a flow-melted tin coating.

NOTE 3 For guidance on the measurement of surface roughness, refer to ISO 4288.