International Standard 1111/1

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Single cold-reduced tinplate and single cold-reduced blackplate — Part 1: Electrolytic and hot-dipped tinplate sheet and blackplate sheet

Fer-blanc et fer noir laminés à froid par simple réduction — Partie 1: Feuilles de fer-blanc obtenues par électrolyse et par immersion à chaud et feuilles de fer noir

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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 developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 1111/1 was developed by Technical Committee ISO/TC 17, *Steel*, and was circulated to the member bodies in October 1982.

It has been approved by the member bodies of the following countries:

Australia	Hungary	Norway
Austria	India	Poland
Belgium	Iran	Romania
Bulgaria	Italy	South Africa, Rep. of
Canada	Japan	Spain
China	Kenya	Sweden
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Egypt, Arab Rep. of	Korea, Rep. of	Turkey
France	Mexico	United Kingdom
Germany, F.R.	Netherlands	USSR

No member body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation ISO/R 1111/1-1969, of which it constitutes a technical revision.

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Single cold-reduced tinplate and single cold-reduced blackplate — Part 1: Electrolytic and hot-dipped tinplate sheet and blackplate sheet

1 Scope and field of application

1.1 This part of ISO 1111 applies to single cold-reduced electrolytic and hot-tipped tinplate sheet in low carbon cold-reduced mild steel in nominal thicknesses from 0,15 mm up to and including 0,49 mm and to single cold-reduced blackplate sheet in low carbon mild steel in nominal thicknesses from 0,15 mm up to and including 0,49 mm.

1.2 This part of ISO 1111 does not apply to tinplate or blackplate in coils, or to double-reduced tinplate or blackplate, or to material described commercially as tinned sheets, steel sheets or electrolytic chromium/chromium oxide coated steel (TFS).

2 References

ISO/R 1024, *Rockwell superficial hardness test (N and T scales) for steel.*

ISO 1111/2, *Single cold-reduced tinplate and single cold-reduced blackplate — Part 2: Electrolytic tinplate coil and blackplate coil for subsequent cutting into sheet.*[1)]

ISO 4977, *Double cold-reduced electrolytic tinplate.*[2)]

3 Definitions

For the purpose of this part of ISO 1111 the following definitions apply:

3.1 tinplate: Cold-reduced low carbon mild steel sheet coated on both surfaces with tin, applied either by dipping in molten tin or by electro-deposition. Tinplate produced by the hot-dipping process is called hot-dipped tinplate; that produced by electro-deposition is called electrolytic tinplate.

3.2 differentially coated tinplate: Electrolytic tinplate, one surface of which carries a heavier tin coating than the other.

3.3 blackplate: Cold-reduced low carbon mild steel sheet, not tinned, and normally not oiled or otherwise treated.

3.4 consignment: A quantity of tinplate or blackplate of the same dimensions and quality made available for despatch at the same time.

4 Conditions of manufacture and utilization

4.1 The methods of manufacture of tinplate and blackplate are the province of the producer.

4.2 The methods of using tinplate and blackplate are the province of the user.

4.3 The tin used for the coating of tinplate shall have a purity of not less than 99,75 %.

4.4 The chemical composition of the steel may be agreed upon between the producer and the purchaser provided that it is consistent with this part of ISO 1111. (See clause 15.)

4.5 At the time they are made available by the producer and under normal conditions of transport and storage, tinplate and blackplate are suitable for surface treatments such as established lacquering and printing operations. Appropriate grades and tempers are also suitable for shaping operations such as stamping, drawing, folding and bending, and assembly work such as joint forming, soldering (tinplate only) and welding. The purchaser's order requirements shall be consistent with the end use of the product.

4.6 Surface finishes

4.6.1 There are four recognized commercial finishes for electrolytic tinplate, namely bright, stone, matt and silver. The appearance is governed by

1) At present at the stage of draft. (Revision of ISO/R 1111/2-1976.)

2) At present at the stage of draft.

— the surface characteristics of the steel base which principally result from controlled preparation of the work rolls used during the final stages of temper rolling;

— the mass of the coating applied;

— whether the tin layer is melted or unmelted.

a) Bright finish: A surface provided by a flow-brightened tin coating on a smooth finish steel base.

b) Stone finish: A surface provided by a flow-brightened tin coating on a steel base finish characterized by a directional pattern.

c) Matt finish: A surface provided by an unmelted coating generally on a shot blast finish steel base (see 4.5).

d) Silver finish: A surface provided by a flow-brightened tin coating on a highly roughened shot blast finish steel base (see 4.5).

