BS EN 10205:2016

BSI Standards Publication

Cold reduced tinmill products — Blackplate

bsi.

National foreword

This British Standard is the UK implementation of EN 10205:2016. It supersedes BS EN 10205:1992 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/109, Coated and Uncoated Flat Products to be Used for Cold Forming.

A list of organizations represented on this committee can be obtained on request to its secretary.

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European foreword

This document (EN 10205:2016) has been prepared by Technical Committee ECISS/TC 109 “Coated and uncoated flat products to be used for cold forming”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by May 2017, and conflicting national standards shall be withdrawn at the latest by May 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10205:1991.

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1 Scope

This European Standard specifies requirements for blackplate product in the form of coils intended for direct use and mostly for the production of tinplate, electrolytically chromium / chromium oxide plate (ECCS) and electrolytically zinc coated plate.

Blackplate is specified in nominal thicknesses that are multiples of 0,005 mm from typical 0,10 mm up to 0,60mm.

This European Standard applies to coils in nominal minimum widths of 600 mm.

In addition to this standard the general technical delivery conditions of EN 10021 apply.

NOTE Standard width coils for specific uses, e.g. tab stock, can be slit into narrow strip for supply in coil form.

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.

EN 10020, *Definition and classification of grades of steel*

EN 10021, *General technical delivery conditions for steel products*

EN 10027-1, *Designation systems for steels - Part 1: Steel names*

EN 10027-2, *Designation systems for steels - Part 2: Numerical system*

EN 10052, *Vocabulary of heat treatment terms for ferrous products*

EN 10079, *Definition of steel products*

EN 10204:2004, *Metallic products - Types of inspection documents*

EN ISO 6892-1:2009, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10079 and EN 10052 and the following apply.

3.1
single reduced blackplate
blackplate which has been reduced to the desired thickness in a cold-reduction mill and subsequently annealed and temper rolled mostly without a water-based lubricant

3.2
double reduced blackplate
blackplate which has been reduced to the desired thickness in a cold-reduction mill and subsequently annealed and temper rolled mostly with the help of a water-based lubricant to achieve a higher gauge reduction

3.3
temper rolling
secondary rolling process to obtain desired roughness and mechanical properties

3.4
standard grade
material that, having passed line inspection, is suitable under normal conditions of storage, not containing any defect that renders the material unsuitable for its intended use

3.5
batch (box) annealing
BA
process in which the cold reduced strip is heated in tight coil form, within a controlled atmosphere, for a pre-determined time/temperature cycle

3.6
continuous annealing
CA
process in which cold reduced coils are unwound and heated in strip form within a controlled atmosphere for a pre-determined time/temperature cycle

3.7
surface appearance
surface appearance of blackplate products determined by the surface characteristics of the steel

3.8
finish
finish of blackplate products determined by roughness average (Ra) and appearance of the surface of the blackplate resulting from controlled preparation of the work rolls used for the final stages of rolling

3.8.1
bright finish
finish resulting from the use of temper mill work rolls that have been ground to a high degree of polish

3.8.2
stone/fine stone finishes
finishes characterized by a directional pattern, resulting from the use of final mill work rolls that have been ground to a lower degree of polish than those used for the bright finish

3.8.3
matt finish
finish resulting from the use of final mill work rolls that have been shot blasted

3.9
coil
rolled flat strip product which is wound into regularly superimposed laps

3.10
longitudinal (line) bow
residual curvature in the strip remaining along the direction of rolling

3.11
transverse (cross) bow
mode of curvature in the sheet such that the distances between its edges parallel to the rolling direction is less than the sheet width

3.12
centre fullness (full centre, centre buckle)
intermittent vertical displacement occurring other than at the edge of the sheet or coil when the material is laid on a flat horizontal surface

3.13
edge camber
deviation of the coil from a straight line forming its chord

3.14
edge wave
intermittent vertical displacement occurring at the edge of a sheet or a sample from a coil when laid on a flat horizontal surface

3.15
feather edge (transverse thickness profile)
variation in thickness, characterized by a reduction of thickness close to the edges, at right angles to the rolling direction

3.16
burr
metal displaced beyond the plane of the surface of the strip by shearing action

Note 1 to entry: Blackplate is usually supplied with cut edges. Blackplate will then have burrs caused by cutting.

