BRITISH STANDARD

BS EN
10333:2005

Steel for packaging — Flat steel products intended for use in contact with foodstuffs, products or beverages for human and animal consumption — Tin coated steel (tinplate)

The European Standard EN 10333:2005 has the status of a British Standard

ICS 67.250

BSI
British Standards

National foreword

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 12, an inside back cover and a back cover.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10333

April 2005

ICS 67.250

English version

Steel for packaging - Flat steel products intended for use in contact with foodstuffs, products and beverages for human and animal consumption - Tin coated steel (tinplate)

Acier pour emballage - Produits plats en acier destiné à entrer au contact des denrées, produits et boissons pour l'alimentation de l'homme et des animaux - Acier revêtu d'étain (fer blanc ou fer étamé)

Verpackungsblech - Flacherzeugnisse aus Stahl für die Verwendung in Berührung mit Lebensmitteln, Produkten und Getränken für den menschlichen und tierischen Verzehr - Verzinnter Stahl (Weißblech)

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 10333:2005: E

Contents

Foreword

This document (EN 10333:2005) has been prepared by Technical Committee ECISS/TC 26 “Tinmill products - Qualities, dimensions, tolerances and specific tests”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by October 2005, and conflicting national standards shall be withdrawn at the latest by October 2005.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

1 Scope

This document specifies the composition of the base steel used for the production of tinplate for use in direct contact with foodstuffs or products for human and animal consumption as well as the composition of tin used to coat it. Tinplate can be produced with or without an organic coating.

The main examples of use are:

— drinks cans,

— food cans,

— packaging of dry foods,

— aerosol cans.

The material should be chosen in accordance with the conditions for its use.

This standard does not apply to categories of steel other than steel for packaging intended for use in contact with foodstuffs, products or beverages for human or animal consumption.

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 610, *Tin and tin alloys – Ingot tin*

EN 10202:2001*, Cold reduced tinmill products – Electrolytic tinplate and electrolytic chromium/chromium oxide coated steel*

EN 10204, *Metallic products – Types of inspection documents*

EN 10334, *Steel for packaging – Flat steel products intended for use in contact with foodstuffs, products and beverages for human and animal consumption - Non-coated steel (blackplate)*

EN ISO 14284, *Steel and iron – Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

3 Terms and definitions

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

3.1
tinplate
cold-rolled blackplate coated on at least one side with a layer of tin. The mass of the coating can reach up to 15.1 g/m²

3.2
blackplate
See EN 10334

3.3
steel intended for use in contact with foodstuffs
See EN 10334

3.4
passivation
surface treatment designed to improve resistance to oxidation, resistance to sulphurizing and ease of lacquering or printing on the tin coating

3.5
steel for packaging
See EN 10334

3.6
steel for other applications than packaging
See EN 10334

4 Information to be provided by the purchaser

The information, which shall be provided by the purchaser at the time of enquiry and order, shall satisfy the requirements of EN 10202.

NOTE Furthermore, the purchaser can specify the type of oil suitable for food contact to be used when the product is delivered oiled.

5 Dimensions and dimensional tolerances

The nominal dimensions shall be agreed at the time of enquiry and order.

Dimensional tolerances shall meet the requirements of Clause 9 of EN 10202:2001.

6 Requirements

6.1 Base metal

The composition of the base metal shall meet the requirements of EN 10334.

NOTE As described in EN 10202:2001 informative Annex A, tighter limits may be necessary for certain elements particularly for manufacturing reasons.

6.2 Tin coating

The chemical composition of the tin ingot used shall comply with the requirements set down in EN 610 for grade Sn99.85 with the exception of the Pb content, which shall be < 0.010 %.

The Pb content of the tin coating shall be ≤ 0,010 %.

6.3 Passivation and oiling

The requirements specified in EN 10202 shall apply.

Unless otherwise specified at the time of enquiry and order, the products delivered shall be coated with an oil that is suitable for contact with foodstuffs.

7 Checks

At the request of the purchaser, conformity with the order requirements shall be proven in accordance with this standard. Unless otherwise specified, the inspection document 2.1 shall be used in accordance with EN 10204.

8 Sampling

The sampling process and the preparation of the sample shall be in accordance with the requirements of EN ISO 14284.

9 Test method

Lead present in the tin coating shall be assayed in accordance with the requirements contained within Annex A. Other methods can be used. Nevertheless, in cases of dispute, the method defined in Annex A is the reference method.

10 Designation

The designation shall be in accordance with EN 10202.

11 Marking, labelling, packaging

Each coil or bundle shall display a label indicating the reference to this standard, the name and the trademark of the manufacturer and the batch identification.

The packaging specifications shall be agreed at the time of enquiry and order.

Annex A
(normative)

Determination of lead

A.1 Scope

Measurement of the lead content of tin coating for steel for packaging.