4.6.2 Blackplate may be available in the same steel base surface finishes.

4.7 Surface treatments (Electrolytic tinplate only)

4.7.1 Passivation treatment

A chemical or electrochemical treatment applied to the surface of electrolytic tinplate to produce a surface of improved resistance to discolouration and superior lacquering and printing quality. The usual procedure is cathodic treatment in a solution of sodium dichromate (see 15.2.4).

4.7.2 Oiling

Normally the surface of electrolytic tinplate has applied to it a very thin coating of an oil which is suitable for food packaging (see 15.2.1).

NOTES

1 When ordering tinplate and blackplate it is recommended that the purpose of manufacture for which the tinplate or blackplate is intended should be stated. When he so requires, the purchaser should indicate to the producer the direction of rolling required.

2 It is recommended that, if required, the producer supplies to the purchaser such details of the steel-making process as may assist the purchaser in his efficient use of the material. It is further recommended that the purchaser be informed of any alterations in the method of manufacture which will significantly affect the properties of the purchased product. Similarly, it is recommended that the purchaser informs the producer of modifications in the fabrication methods which will significantly affect the way in which the purchased product is used.

5 Material grading

5.1 Electrolytic tinplate, standard grade

Standard grade electrolytic tinplate represents the normal production of lines employing the usual inspection and classification procedures. In normal conditions of storage and use, standard grade electrolytic tinplate permits lacquering and printing over the entire surface.

NOTE — Electrolytic tinplate, second grade, is available in certain countries. It represents the best sheets rejected from the standard grade but may contain sheets exhibiting surface imperfections, tinning defects, and shape and other defects to a minor extent (but not pinholes or off-gauge material). Suitability for lacquering and printing over the entire surface is not guaranteed.

5.2 Hot-dipped tinplate

After coating, hot-dipped tinplate is inspected and graded as follows.

5.2.1 First grade or primes

Tinplate which at the time of despatch is free from defects readily visible to the unaided eye. In normal conditions of storage and use it is suitable for lacquering or printing over the entire surface of the sheet.

5.2.2 Second grade or seconds

Tinplate which at the time of despatch has visible imperfections of moderate magnitude or frequency. Lacquering or printing over the entire surface of the sheet is not guaranteed.

NOTE — The term "standard grade" is applied to hot-dipped tinplate which is inspected during processing and from which material not of first or second grade is rejected. The accepted material, however, is not segregated into first and second grades.

5.3 Blackplate

Blackplate is line inspected during processing. Material having visible imperfections of only moderate magnitude or frequency is included. Blackplate is liable to rust, but at the time it is made available by the producer the material is suitable for normal lacquering and printing over the entire surface.

NOTE — Second grade. In certain countries, blackplate rejected during line inspection because of surface imperfections or shape defects of limited extent is available as second grade. Suitability for lacquering or printing over the entire surface of the sheet is not guaranteed.

6 Tin coating masses

6.1 Expression of tin coating masses

Tin coating masses shall be expressed in grams per square metre (g/m^2).

6.2 Electrolytic tinplate, equally coated

6.2.1 A number of coating masses are specified as shown in table 1.

Table 1 — Coating masses for electrolytic tinplate, equally coated

Code [1]	Nominal coating mass [1]		Minimum average coating mass (see 6.5)
	g/m²		g/m²
	Per surface	Total both surfaces	Total both surfaces
E2,8/2,8	2,8	5,6	4,9
E5,6/5,6	5,6	11,2	10,5
E8,4/8,4	8,4	16,8	15,7
E11,2/11,2	11,2	22,4	20,2

1) The code figures are derived from the nominal coating mass on each surface of the tinplate.

6.3 Electrolytic tinplate, differentially coated

6.3.1 A number of coating masses are specified as shown in table 2.

Table 2 — Coating masses for electrolytic tinplate, differentially coated

Code [1]	Nominal coating mass [1]		Minimum average coating mass (see 6.5)	
	g/m²		g/m²	
	Heavily coated surface	Lightly coated surface	Heavily coated surface	Lightly coated surface
D5,6/2,8	5,6	2,8	4,75	2,25
D8,4/2,8	8,4	2,8	7,85	2,25
D8,4/5,6	8,4	5,6	7,85	4,75
D11,2/2,8	11,2	2,8	10,1	2,25
D11,2/5,6	11,2	5,6	10,1	4,75

1) The code figures are derived from the nominal coating mass on each surface of the tinplate.