3.17
rolling width
width of the strip perpendicular to the rolling direction

3.18
consignment
quantity of material of the same specification made available for dispatch at the same time

3.19
pallet
base platform on which a coil is placed to facilitate ready transportation

3.20
sample unit
750 m of coil for the purposes of sampling

3.21
line inspection
final inspection of the finished product performed by instruments and/or by visual examination at normal production line speeds

3.22
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

3.23
mill edge
trimmed before temper rolling therefore leading to higher width tolerances

4 Classification and designation

4.1 Classification

The classification of the relevant steel grades is according to EN 10020. Steel grades for cold reduced blackplate for the manufacturing of tinplate or ECCS are non alloy quality steels.

4.2 Designation

For the steel grades covered by this document, the steel names as given in the relevant tables are allocated in accordance with EN 10027-1. TS grades are batch annealed grades and TH grades are continuous annealed grades. The steel numbers as given in the relevant tables are allocated in accordance with EN 10027-2.

5 Information to be supplied by the purchaser

5.1 Mandatory information

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

a) quantity expressed in length or mass;

b) description of the material (blackplate coil);

c) dimensions (thickness and width);

d) edge condition, see 6.4 (T for trimmed edges and M for mill edges);

e) number of this European Standard (EN 10205);

f) steel name or steel number (see Table 3);

g) appearance (see 6.5);

h) finish (see 6.5);

i) surface condition (oiling), see 6.6;

j) intended use of the material e.g. stamping, drawing, beading, bending and assembly work such as. joint forming, soldering and welding, surface coating (metallic and organic coating);

k) dispatch and packaging conditions (see Clause 14), e.g. inner diameter of coils, coil winding direction, maximum and minimum mass and/or outside diameter of coils;

l) if required, standard designation for a test report 2.2 or an inspection certificate 3.1 or 3.2 in accordance with EN 10204:2004 (see 10.1).

5.2 Options

In addition to the information in 5.1 the purchaser shall provide further information to the supplier to ensure that the order requirements are consistent with the end use of the product.

The purchaser is responsible of the choice of grade, the supplier not always being aware to assess of the relevance of the purchaser's choice.

5.3 Ordering example

a) Example 1: 5 t blackplate coil, thickness 0,22 mm, rolling width 800 mm with trimmed edges in accordance with this European Standard of steel grade TS275, appearance A, stone finish with test report 2.2 according to EN 10204:2004 shall be designated:

1) 5 t blackplate coil 0,22 × 800 EN 10205-TS275-A-ST, EN 10204:2004 – 2.2;

2) 5 t blackplate coil 0,22 × 800 EN 10205-1.0375-A-ST, EN 10204:2004 – 2.2.

b) Example 2: 5 t blackplate coil, thickness 0,18 mm, rolling width 750 mm with trimmed edges in accordance with this European Standard of steel grade TH620, appearance B, stone finish, with inspection certificate 3.1 according to EN 10204:2004 shall be designated:

1) 5 t blackplate coil 0,18 × 750 EN 10205-TH620-B-ST, EN 10204:2004 – 3.1;

2) 5 t blackplate coil 0,18 × 750 EN 10205-1.0374-B-ST, EN 10204:2004 – 3.1.

NOTE The designation does not cover variations in all material properties.

6 Steelmaking process

6.1 General

The steelmaking process of blackplate is under the responsibility of the manufacturer with the exception that the steel is continuously cast and that the open hearth (Siemens-Martin) process shall not be employed unless in combination with a secondary steelmaking or ladle refining process. If specified at the time of order the steel making process shall be reported to the purchaser.

6.2 Chemical composition and deoxidation

If blackplate is used for food contact, the steel type shall be manufactured in accordance with food safety regulations. The purchaser should be aware of existing national regulations which may impose limitations on some elements.

NOTE Information on the types and chemical composition of steels for blackplate is provided in Annex A.

All steels shall be fully killed.

6.3 Product traceability

Each product shall be traceable to the cast.

6.4 Mill edges/trimmed edges

If not specified otherwise at the time of enquiry and order the products shall be delivered with trimmed edges.

6.5 Surface characteristics

Surface characteristics concern surface appearance (see Table 1) and surface finish (see Table 2).

