
**Cold-reduced tinmill products —
Electrolytic chromium/chromium
oxide-coated steel**

Aciers pour emballage laminés à froid — Fer chromé électrolytique

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 9, *Tinplate and blackplate*.

This second edition ~~is a technical revision of the first edition (ISO 11950:1995)~~, which has been technically revised.

Introduction

Selling of packaging steels is today a worldwide business. Therefore, revision of this International Standard was expected earlier, since the last edition dated from 1995. Because of the long period between revisions, harmonization became difficult. In some regions, the properties of the packaging steels are determined by the hardness test whereas in other regions, a decade ago, the hardness test was replaced by the tensile test. Since the latest available techniques should be reflected in this International Standard, the possibility of using the tensile test as the reference test for determining the mechanical properties should be considered during the next revision of this International Standard.

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Cold-reduced tinmill products — Electrolytic chromium/chromium oxide-coated steel

1 Scope

This International Standard specifies requirements for single and double cold-reduced electrolytic chromium/chromium oxide-coated steel (ECCS) in the form of sheets or coils.

Single cold-reduced ECCS is generally specified in nominal thicknesses that are multiples of 0,005 mm, from 0,150 mm up to and including 0,600 mm. Double cold-reduced ECCS is generally specified in nominal thicknesses that are multiples of 0,005 mm, from 0,100 mm up to and including 0,360 mm.

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 requirements*

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

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method*

ISO 6892-1—²⁾, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

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

3 Terms and definitions

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

3.1

blackplate

cold-reduced low-carbon mild steel, applied for manufacturing ECCS

Note 1 to entry: See ISO 11951.^[1]

3.2

electrolytic chromium/chromium oxide-coated steel

ECCS

cold-reduced low-carbon mild steel sheet or coil, electrolytically treated to produce on both surfaces a duplex film of metallic chromium adjacent to the steel substrate with a top layer of hydrated chromium oxide or hydroxide

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

2) To be published (Revision of ISO 6892-1:2009)

3.3

single cold-reduced

description of product in which the blackplate has been reduced to the desired thickness in a cold-reduction mill and subsequently annealed and temper rolled

3.4

double cold-reduced

description of product in which the blackplate has had a second major reduction after annealing

3.5

standard grade ECCS sheet

product in sheet form which is confirmed to be 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, and
- b) free from damage which render the material unsuitable for the intended use

Note 1 to entry: The standard material is compliant with the requirements as specified in this International Standard.

3.6

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

3.7

continuously annealed

CA

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

3.8

finish

appearance of the surface of ECCS, governed by the surface roughness, R_a , of the steel base which results from controlled preparation of the work rolls during the final stages of rolling

3.8.1

smooth finish

finish of blackplate resulting from the use of temper-mill work rolls that have been ground to a low roughness

Note 1 to entry: This finish is used for the production of bright finish ECCS.

3.8.2

bright finish

finish on ECCS using the smooth finish blackplate

3.8.3

stone finish

finish 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

3.8.4

matt finish

finish resulting from the use of temper-mill work rolls with dull surface textured by shot blast, electro discharge texturing (EDT), electron beam texturing (EBT) or another suitable method

3.9**coil**

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

3.10**longitudinal bow****line bow**

residual curvature in the strip remaining along the direction of rolling

3.11**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

3.12**centre fullness****centre buckle****full centre**

intermittent vertical displacement or wave in the strip occurring other than at the edges

Note 1 to entry: See [Figure 8](#).

3.13**edge wave**

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

3.14**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

3.15**edge camber**

deviation of edge of coil/sheet from a straight line forming its chord

3.16**burr**

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

3.17**rolling width**

width of the rolled strip perpendicular to the direction of rolling

3.18**pallet**

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

3.19**stillage platform**

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

3.20**consignment**

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

3.21

bulk package

bulk

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

3.22

line inspection

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

3.23

anvil effect

effect that 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 General technical delivery condition

In cases where the technical delivery condition is not specified in this International Standard, then ISO 404 shall apply.

5 Classification

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

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6 Information to be supplied by the purchaser

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6.1 Designation

ISO 11950:2016

For the purposes of this International Standard, ECCS 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 requirements, the steel grade designations are given in [Table A.1](#) for single cold-reduced ECCS and in [Table A.2](#) for double cold-reduced ECCS. For the tensile properties requirements, the steel grade designations are given in [Table B.1](#).