6.4 Hot-dipped tinplate

Table 3 — Coating masses for hot-dipped tinplate

Code [1]	Nominal coating mass [1]	Minimum average coating mass (see 6.5)
	g/m²	g/m²
	Total both surfaces	Total both surfaces
H12/12	24,0	21,0
H14/14	28,0	24,6
H15/15	30,0	26,0
H17/17	33,6	28,0

1) The code figures are derived from the nominal coating mass on each surface of the tinplate. In hot-dipped tinplate it is not possible, as for electrolytic tinplate, intentionally to vary the distribution between the two surfaces and the total coating is assumed to be equally divided between the two surfaces.

6.5 The average value of the coating masses of the sample selected to represent a consignment in accordance with clause 9 and tested in accordance with clause 10 shall not be lower than the appropriate minimum average coating mass specified in tables 1, 2 or 3.

NOTES

1 The individual specimens of the sample may show tin coatings as low as, for example, 80 % of the minimum average coating mass for equally coated or differentially coated electrolytic tinplate and 60 % of the minimum average coating mass for hot-dipped tinplate. It is emphasised that isolated specimens have no representative value in relation to the consignment under consideration.

2 In practice the producer aims to apply the nominal coating mass, the minimum average coating mass values only occasionally being encountered.

6.6 Marking of differentially coated tinplate

In order to distinguish material having differential coatings, the sheet should be marked on one surface which, by agreement, can be either the lightly or the heavily coated surface. In all cases, both the surface to be marked and the surface which is to be piled uppermost should be clearly designated on the contract by the purchaser. Generally the marking should be made on the heavily coated surface in the form of dull straight continuous parallel lines about 1 mm wide (see annex A). If the marking is on the lightly coated surface then at least alternate lines should be interrupted, or geometrical patterns may be used.

7 Temper classifications

7.1 The term "temper", when applied to tinplate and blackplate, summarises a combination of interrelated mechanical properties and no single mechanical test can measure all the various factors which contribute to the fabrication characteristics of the material. However, the Rockwell 30T hardness test (HR 30T) is the best single test available and serves as a guide to the properties of the material. This test forms the basis for a system of temper classification as shown in table 4, which gives the hardness values at which the producer shall aim.

7.2 The purchaser shall specify the temper required by reference to the appropriate temper classification as set out in table 4.

Table 4 — Rockwell HR 30T hardness values normally associated with the temper classification of batch annealed and continuously annealed tinplate

Temper classification	Rockwell HR 30T hardness aim	
	Mean	Maximum deviation of sample average
T 50	52 max.	
T 52	52	+ 4 − 4
T 55	55	+ 4 − 3
T 57	57	+ 4 − 3
T 61	61	+ 4 − 4
T 65	65	+ 4 − 4
T 70	70	+ 3 − 4

7.3 The hardness of tinplate and blackplate shall be determined on samples selected in accordance with clause 9 and tested in accordance with clause 11. When evaluating the hardness of tinplate and blackplate, average values and not individual values shall be considered. The Rockwell hardness values shown in table 4 are for tests performed with a diamond anvil on tinplate after de-tinning.

NOTES

1 The Rockwell hardness test is sensitive to the "anvil" effect and hence is affected by the thickness of the test specimen. The values in table 4 are typical for nominal thicknesses in the range of 0,25 mm to 0,30 mm. Material of the same metallurgical quality in 0,22 thickness, for instance, would be one HR 30T unit higher and material of 0,43 mm thickness one unit lower. Thinner material, for example 0,17 mm, may be 2 units higher. For a given temper classification, the corresponding HR 30T values for blackplate may be as much as 4 units lower, depending on the age of the material and the conditions of storage.

2 On relatively thin material the HR 15T test may be employed and the values converted to HR 30T (see annex B).

7.4 The mechanical properties of continuously annealed tinplate and blackplate and batch annealed material of the same HR 30T hardness are not identical. By agreement, the type of annealing [batch — (BA), or continuous — (CA)] may be specified when ordering, e.g. T 61(BA) or T 61(CA).

NOTE — HR 30T test values may be affected by the surface roughness of the steel base obtained by the use of shot blast rolls in the final pass of temper rolling.