If not specified otherwise at the time of enquiry and order, the material shall be delivered with surface appearance B and surface finish Stone.

Table 1 — Surface appearance

Symbol	Characteristics
A	Bright, metallically clean surface. Pitting, small defects and scratches are permitted
B	Bright, metallically clean surface. Pitting, grooves, and scratches are permitted as long as the uniform smooth appearance is not substantially impaired when viewed with the naked eye.
C	Bright, metallically clean surface. Pitting, grooves, and scratches are permitted as long as the uniform smooth appearance of the mirror surface is not impaired.

Table 2 — Surface finish

Product finish	Code	Normal surface roughness, R_a, µm
Bright	BT	≤ 0,35
Fine stone	FS	0,25 to 0,45
Stone	ST	0,35 to 0,60
Matt	MM	≥ 0,90

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

6.6 Oiling

To avoid corrosion blackplate shall normally be supplied with a sufficient layer of suitable, non-mineral, protective oil. The oil shall be removed by an adequate inline cleaning process before any subsequent coating.

Blackplate is normally supplied oiled on both sides.

The selection of oils and the oiling quantity may be the subject of a separate agreement.

If blackplate is temper rolled with a water based lubricant the blackplate is deemed suitable for immediate further processing without further inline cleaning.

If the blackplate is to be supplied in the as-rolled condition, or without oil, there is an increased risk of scratching and rust formation during transportation and storage.

6.7 Discontinuities

The production of blackplate coils in continuous-strip mill operations does not allow the opportunity for the removal of all surface defects. However the manufacturer shall ensure that in coils according to this European standard at least 90 % of the coil can be used for the intended further processing: free from surface defects which render the material unsuitable for the intended use:

- free from damage which render the material unsuitable for intended use;
- compliant to the requirements as specified in this European standard.

7 Mechanical properties

7.1 General

For the purposes of this European Standard, blackplate is classified based on tensile properties as given in Table 3.

Individual mechanical properties can significantly influence the performance of blackplate in processing and subsequent intended use and will vary depending on the steel type and the methods of casting, annealing and skin passing employed.

For the purpose of this European Standard the tensile test is the reference method for the determination of the mechanical properties. In cases of dispute, a tensile test shall be performed.

The mechanical properties of the blackplate determined by the means of the tensile test are used for the classification shown in Table 3.

The tensile test method is reported in 11.1.

7.2 Mechanical properties of blackplate

When tested as described in 7.1, the mechanical properties shall be as given in Table 3. For the indication of the mechanical properties the Rockwell hardness test can also be performed (see Annex B).

Table 3 — Mechanical properties of blackplate products ($R_{p0.2}$ or R_{el})

		Yield/0,2 % Proof strength (R_p) - MPa		Tensile strength (R_m) - MPa	
Steel name	Steel number	Nominal values	Dev.	Aim values	Dev.
TS230	1.0371	230	±50	325	±50
TS245	1.0372	245	±50	340	±50
TS260	1.0379	260	±50	360	±50
TS275	1.0375	275	±50	375	±50
TS290	1.0381	290	±50	390	±50
TS480	1.0380	480	±50	510	±50
TS550	1.0385	550	±50	575	±50
TH415	1.0377	415	±50	435	±50
TH435	1.0378	435	±50	460	±50
TH470	1.0351	470	±50	510	±50
TH520	1.0384	520	±50	540	±50
TH550	1.0373	550	±50	570	±50
TH580	1.0382	580	±50	590	±50
TH620	1.0374	620	±50	625	±50

NOTE 1 Table 3 represents the grades in common use. Other grades can be available for specific end uses.

NOTE 2 The deviations shown refer to measurements of individual samples.

NOTE 3 The deviation of ± 50 shown in Table 3 represents the normal range within the specified grades. For special requirements a tolerance of ± 40 can be supplied.

NOTE 4 TS grades are batch annealed and TH grades are continuously annealed.

8 Tolerances on dimensions and shape

8.1 Linear dimensions

8.1.1 Thickness

The thickness of the material shall conform to the following:

a) the deviation from the agreed thickness measured at the centre line of the strip shall not exceed ± 5 %;

b) the deviation from the agreed thickness measured at any point from at least 6 mm of the mill trimmed edge shall be within +5 % to –8 % ;

c) the average thickness shall not deviate from the nominal thickness by more than ± 2 % for consignments comprising more than 10 000 m (or corresponding number of sheets).

