



**International
Standard**

ISO 11950

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

*Aciers pour emballage laminés à froid — Fer chromé
électrolytique*

**Third edition
2026-04**

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Contents

	Page
Foreword	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 General technical delivery condition	4
5 Classification	4
6 Information to be supplied by the purchaser	4
6.1 Designation.....	4
6.2 Mandatory information.....	5
6.3 Options.....	5
7 Manufacturing features	5
7.1 Manufacture.....	5
7.2 Annealing.....	5
7.3 Finish.....	6
7.4 Oiling.....	6
7.5 Imperfections.....	6
7.5.1 Coils.....	6
7.5.2 Sheets.....	7
8 Chromium/chromium in oxide coating mass	7
9 Mechanical properties	7
9.1 General.....	7
9.2 Hardness requirement.....	7
9.3 Tensile property requirement.....	7
10 Tolerances on dimensions and shape	8
10.1 General.....	8
10.2 Thickness and feather edge.....	8
10.2.1 Thickness.....	8
10.2.2 Feather edge.....	8
10.3 Width.....	8
10.4 Length.....	8
10.4.1 Length of coil.....	8
10.4.2 Length of sheet.....	8
10.5 Edge camber.....	8
10.6 Out-of-squareness of sheet.....	9
10.7 Flatness.....	10
10.7.1 Edge wave.....	10
10.7.2 Longitudinal and transverse bow.....	10
10.7.3 Centre fullness.....	10
11 Joint within a coil	11
11.1 General.....	11
11.2 Number of joints.....	11
11.3 Location of joints.....	11
11.4 Dimension of joints.....	11
11.4.1 Thickness.....	11
11.4.2 Overlap.....	11
12 Sampling	11
13 Test method	12
13.1 Chromium/chromium in oxide coating mass.....	12
13.1.1 Test piece.....	12
13.1.2 Method of determination.....	12

ISO 11950:2026(en)

13.2	Hardness test.....	12
13.2.1	Test piece.....	12
13.2.2	Test method.....	13
13.3	Tensile test.....	13
13.3.1	Test piece.....	13
13.3.2	Test method.....	13
13.4	Flatness test.....	13
13.4.1	General.....	13
13.4.2	Edge wave.....	14
13.4.3	Longitudinal or transverse bow.....	14
13.4.4	Centre fullness.....	14
14	Retests.....	16
15	Inspection document.....	16
16	Dispatch and packaging.....	16
16.1	Coils.....	16
16.2	Sheets.....	17
16.3	Labelling.....	17
Annex A	(normative) Hardness requirements for ECCS.....	18
Annex B	(normative) Tensile property requirements for ECCS.....	19
Annex C	(informative) Steel types.....	21
Annex D	(informative) Springback test for routine determination of $R_{p0,2}$ or R_{eL} for ECCS.....	22
Annex E	(normative) Methods for the determination of metallic chromium and chromium in the oxides on the surface of electrolytic chromium/chromium oxide-coated steel.....	23
Annex F	(normative) Rockwell HR15Tm values and their HR30Tm equivalents.....	30
Annex G	(normative) Average chromium/chromium in oxide coating mass for the ECCS produced through the trivalent chromium process.....	31
Bibliography	32

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 document 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).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 9, *Tinplate and blackplate*.

This third edition cancels and replaces the second edition (ISO 11949:2016), which has been technically revised.

The main changes are as follows:

- an option to use either the trivalent chromium process or the hexavalent chromium process for electrolytic chromium/chromium oxide-coated steel has been added (see [3.2](#));
- a new term entry has been added to define "fine stone finish" (see [3.8.3](#)), and subsequent entries have been renumbered;
- sheet numbers in bulk package other than multiples of 100 may be supplied ([16.2](#));
- the maximum weight of sheets in bulk package has been increased up to 3 000 kg instead of 2 000 kg (see [16.2](#));
- several steel grades have been added (see [Tables A.1, A.2](#) and [B.1](#));
- the lower yield strength, R_{eL} has been specified for CA (see [9.3, 13.3.2, Annex B](#) and [Annex D](#)).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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

1 Scope

This document 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 0,390 mm.

This document applies to coils and sheets cut from coils in nominal minimum rolling widths of 600 mm.¹⁾

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 404, *Steel and steel products — General technical delivery requirements*

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

ISO 6892-1:2019, *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.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

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

Note 1 to entry: This can either be produced by a hexavalent chromium process or by a trivalent chromium process.

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

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 defined as complying with the requirements as specified in this document.

3.6

batch annealing

box annealing

BA

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 annealing

CA

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

appearance of the 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

appearance of the surface of ECCS using the smooth finish blackplate

3.8.3

fine stone finish

appearance of the surface of ECCS characterized by a directional pattern, resulting from the use of final-mill work rolls that have been ground to a lower level of roughness than those used for stone finish

3.8.4

stone finish

appearance 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

3.8.5

matt finish

appearance 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

rolling width

measurement of the rolled strip perpendicular to the direction of rolling

3.17

stillage platform

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

3.18

consignment

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

3.19

bulk package

bulk

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

3.20

line inspection

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

4 General technical delivery condition

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

5 Classification

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

6 Information to be supplied by the purchaser

6.1 Designation

For the purposes of this document, 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 shall be in accordance with [Annex A](#), specifically [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 shall be in accordance with [Table B.1](#) of [Annex B](#).

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

- a) a reference to this document, 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 document, steel grade T61, continuously annealing (CA), stone finish, with a thickness of 0,220 mm, a width of 800 mm and a length of 900 mm is designated:

ISO 11950-T61CA - stone - 0,220 × 800 × 900

Double cold-reduced ECCS coil, in accordance with this document, steel grade T75, continuously annealing (CA), stone finish, with a thickness of 0,180 mm and a width of 750 mm is designated:

ISO 11950-T75CA - stone - 0,180 × 750

ECCS coil, in accordance with this document, steel grade TH415, continuously annealing (CA), stone finish (ST), with a thickness of 0,200 mm, a width of 750 mm is designated:

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

ECCS sheet, in accordance with this document, steel grade TS520, batch annealing (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 is 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. 50 000 kg of sheets, 100 000 kg 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 Information on 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

At time of order, it may be agreed between the supplier and purchaser for the ECCS to be produced using either hexavalent chromium process or chromium trivalent process.

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 the 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 document.

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	Blackplate	
		Finish	Surface roughness ^{b,c} Ra 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 21920-3[2].			

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.

7.5 Imperfections

7.5.1 Coils

The manufacturer is expected to employ normal quality control and line inspection procedures to ensure that the ECCS manufactured is in accordance with the requirements of this document.

However, the production of ECCS coils in continuous-strip mill operations does not afford the opportunity for removal of all ECCS that do not conform with the requirements of this document.

At the time of shearing, sheets not conforming to the standard grade ECCS sheet shall be set aside by the purchaser or its agent.

The quantity of sheets conforming with this document shall be at least 90 % of any one coil.

List items a) and b) in [3.5](#) cannot be verified by specific tests. Accordingly, those items are recommended to be the subject of a special agreement between the purchaser and the manufacturer.

In processing ECCS coil, when the purchaser (or the purchaser's agent) encounters recurring imperfections which seem to be excessive, it is essential, where practicable, that the processing of the coil is stopped and the manufacturer is advised.