8 Dimensional requirements

8.1 Thickness

8.1.1 Tinplate and blackplate are normally available in any nominal thickness which is a multiple of 0,01 mm from 0,15 mm up to and including 0,49 mm.

8.1.2 The producer shall aim to produce the thickness ordered.

8.1.3 Determination of thickness

8.1.3.1 The average thickness of the consignment may be determined by weighing whole sheets, or by direct measurement using a micrometer.

When the weighing technique is used, the mass of each whole sheet is determined, its area is measured, and the thickness determined by applying the formula given in 8.1.3.2.

The mass of the sheet shall be determined to a precision of 2 g and the dimensions of the sheet shall be measured to a precision of 0,5 mm. The thickness shall be stated to the nearest 0,001 mm.

If the average thickness of a consignment is to be determined by direct measurement, a hand-operated micrometer shall be used. It shall be accurate to 0,001 mm. The measurement of thickness shall be carried out at least 10 mm from the trimmed edge.

In any case of dispute, retesting of thickness by the weighing method only shall be employed.

NOTE — It is recommended that when a micrometer is used it should have a ball ended shank anvil of approximately 3 mm diameter, a curved surface anvil of approximately 25 mm radius and a face diameter of approximately 13 mm.

8.1.3.2 Thickness shall be calculated by applying the following formula:

$$\text{thickness (mm)} = \frac{\text{mass (g)}}{\text{actual area (mm}^2\text{)} \times 0{,}007\,85\ \text{(g/mm}^3\text{)}}$$

8.1.3.3 For determining the variation of thickness within a sheet, using the specimens Y (see figure 3), either the weighing or the direct measurement technique may be employed. If the former, the thickness of each of the specimens Y shall be determined by weighing the specimen, measuring the area and applying the formula given in 8.1.3.2 above.

The mass of the specimens shall be determined to an accuracy of 0,01 g or better, and the dimension of the specimen shall be measured to an accuracy of 0,1 mm. The thickness shall be stated to the nearest 0,001 mm.

If the variation in thickness is determined by direct measurement, the micrometer to be used shall be as defined in 8.1.3.1 and the specimen Y (see figure 3) shall be measured at two locations. The thickness shall be stated to the nearest 0,001 mm.

8.1.4 Thickness tolerances

8.1.4.1 The thickness of each sheet selected in accordance with 9.2.3 shall be measured as described in 8.1.3. The average thickness of a consignment shall be represented by the arithmetic mean of all the specimen sheets tested.

8.1.4.2 The value of the arithmetic mean shall not deviate from the nominal thickness by more than:

a) ± 2,5 % for a consignment of more than 20 000 sheets; or

b) ± 4 % for a consignment of 20 000 sheets or less;

8.1.4.3 Tolerances on nominal thickness of individual sheets. No sheet among those selected in accordance with 9.2.3 and measured as described in 8.1.3 shall deviate from the nominal thickness by more than:

a) ± 8,5 % if the weighing method is employed, or

b) the tolerances given in table 5 if the micrometer method is employed.

Any sheets not meeting the requirements of table 5 are subject to rejection.

8.1.4.4 Tolerances on local thickness within a sheet. The thickness of either of the two individual specimens determined in accordance with 8.1.3.3 shall not deviate from the actual average thickness of the whole sheet determined in accordance with 8.1.3.1 by more than 4 %.

NOTE — Transverse thickness profile (feather edge) is a term used to define the reduction in sheet thickness at right angles to the rolling direction, close to the edge.

8.2 Linear dimensions of sheets

8.2.1 Determination of linear dimensions

The measurements shall be made on the sample selected in accordance with 9.2.3 with the sheets being laid on a flat surface. The measurement of length and width to the nearest 0,5 mm shall be made across the centre of the sheet.

8.2.2 Size of sheet

Each sheet shall be such that a rectangle of the ordered dimensions is available in it.