The test method is reported in 11.2.2.

8.1.2 Feather edge

For the definition of feather edge, see 3.11. The thickness when measured at a distance of 6 mm from the trimmed edge shall not vary by more than 6 % from the centre thickness measured perpendicularly to the trimmed edge.

The test method is reported in 11.2.3.

8.1.3 Width

The coil width of blackplate with mill edges shall not differ from the ordered dimension, by more than +9/-0 mm.

The coil width of blackplate with trimmed edges shall not differ from the ordered dimension, by more than +3/-0 mm.

8.1.4 Coil length

The difference between the actual length and the manufacturer's indicated length, measured on any single coil, shall not exceed by more than ± 3 %.

8.2 Shape

8.2.1 Edge camber of coils

For trimmed edges, edge camber, measured over a chord length of 1 m, shall not exceed 0,3 mm (see Figure 2) when measured on the coil prior to slitting.

The test method is reported in 11.2.4.

8.2.2 Edge wave

The wave height (h) at any point shall not exceed 2,5 mm (see Figure 3). No more than six waves in excess of 1,5 mm shall be present over a cut length of 1 m.

The test method is reported in 11.2.5.

8.2.3 Longitudinal and transverse bow

Bow may be either convex or concave face uppermost on the bulk package. The normal convention is to express convex bow uppermost as a positive (+) value and concave bow as a negative (-) value (see Figure 4).

The individual values of both longitudinal and transverse bow shall not exceed 30 mm. This shall apply after normal levelling operations.

Where both convex and concave bow are present in the same coil, the sum of the maximum values of each, ignoring the sign (±), shall not exceed 30 mm.

The test method is reported in 11.2.6.

8.2.4 Centre fullness

Centre fullness shall be determined measuring the edge lift developed during the test. The value shall not exceed 9 mm (see Figure 5).

NOTE Centre fullness is not clearly visible in a coil but usually becomes apparent during either printing or slitting. This feature is best observed when the sheet is suspended vertically from one corner.

The test method is reported in 11.2.7.

8.2.5 Burrs

Burrs shall not be present to such an extent as to interfere with the processing of the product. If there are special requirements for these edges, corresponding agreements shall be made on ordering.

9 Welds within a coil

The coils shall be continuous, within the weight limits supplied, if necessary by means of electrical welds.

The number of welds in a coil shall not exceed three in lengths of 10 000 m. No joint shall be placed nearer than 500 m from any extremity of the coil.

The location of each weld in a coil shall be marked with a punched hole and additionally be indicated visibly.

NOTE The location of each weld can be indicated by the insertion of a piece of non-rigid material. However, alternative methods can be agreed between the producer and the purchaser at the time of enquiry and order.

The total thickness of any weld shall not exceed 50 % the nominal thickness of the material forming the weld.

In any lap weld, the total length of overlap shall not exceed 10 mm. The free overlap shall not exceed 5 mm.

10 Inspection and Sampling

10.1 Testing procedures and types of documents

Products complying with this European Standard may be ordered and delivered with an inspection document 2.2, 3.1 or 3.2 as specified in EN 10204:2004.

If agreed at the time of enquiry and order, a 2.2 test report shall be provided.

If in accordance with the agreements in the order an inspection certificate 3.1 or 3.2 to EN 10204:2004 is to be provided, the specific inspections and tests described shall be carried out and the results shall be confirmed in the inspection certificate.

10.2 Frequency of testing and sampling

10.2.1 General

The amount of testing, the sampling conditions and the test methods to be applied for the verification of the requirements shall be in accordance with the following.

10.2.2 Lots and units

For the purpose of sampling, each consignment of coils shall be considered as one lot.

10.2.3 Selection of sample units

For lots comprising up to and including 20 units, four sample units shall be selected at random.

For lots comprising more than 20 units, four units shall be selected at random from each 20 units and from any remaining part of 20 units.