A.2 Principle

- Coulometric dissolution of tin coating in hydrochloric acid;
- Elimination of tin through hydrobromic distillation;
- Placing of remaining elements into solution and assaying of lead by means of atomic absorption spectro-photometry.

A.3 Apparatus

- Direct current generator for currents of between 0 mA and 500 mA;
- Potentiometer recorder with a range of 0 mV to 2500 mV;
- Calomel electrode (ECS) and counter-electrode in platinum wire;
- Glass laboratory receptacles and adjustable hot plate;
- Air-drying vinyl spray paint can;
- Atomic absorption spectro-photometer with oven able to detect between 0 µg/l and 100 µg/l lead.

A.4 Reagents

All of the solutions shall be prepared on the basis of products intended specifically for toxicological analyses:

- Hydrochloric acid 2N;
- Hydrochloric acid at 10 %;
- Bromine solution at 10 % in hydrobromic acid;
- Sulphuric acid 9N;
- Lead standard solution at 5 µg/ml prepared by dilution of a commercial solution at 1 g/l.

A.5 Health and safety

For the needs of the following instructions, the safety data sheets of the relevant used chemicals are applicable.

A.6 Instructions

— Cut out a strip of tinplate (about 12 cm x 2.5 cm);

— Lacquer the surface which is not analysed;

— Overlap the edges of the sample, with the plain surface inwards, mount on a steel sample-holder (see Figure A.1) and insert into a 150 ml low profile beaker;

— Add about 50 ml of hydrochloric acid 2N, so that the tinplate is completely submerged;

— Position the electrode system (see Figure A.2) and perform the coulometric dissolution of tin by applying a current of 8 mA/cm²;

— Load the dissolution curve of tin with the potentiometric recorder;

— Remove the sample and the electrodes, rinse in 2 changes of water and add 2 ml of sulphuric acid 9N;

— Reduce the volume to 5 ml approx. through soft evaporation;

— Add 5 ml of the bromine solution and proceed to the distillation of the tin by increasing the heat and stirring the contents of the beaker continuously;

— When white sulphuric flames begin to be produced, turn the heat up to a very high temperature to eliminate the sulphuric acid entirely;

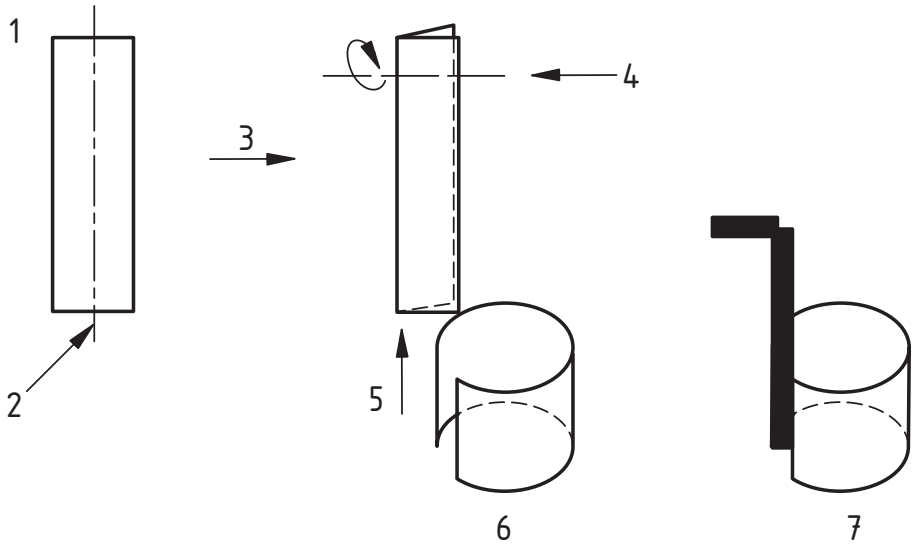
— Leave to cool, then take up the dry residue with 10 ml hydrochloric acid to 10 % by placing on a low heat to dissolve;

— Transfer into a 100 ml volumetric flask and assay the lead by means of an electrothermal atomic absorption spectro-photometry;

— Carry out simultaneous blank tests for all reagents and at least 2 reference points leading to final solutions before spectro-photometry containing between 0 µg/l and 100 µg/l of lead (1 ml of the standard solution diluted in 100 ml leads to 50 µg/l of lead).