Table 5 — Ordered thickness and thickness tolerances

Values in millimetres

Ordered thickness	Tolerance (±)
0,14	0,015
0,15	0,015
0,16	0,015
0,17	0,015
0,18	0,020
0,19	0,020
0,20	0,020
0,21	0,020
0,22	0,020
0,23	0,025
0,24	0,025
0,25	0,025
0,26	0,025
0,27	0,025
0,28	0,030
0,29	0,030
0,30	0,030
0,31	0,030
0,32	0,030
0,33	0,035
0,34	0,035
0,35	0,035
0,36	0,035
0,37	0,035
0,38	0,040
0,39	0,040
0,40	0,040
0,41	0,040
0,42	0,040
0,43	0,045
0,44	0,045
0,45	0,045
0,46	0,045
0,47	0,045
0,48	0,050
0,49	0,050

8.2.3 Tolerances on linear dimensions

Each sheet in the sample shall be of not less than the ordered dimensions. It is trimmed on both edges and the trimmed (coil width) dimension shall not exceed the ordered dimension by more than 3 mm. Normally the drum cut dimension shall not exceed the ordered dimension by more than 3 mm, and in no case shall it exceed the ordered dimension by more than 5 mm.

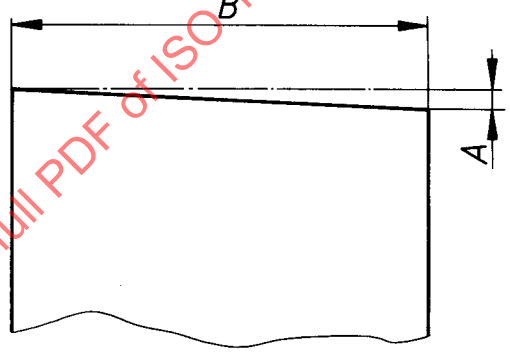
8.3 Out-of-squareness tolerance

Out-of-squareness is defined as a percentage ratio of two values A and B (see figure 1):

A is the deviation of an edge from a straight line drawn at a right angle to the other edge of the sheet, touching one corner and extending to the opposite edge;

B is the length of the normal shown in figure 1.

For each sheet in the sample, the out-of-squareness will not normally exceed 0,15 % but in no circumstances shall it exceed 0,25 %.



$$\text{Out-of-squareness} = \frac{A}{B} \times 100\ \%$$

Figure 1 — Measurement of out-of-squareness

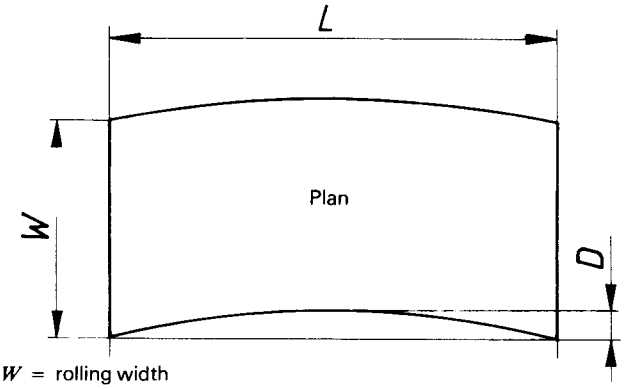
8.4 Camber tolerance

Camber is the deviation of an edge from a straight line forming a chord to it.

Camber expressed as a percentage is defined as

$$\frac{\text{deviation } (D)}{\text{length of chord } (L)} \times 100$$

For each sheet in the sample, camber shall not exceed 0,15 %.



W = rolling width
L = length of chord
D = deviation

Figure 2 — Camber of sheet

NOTE — Other geometrical features may be present in cold reduced tinplate and cold reduced blackplate sheets, such as:

burr: metal displaced beyond the plane of the surface of the sheet by shearing action.

edge wave: an intermittent vertical displacement occurring at the sheet edge when the sheet is laid on a flat surface.

centre buckle (full centre): an intermittent vertical displacement or wave in the sheet occurring other than at the edges.

longitudinal bow (line bow): residual curvature in the sheet remaining along the direction of rolling.

transverse bow (cross bow): a mode of curvature in the sheet such that the distance between the edges parallel to the rolling direction is less than the sheet width.

Although it is not possible at present to define methods of measuring or to specify limits for these geometrical features, certain of which are subjective to the equipment employed by the purchaser, the producer shall endeavour to keep the occurrence and magnitude of burr, edge wave, centre buckle, longitudinal bow and transverse bow to a minimum. He should also endeavour to minimize variation of the longitudinal bow.

9 Selection of sample sheets

If tests are made to ascertain compliance with the requirements of this part of ISO 1111, the following procedures shall be adopted.

9.1 Number of bulk packages

As the number of sheet per bulk package can vary, e.g. between 1 000 and 2 000, the rate of sampling is specified on a percentage basis (other than for verification of properties).