10.2.4 Selection of sample sheets

After the coils in a consignment have been cut into rectangular or scrolled sheets, the sheets deemed not to be of standard grade shall be excluded. The standard grade sheets that remain shall be sampled using a unit of strip 750 m in length (which approximates to one bulk package of blackplate) in accordance with Figure 1.

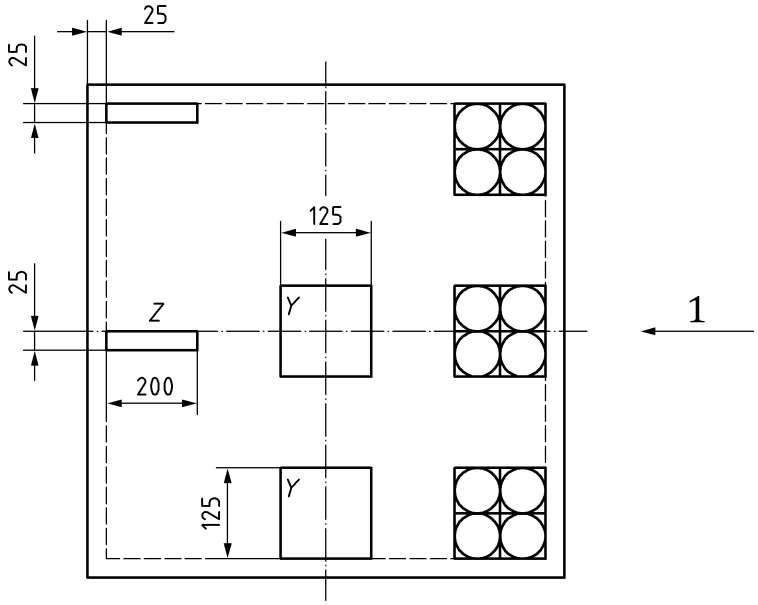
Since the samples shall be cut from coils in the consignment, sampling is usually carried out by the purchaser during the normal shearing operation.

From each sample unit selected in accordance with Figure 1 the following sample sheets shall be taken at a distance from at least 5 m from each end of a coil:

a) for verification of the dimensions and shape: five sheets;

b) for the verification of the mechanical properties: two sheets. For each of the two sheets, two rectangular test samples of approximately 200 mm x 25 mm wide, (taken in parallel to the rolling direction at a position marked *Z* in Figure 1). Ensure that the edge test samples are away from the edges of the sheet by a minimum of 25 mm. Unless the material has not been already pre-stoved through a lacquering or printing process, artificially age the test pieces at 200 °C for 20 min before carrying out the tensile test.

Dimensions in millimetres



Key

1 direction of rolling

Y test pieces for determination of local thickness variation

Z test pieces for tensile tests

Figure 1 — Location of test pieces

11 Test methods

11.1 Tensile test

Determine the 0,2 % proof strength as described in EN ISO 6892-1 (see also 7.1) using the conditions specified for thin products of EN ISO 6892-1.

Carry out one test on each of the test pieces, i.e. two tests per sample sheet selected.

Calculate the representative proof strength for the consignment as the arithmetic mean of all the proof strength results on all the sample sheets taken from the consignment.

11.2 Tolerances on dimensions and shape

11.2.1 General

The following tests are performed only in case of dispute.

11.2.2 Test method for thickness

Thickness shall be measured using a spring loaded micrometer accurate to 0,001 mm. The micrometer shall have a ball ended shank of approximately 3 mm diameter, and a curved surface base anvil of approximately 25 mm radius.

Measurements shall be made to the nearest 0,001 mm.

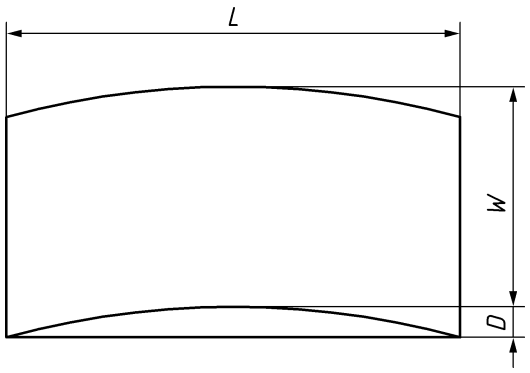
Thickness at individual points shall be measured at least 6 mm from the edge.