A.7 Figures

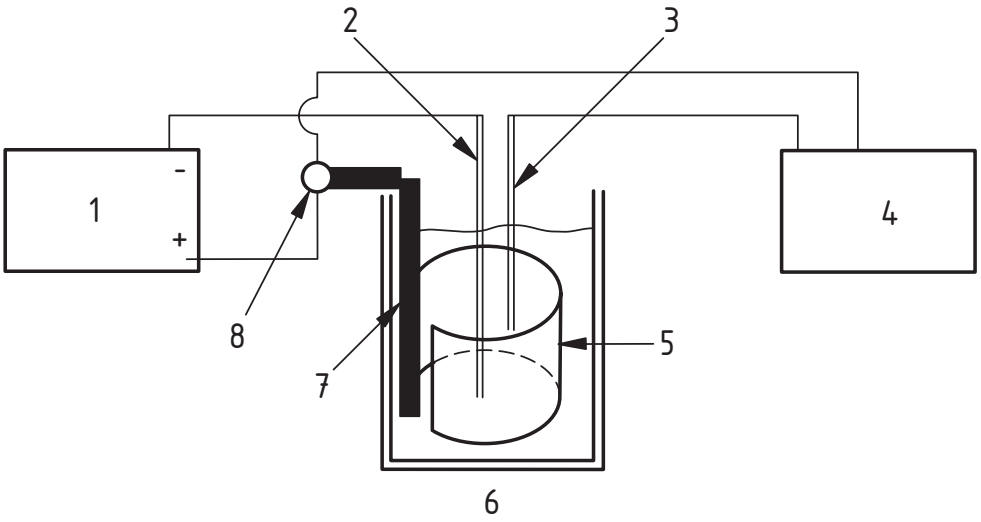
Sample holder: fold a strip of blackplate 1 cm wide in half lengthways, leaving sufficient space between the two sides of the fold to slide in the cylinder of tinplate as shown in Figure A.1:



Key

1 Band of blackplate
2 Axis of folding
3 Folding 180 °
4 Axis of folding 90 °
5 Sliding in the fold
6 White iron sample hemmed
7 Fixed sample seen aside

Figure A.1 — Sample holder



Key

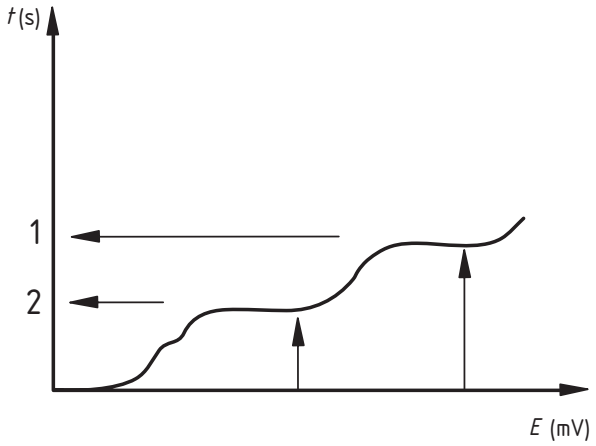
1 Generator
2 Auxiliary electrode in platinum
3 Electrode of reference (EC)
4 Recorder
5 HCl 2N
6 Beaker 150 ml
7 Sample support in black plate
8 Connection clip

Figure A.2 — Coulometry cell

A.8 Expression of results

A.8.1 Weight of tin dissolved

An example of the free and alloyed tin dissociation curve is given in Figure A.3.



Key

1 t_{total}
2 t_1 (free tin)

Figure A.3 — Free and alloyed tin dissolution curve

NOTE The time and dissolution characteristics of free and alloyed tin are taken at the points of inflection of the voltage level steps measured by the potentiometric recorder.

To calculate the amount of dissolved alloyed tin ($FeSn_2$) use the following formulae:

t total - $t_1 = t_2$ where $2\ t_2 / 3$ seconds for Sn of alloyed Sn

Total time for dissolving t_{Sn}:

$$t_{Sn} = t_1 + 2t_2/3 \text{ in seconds}$$

Mass of dissolved tin (Faraday's law) in mg: $\frac{8S \times t_{sn} \times 119}{2 \times (96500)}$ (1)

where S is the surface area of the sample in cm²

A.8.2 Lead concentration:

% Lead content of tin coating **=** $\frac{2 \times C}{S \times t_{sn}}$ (2)

Where C is the concentration of lead detected in µg/l

NOTE In practice, sampling in the range 0-100 µg/l is adjusted for a sample of several tens of cm² (as an example, S = 30 cm² for 12 cm x 2,5 cm) and whose tin coating is greater than 2,8 g/m².

In the case of a thinner tin coating and/or a sample with small surface area, the calibration curve shall be plotted for a lower range.

Bibliography

[1] Directive 89/109/EEC of 21 December 1988 on materials and articles intended to come into contact with foodstuffs.

[2] Directive 94/62/EC of the European Parliament and Council of 20 December 1994 on packaging and packaging waste.

[3] Council of Europe – Guidelines for metals and alloys intended to come into contact with foodstuffs

[4] EN 10079, *Definition of steel products*

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