For consignments comprising less than four bulk packages, each bulk package shall be sampled individually. For other size consignments, bulk package samples shall be selected at random, at the rate of 20 % of the total number of bulk packages, subject to a minimum of four bulk packages.

9.2 Number of sheets

9.2.1 Verification of grades

From each of the bulk packages selected in accordance with 9.1, sheets at the rate of 1 % per bulk package shall be taken at random and inspected. In case of dispute, further sheets at the rate of 5 % per bulk package shall be taken at random and inspected (see clause 12).

9.2.2 Verification of properties

a) Electrolytic tinplate: From each of the bulk packages selected in accordance with 9.1, two sheets shall be taken for checking the tin coating mass and also the hardness.

b) Hot-dipped tinplate: From each of the bulk packages selected in accordance with 9.1, four sheets shall be taken for checking the tin coating mass and two sheets per bulk package for determining the hardness.

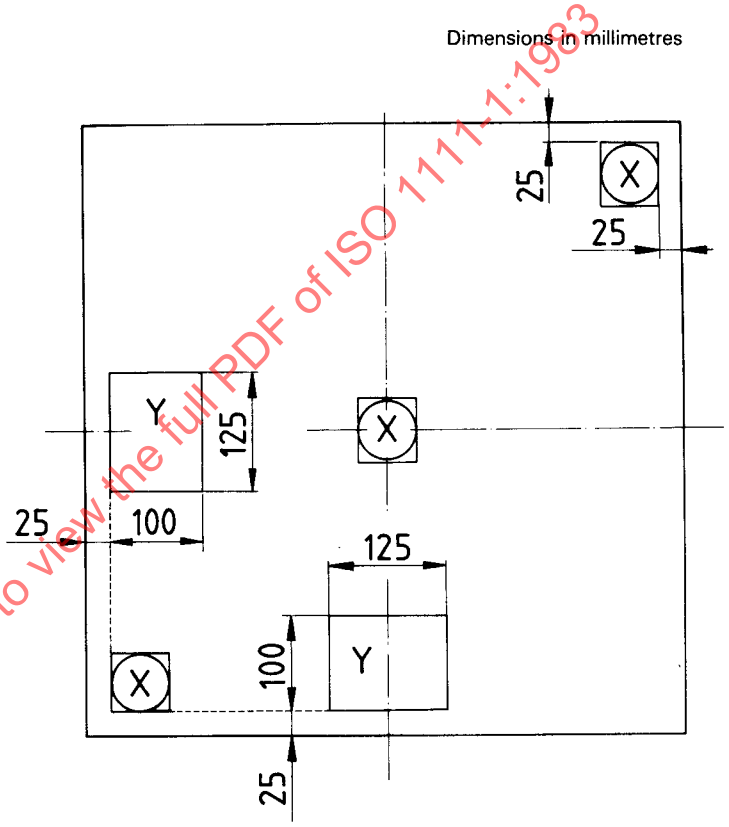
c) Blackplate: From each of the bulk packages selected in accordance with 9.1, two sheets shall be taken for checking the hardness.

9.2.3 Verification of dimensions

From each of the bulk packages selected in accordance with 9.1, sheets at the rate of 0,5 % per bulk package shall be taken at random.

9.3 Location of test specimens

The test specimens shall be taken from the positions indicated in figure 3.



X = specimens for tin coating mass tests
Y = specimens for hardness tests and determination of local thickness within a sheet

Figure 3 — Position of test specimens

10 Determination of tin coating masses

10.1 Specimens

For tin coating mass determination, from each sheet selected in accordance with clause 9, three specimens each of an accurately determined area not less than 2 500 mm^2 and preferably in the form of discs, shall be carefully prepared. These shall be selected, one from the centre of the sheet and the other two from diagonally opposed corners (positions X on figure 3). However, in the case of electrolytically coated material, for routine purposes, the specimens X may be taken at edge-centre-edge locations in a line at right angles to the rolling (tinning) direction. The edge specimens shall clear the edges of the sheet by 25 mm.

10.2 Method of determination

The tin coating mass may be determined by any of the recognized and accepted analytical methods (but see 12.2). The value shall be expressed in grammes of tin per square metre to the nearest 0,1 g/m^2.

Whether tin coating mass determinations are made on individual or grouped specimens, the tin coating mass of a consignment shall be taken as the average value of all the results.