11.2.3 Feather edge

The measurement of feather edge shall be done on three individual points and shall be measured on the same straight line perpendicularly to the rolling direction using a spring loaded micrometer as described previously.

The three measurements shall be made along the stated line at the centre of the rolling width and 6 mm from each trimmed rolling width edge.

11.2.4 Short pitch camber



Key

L length of chord

W rolling width

D deviation from a straight line

Figure 2 — Short pitch camber of coils

The short pitch camber shall be tested as follows: The selected sample is placed (Figure 2) against a straight edge and short pitch camber (D) is determined by using a feeler gauge of 0,3 mm diameter. Where the gauge will fit between the straight edge and the sample, the product is deemed to be out of specification.

11.2.5 Edge wave

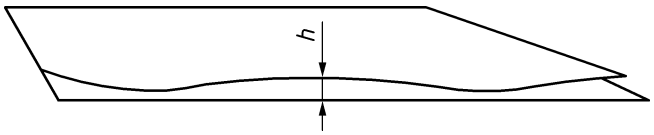


Figure 3 — Edge wave

The edge wave shall be tested as follows: Each sample is laid on a flat horizontal surface which is larger than the sample itself.

Wave heights are determined by using feeler gauges of standard diameters in increments of 0,25 mm (Figure 3).

The wave height shall be given as the feeler gauge diameter that just fits under the wave at the edge of the sample.

11.2.6 Longitudinal or transverse bow

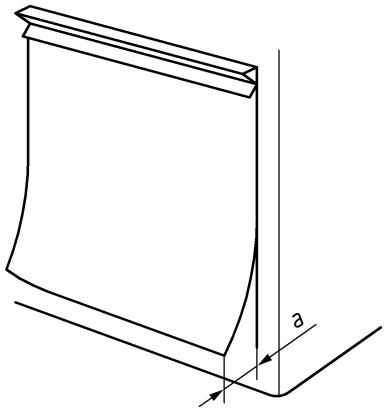


Figure 4 — Longitudinal or transverse bow

The maximum value of longitudinal and transverse bow shall be determined by hanging the sample from one horizontal edge against a rigid vertical surface, noting whether the upper or lower surface is against the vertical surface, so that the bow causes the bottom edge of the sample to stand away from that surface. When selecting the sample it is necessary to identify the outer and inner face of the coil.

The sample shall be evenly supported along the top to a depth not exceeding 25 mm from the edge. When purchased as coil, this shall apply after normal levelling operations. The maximum distance the bottom edge stands away from the vertical (value *a* in Figure 4) is measured with a steel ruler to the nearest 1 mm and recorded with the appropriate plus or minus sign indicating convex or concave bow respectively.

11.2.7 Centre fullness

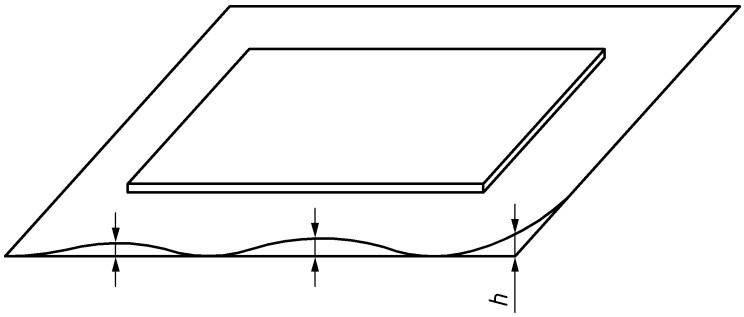


Figure 5 — Centre fullness

This test applies only to sheets of not less than 600 mm coil width and 750 mm cut length. No test method is proposed for sheets below these dimensions. The sample sheet shall be laid on a flat, horizontal, surface which is larger than the sample. A rigid flat and heavy board, approximately 450 mm x 600 mm x 25 mm thick shall be placed on the centre of the sample with the length oriented along to the rolling direction. It may be necessary to test the sample on both surfaces.

The board shall be moved around the surface of the sample centre until a position giving highest edge lift can be identified. Pressure shall be then applied to the board so as to flatten the sample in the centre and raise the edge to a maximum height. During the test the board shall not overlap the edges to be measured.