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

- a) a reference to this International Standard, i.e. ISO 11950;
- 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 [7.2](#));
- d) the type of finish (see [7.3](#));
- e) the dimensions, in millimetres:
 - for coils, thickness × width;
 - for sheets, thickness × width × length.

By agreement, the symbol “× C” after width may be designated for coils.

By agreement, the symbol “w” may be designated after the number for the width to indicate that the number is the dimension perpendicular to the direction of rolling.

EXAMPLE

Single cold-reduced ECCS sheet, in accordance with this International Standard, steel grade T61, continuously annealed (CA), stone finish, with a thickness of 0,220 mm, a width of 800 mm and a length of 900 mm shall be designated:

ISO 11950 - T61 CA - stone - 0,220 × 800 × 900

Double cold-reduced ECCS coil, in accordance with this International Standard, steel grade T75, continuously annealed (CA), stone finish, with a thickness of 0,180 mm and a width of 750 mm shall be designated:

ISO 11950 - T75 CA - stone - 0,180 × 750

ECCS coil, in accordance with this International Standard, steel grade TH415, continuously annealed (CA), stone finish (ST), with a thickness of 0,200 mm, a width of 750 mm shall be designated:

ISO 11950 - TH415 CA - ST - 0,200 × 750 × C

ECCS sheet, in accordance with this International Standard, steel grade TS520, batch annealed (BA), stone finish, with a thickness of 0,140 mm, a dimension perpendicular to the direction of rolling of 844 mm and a length of 755 mm shall be designated:

ISO 11950 - TS520 BA - stone - 0,140 × 844w × 755

6.2 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 6.1;
- b) the quantity, expressed on an area or mass basis, e.g. 50 tons of sheets, 100 tons of coils;
- c) the minimum and the maximum coil weight, the minimum and the maximum coil outer diameter, the coil internal diameter, the core vertical or horizontal and the direction of winding (see 16.1);
- d) the maximum weight of bulk package;
- e) other inspection document than that specified by the manufacturer (see Clause 15);
- f) end use;
- g) any further special requirements.

NOTE Appropriate steel grade is 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 is important when the steel grade is selected.

6.3 Options

In addition to the information in 6.2, the purchaser may wish to provide additional 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/her fabrication operations that will significantly affect the way in which the ECCS is used.

NOTE When ordering cold-reduced ECCS, the purpose of manufacture for which the material is intended is generally stated. When double cold-reduced ECCS is used for built-up can bodies, the rolling direction is around the circumference of the can so as to minimize the hazard of flange cracking. In such cases, the direction of rolling is clearly designated on the contract.

7 Manufacturing features

7.1 Manufacture

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

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

The manufacturing method of ECCS is left to the discretion of the manufacturer and is not specified in this International Standard.

7.2 Annealing

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

7.3 Finish

ECCS is usually available in the finishes as indicated in Table 1. The type of finish is designated either by the ECCS finish or the code shown in Table 1.

Table 1 — Typical finishes for ECCS

ECCS finish	Code ^a	Finish	Surface roughness ^{b,c} <i>R_a</i> μm
Bright	BT	Smooth	≤0,35
Fine stone	FS	Fine stone	0,25 – 0,45
Stone	ST	Stone	0,35 – 0,60
Matt	MM	Matt	≥0,90

^a By agreement between the purchaser and the manufacturer, another code system may be applied.

^b Values of surface roughness in this table are not mandatory. The values are given for reference in order to classify the finishes.

^c The measurement of surface roughness is in accordance with ISO 4288.

NOTE 1 Special surface finishes are available by agreement at the time of ordering.

NOTE 2 Double cold-reduced ECCS is usually supplied with a stone finish.

7.4 Oiling

Under normal conditions of transport and storage, ECCS shall be suitable for surface treatments, such as established lacquering and printing operations.

ECCS coils and sheets are supplied with an oil coating. The oil shall be one that is recognized (i.e. by the relevant national or international authority) as being suitable for food packaging. Unless otherwise agreed at the time of ordering, the kind of oil is at the discretion of the manufacturer.

NOTE For the oil, dioctyl sebacate (DOS) is usually used.