11 Determination of hardness

11.1 Specimens

For determination of hardness, from each sheet selected in accordance with 9.2, two rectangular specimens 100 mm × 125 mm shall be cut from the middle of adjacent sides, that is at positions marked Y on figure 3.

11.2 Hardness test

11.2.1 Three measurements shall be made on each of the specimens selected in accordance with 9.2. The HR 30T tests shall be carried out by the method described in ISO/R 1024, using the conditions detailed in 4.4 a) of that document and using a diamond anvil (see also clause 7 and annex B). In the case of tinplate the test shall be made on the test pieces after chemically or electro-chemically de-tinning. The average value shall be the arithmetic mean of all the values so obtained.

11.2.2 On relatively thin material (e.g. 0,22 mm and thinner), the hardness measurements may be made using the HR 15T test, in which case the values obtained shall be converted using the table given in annex B.

12 Retests

12.1 Material grades

In the event of the sample selected in accordance with clause 9 failing to meet the requirements of clause 5, a further set of samples selected from other bulk packages at the rate of 5 % per bulk package shall be taken at random and inspected. If the retest is satisfactory, the consignment shall be deemed to meet the requirements of this part of ISO 1111, but if the retest fails the consignment shall be deemed not to meet the requirements of this part of ISO 1111.

12.2 Tin coating masses

In the event of the average tin coating mass failing to meet the specified requirements, two further sets of samples from other bulk packages shall be selected as specified in clause 9 and specimens taken as described in 10.1. If both retests are satisfactory, the consignment shall be deemed to meet the requirements of this part of ISO 1111, but if either of the additional tests fails the consignment shall be deemed not to meet the requirements of this part of ISO 1111.

The retest determination shall be made using the iodine titration reference method specified in annex C.

12.3 Hardness tests

In the event of any average hardness test value, determined by the procedure in clause 11, failing to meet the appropriate values specified in table 4, a retest shall be made on two further sets of samples selected from other bulk packages according to the procedure outlined in clause 9. If both retests are satisfactory, the consignment shall be deemed to meet the requirements of this part of ISO 1111, but if the result of either of the retests fails, the consignment shall be deemed not to comply with this part of ISO 1111.

12.4 Dimensional tests

If the result of any dimensional check is unsatisfactory, a further check shall be made on two further sets of samples selected from other bulk packages according to the procedure outlined in clause 9. If both retests are satisfactory, the consignment shall be deemed to meet the requirements of this part of ISO 1111, but if either of the additional checks fails to meet the relevant requirements, the consignment represented shall be deemed not to comply with this part of ISO 1111.

In case of dispute involving the average thickness of a consignment and/or variation of thickness within a sheet, the weighing method only shall be used.

13 Packaging

Single cold-reduced tinplate and blackplate are customarily packed on a stillage platform forming a bulk package weighing between approximately 1 000 kg and 2 000 kg.

The number of sheets in each bulk package shall be a multiple of 100.

NOTE — When required, the purchaser should indicate the direction of the runners of the stillage platform.

14 Coding

14.1 The procedure for composing the abbreviated quality designation shall be as follows:

First, specify the temper classification: T 50, T 52, T 57, etc.

Second, specify the type of tin coating: E (electrolytic equally coated), D (electrolytic differential coated), H (hot-dipped).

Third, specify the tin coating mass according to values shown in

sub-clause 6.2: 2,8/2,8, 5,6/5,6, 8,4/8,4, etc.

sub-clause 6.3: 5,6/2,8, 8,4/2,8, 8,4/5,6, etc.

sub-clause 6.4: 12/12, 14/14, 15/15, etc.

Finally, specify the marking procedure required for differentially coated materials (see 6.6).

NOTE — If it is agreed that the terms (BA) or (CA) be stated, they should appear after the temper designation.

14.2 Examples

Examples of designation are given in table 6.

15 Special arrangements

15.1 Special arrangements between the producer and user may contain other provisions, provided they are not inconsistent with this part of ISO 1111.

15.2 Examples of such arrangements are as follows.

15.2.1 Heavy oil coatings (it should be noted that such coatings may affect lacquerability — see 4.7.2).

15.2.2 Chemical composition of the steel (for example, limitation of certain elements which may affect performance).

15.2.3 Marking of differentially coated tinplate.

15.2.4 Tinplate surface passivation treatment if other than cathodic sodium dichromate is required (see 4.7.1). (Not applicable to hot-dipped tinplate).