Edge lift shall be determined by using a 9 mm diameter feeler gauge and the product is deemed out of specification when the feeler gauge fits under the edge of the sheet at the point of maximum lift (value *h* in Figure 5).

12 Retests

For retests, sorting and reprocessing in accordance with Figure 1 the requirements of EN 10021 shall apply (see 10.2.4).

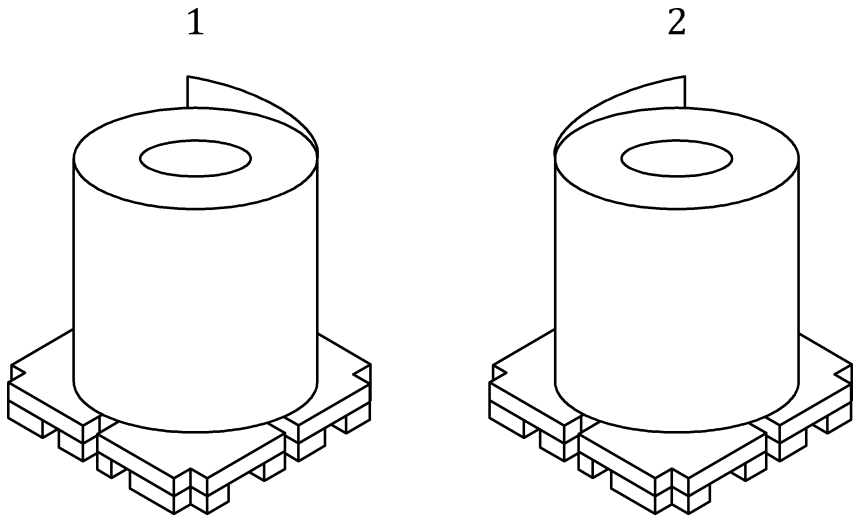
13 Marking

The products shall be marked by a label with the manufacturer's trademark or symbol and the steel name or number. The product shall also be marked with dimensions as well as an identification number related to an appropriate inspection certificate.

14 Dispatch and packaging

14.1 Coil dispatch

Unless otherwise requested at the time of order, coils shall be dispatched with their cores in a vertical position (see 5.1) and wound anti clockwise (see 1 of Figure 6). (The other two options would be with the cores horizontal and vertical position wound clockwise (see 2 of Figure 6)). The internal diameters of the coils shall be within the range 420 (+10, −15) mm.



Key

1 = anti clockwise

2 = clockwise

Figure 6 — Direction of coil winding

14.2 Pallet dimensions

The purchaser may specify the pallet dimensions to ensure proper handling. If not specified by the purchaser, the pallet dimensions are chosen at the discretion of the manufacturer.

Annex A
(informative)

Examples of steel types and chemical composition

Steels for tinmill products normally contain elements as shown in Table A.1, type A steel being lower in carbon and manganese than type B.

Purchasers should agree with their suppliers the type to be ordered for specific applications, noting that type B is not suitable for welding. Steels with alternative compositions are available for special purposes. Details should be agreed with the supplier.

Continuous casting is the normal method of producing the steels for tinmill products. Continuously cast steel is prepared by using a technique in which the steel is continuously solidified upon pouring, resulting in a more homogeneous structure than ingot cast steel.

Table A.1 — Chemical composition of continuously cast steels % by weight

Element	Type A	Type B
	Element (maximum unless otherwise stated)	
Carbon	0,04 - 0,08	0,09 - 0,12
Silicon	0,030	0,030
Manganese	0,18 - 0,35	0,30 - 0,50
Phosphorus	0,020	0,020
Sulphur	0,020	0,020
Copper	0,080	0,080
Nickel	0,080	0,080
Tin	0,020	0,020
Arsenic	0,020	0,020
Molybdenum	0,020	0,020
Chromium	0,080	0,080
Nitrogen	0,008	0,008
Aluminium	0,02 - 0,08	0,02 - 0,08
Others	0,020	0,020

NOTE 1 Some individual chemical elements can be modified upon agreement to suit special applications.

NOTE 2 Chemical elements included as “Others” are those which occur naturally in very small quantities but which are not deliberately added in the steelmaking process.

The choice of a suitable physical or chemical analytical method for the analysis shall be at the discretion of the manufacturer. For product analysis the relevant existing European or International Standards should be taken into account.