Table 6 — Examples of abbreviated quality designation

Type	Class	Abbreviated quality designation
Blackplate	Temper classification T 50	T 50
Tinplate	Temper classification T 57 equally coated electrolytic 2,8/2,8 g/m^2	T 57, E2,8/2,8
Tinplate	Temper classification T 61 (BA) differentially coated electrolytic 8,4/5,6 g/m^2	T 61(BA) D8,4/5,6
Tinplate	Temper classification T 65 (CA) hot-tipped 12/12 g/m^2	T 65(CA) H12/12

Annex A

Recommended marking system to indicate coating mass combination for differentially coated tinplate

The marking system consists of parallel straight lines about 1 mm wide, the distance between the lines indicating the coating masses.

The spacings shown in table 7 should be used.

Table 7 — Spacings used

Code	Line spacing, mm
D5,6/2,8	12,5
D8,4/2,8	25
D8,4/5,6	25 alternating with 12,5
D11,2/2,8	37,5
D11,2/5,6	37,5 alternating with 12,5

Dimensions in millimetres

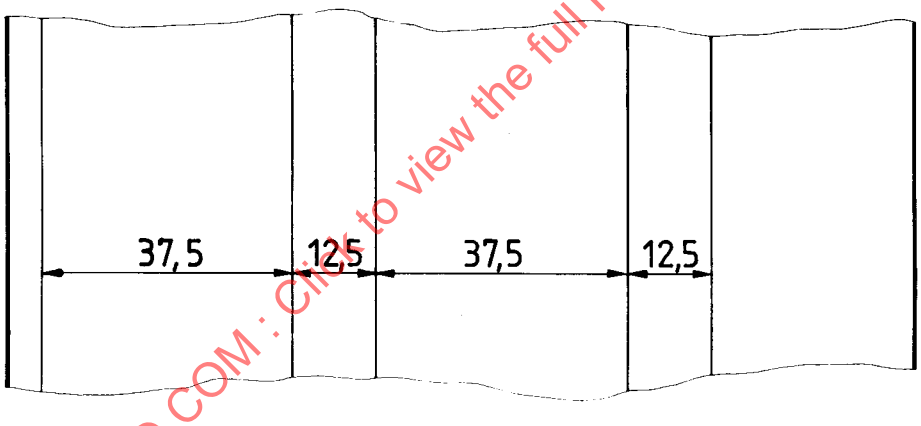


Figure 4 — Marking system for electrolytic tinplate differentially coated (Example of marking for D11,2/5,6)

NOTE — Electrolytic tinplate, differentially coated, with nominal coatings not contained in table 2 should be marked with parallel lines employing 75 mm spacings.

Annex B

Rockwell HR 30T and HR 15T test

The indentation hardness shall be measured on a Rockwell superficial hardness testing machine employing 30T or 15T scales (see ISO/R 1024), as appropriate. The machine shall be provided with an anvil having a diamond centre spot and, in the case of tinplate, tests shall always be carried out on de-tinned specimens. Avoid testing near the edges of the specimen because of a possible cantilever effect.

To carry out the test, place the specimen on the anvil and bring it into contact with the ball indenter by turning the hand wheel until the indicator on the dial shows that the minor load is applied. Then turn the adjustable rim of the dial until the pointer reads zero and apply the major load by operating the handle. The rate of loading is controlled by a dash-pot incorporated in the machine. As soon as the loading is complete, remove the major load by pulling the handle forward and read the Rockwell hardness number directly on the appropriate scale.

If on relatively thin material the HR 15T scale is used (see 7.4), convert the values to HR 30T values using table 8.

Table 8 — Hardness conversion values

HR 15T value	Equivalent HR 30T value
90,0	76,0
89,5	75,5
89,0	74,5
88,5	74,0
88,0	73,0
87,5	72,0
87,0	71,0
86,5	70,0
86,0	69,0
85,5	68,0
85,0	67,0
84,5	66,0
84,0	65,0
83,5	63,5
83,0	62,5
82,5	61,5
82,0	60,5
81,5	59,5
81,0	58,5
80,5	57,0
80,0	56,0
79,5	55,0
79,0	54,0
78,5	53,0
78,0	51,5
77,5	51,0
77,0	49,5
76,5	49,0
76,0	47,5
75,5	47,0
75,0	45,5
74,5	45,0
74,0	43,5
73,5	43,0
73,0	41,5