NOTE The list of available International Standards on chemical analysis is given in CEN/TR 10261.

Annex B
(informative)

The Rockwell Hardness test for routine determination

B.1 General

This is not the reference method. In all cases of dispute, the method described in EN ISO 6892-1:2009, 13.4 should be used.

B.2 Test pieces

The hardness tests shall be carried out prior to lacquering or printing.

From each of the sample sheets obtained in accordance with Clause 12, take two test pieces 125 mm X 125 mm from the positions marked *Y* in Figure 1.

NOTE 1 The test pieces (*Y*) taken for determination of the thickness variations within the individual sample sheets can be used also for the hardness determinations where appropriate.

Before carrying out the hardness tests in accordance with B.3, remove any coating layers by chemical means (to avoid hardening of the surface during preparation) and artificially age the test pieces at 200 °C for 20 min.

NOTE 2 Polish shot blast finish material with 600 grit grinding paper to avoid any influence of the topography. The resulting hardness test value will be higher due to grinding.

B.3 Test method

Using a Rockwell superficial hardness testing machine determine the Rockwell HR30 Tm indentation hardness either:

a) directly, in accordance with EN ISO 6508-1 or

b) indirectly, on relatively thin sheets (e.g. 0,22 mm and thinner), by determining the HR 15 T hardness in accordance with EN ISO 6508-1 and then converting the HR 15 T values to HR 30 Tm values using Table B.1.

Make three hardness measurements on each of the test pieces taken in accordance with B.2.

Calculate the representative hardness for the consignment as the arithmetic mean of all the hardness results on all the sample sheets taken from the consignment.

Carry out the tests on test pieces according to EN ISO 6508-1 from which all organic coatings have been removed. Avoid testing near the edges of the test pieces because of a possible cantilever effect.

Table B.1 — Rockwell HR 15 T values and their HR 30 Tm equivalents

HR 15 T	Equivalent HR 30 Tm value
92,0	80,5
91,5	79,0
91,0	78,0
90,5	77,5
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

B.4 Hardness for tinmill products

Hardness values for tinmill products shall be as given in Table B.2 when tested as described in B.3.

Table B.2 — Hardness values

Rockwell HR30Tm hardness values (for guidance only)						
Thickness t (mm)						
	t ≤ 0,21		0,21 < t ≤ 0,28		t > 0,28	
Steel grade	Nom.	±	Nom.	±	Nom.	±
TS230	Max 53		Max 52		Max 51	
TS245	53	4	52	4	51	4
TS260	56	4	55	4	54	4
TS275	58	4	57	4	56	4
TS290	60	4	59	4	58	4
TH415	62	4	61	4	60	4
TH435	65	4	65	4	64	4
TH520	-	-	71	-	-	-
TH550	-	-	72	-	-	-
TH580	-	-	73	-	-	-
TH620	-	-	75	-	-	-

NOTE 1 Table B.2 represents the grades in common use. Other grades are available for specific end use.

NOTE 2 The deviations shown refer to measurements of individual samples.

Annex C
(informative)

List of corresponding former designations

Comprises the former designations and the new designations:

Table C.1 — List of corresponding former designations

Steel name	**Steel number**	**Steel name from** EN 10205:1991
TS230	1.0371	T50BA
TS245	1.0372	T52BA
TS260	1.0379	(T55BA)
TS275	1.0375	T57BA
TS290	1.0381	(T59BA)
TS550	1.0385	(DR550BA)
TH415	1.0377	T61CA
TH435	1.0378	T65CA
TH520	1.0384	(DR520)
TH550	1.0373	DR550
TH580	1.0382	(DR580)
TH620	1.0374	DR620

Bibliography

[1] CEN/TR 10261, *Iron and steel - European standards for the determination of chemical composition*

[2] EN ISO 4288, *Geometrical product specifications (GPS) - Surface texture: Profile method - Rules and procedures for the assessment of surface texture (ISO 4288:1996)*

[3] EN ISO 6508-1, *Metallic materials - Rockwell hardness test - Part 1: Test method (ISO 6508-1:2016)*

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

[5] ISO 11951, *Cold-reduced tinmill products — Blackplate*

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