

Specification for

Continuously hot-dip zinc coated structural steel strip and sheet — Technical delivery conditions

The European Standard EN 10147:1991 with the incorporation of its amendment A1:1995 has the status of a British Standard

ICS 77.140.50

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee ISE/10, Flat rolled steel products, upon which the following bodies were represented:

- British Railways Board
- British Steel Industry
- Cold Rolled Sections Association
- Society of Motor Manufacturers and Traders Limited

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Welded Steel Tube Association
- Coated Metals Limited
- Department of the Environment (Property Services Agency)
- International Tin Research Institute
- Metal Roof Deck Association
- National Association of Steel Stockholders
- Paintmakers' Association of Great Britain Ltd.
- Zinc Development Association

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 June 1996

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The following BSI references relate to the work on this standard.:
Committee reference ISE/10
Draft for comment 90/39695 DC

ISBN 0 580 14999 4

Amendments issued since publication

Amd. No.	Date	Comments
8722	May 1996	
9639	October 1997	Indicated by a sideline in the margin

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National foreword

This British Standard has been prepared by Technical Committee ISE/10 and is the English language version of EN 10147:1991 *Continuously hot-dip zinc coated structural steel strip and sheet for cold forming — Technical delivery conditions*. It incorporates amendment 1:1995. Amendment No. 2 is published to correct typographical errors.

National annex NA gives the mechanical properties, mandrel diameters and coatings available for continuously hot dip coated flat products over greater thickness than 3 mm.

Cross-references

Publications referred to	Corresponding British Standard
EN 10002-1:1990	BS EN 10002 <i>Tensile testing of metallic materials</i> Part 1:1990 <i>Method of test at ambient temperature</i>
EN 10025:1993	BS EN 10025:1993 <i>Hot rolled products of non-alloy structural steels — Technical delivery conditions</i> BS EN 10027 <i>Designation systems for steel</i>
EN 10027-1:1992	Part 1:1992 <i>Steel names, principal symbols</i>
EN 10027-2:1991	Part 2:1992 <i>Steel numbers</i>
EN 10079:1992	BS EN 10079:1993 <i>Definition of steel products</i>
EN 10142:1990	BS EN 10142:1991 <i>Specification for continuously hot-dip zinc coated low carbon steel sheet and strip for cold forming: technical delivery conditions</i>
EN 10143:1993	BS EN 10143:1993 <i>Continuously hot-dip coated steel sheet and strip. Tolerances on dimensions and shape</i>
EN 10147:1991	BS EN 10147:1992 <i>Specification for continuously hot-dip zinc coated structural steel sheet and strip. Technical delivery conditions</i>
EN 10204:1991	BS EN 10204:1991 <i>Metallic products. Types of inspection documents</i>
EURONORM 12	BS 1639:1964 <i>Methods for bend testing of metals</i>

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Summary of pages

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

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

ICS 77.140.50

Descriptors: Iron and steel products, metal plates, steel strips, structural steels, unalloyed steels, hot-dip galvanizing, continuous coating, delivery conditions, designation, classifications, inspection, tests, marking

English version

Continuously hot-dip zinc coated structural steel strip and sheet — Technical delivery conditions

(includes amendment A1:1995)

Bandes et tôles en acier de construction
galvanisées à chaud en continue — Conditions
techniques de livraison
(inclut l'amendement A1:1995)

Kontinuierlich feuerverzinktes Band und Blech
aus Baustählen — Technische
Lieferbedingungen
(enthält Änderung A1:1995)

This European Standard was approved by CEN on 30 November 1991, amendment 1 was approved by CEN on 1995-05-10. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. It includes Amendment 1:1995 which was approved by CEN on 1995-05-10.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword to EN 10147

This European Standard has been prepared by ECISS/TC 27, Surface coated steel flat products, the secretariat of which is held by Normenausschuss Eisen und Stahl (FES) in DIN.

It supersedes Euronorm 147 (1979) — Continuous hot-dip zinc coated unalloyed steel sheet and coil with specified minimum yield strengths for structural purposes; Quality standard.

The European Committee for Iron and Steel Standardization (ECISS) has allocated TC 27 the task of transforming Euronorm 147-79 into a European Standard (EN10147). This European Standard EN 10147 was approved by CEN on 30 November 1991.

In accordance with the Common CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Foreword to Amendment 1

This Amendment 1 to the European Standard EN 10147 has been prepared by Technical Committee ECISS/TC 27, Surface coated steel flat products, of which the secretariat is held by DIN.

During the 14th COCOR meeting on 27 and 28 May 1993 in Brussels ECISS/TC 27 was charged to prepare an amendment of EN 10147 in order to work in the new designations according to EN 10027-1 and ECISS Information Circular IC 10 as well as the steel numbers according to EN 10027-2.

It is intended to issue a second version of EN 10147 as soon as this amendment is adopted.

This amendment to European Standard EN 10147 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 1995, and conflicting national standards shall be withdrawn at the latest by December 1995.

According to the CEN/CENELEC Internal Regulations the following countries are bound to implement this Amendment 1 to European Standard EN 10147: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

1.1 This European Standard specifies requirements for continuously hot-dip zinc coated flat products in thicknesses $\leq 3,0$ mm made of the steels given in Table 1. The thickness is the final thickness of the delivered product after zinc coating. This European Standard applies to strip of all widths and to sheets cut from it (≥ 600 mm width) and cut lengths (< 600 mm width).

The types of coating, coating masses and coating finishes available, and surface qualities are given in Table 2 to Table 4 (see also **5.2** to **5.4**).

1.2 If agreed at the time of ordering, this European Standard may also be applied to continuously hot-dip zinc coated flat products in thicknesses $> 3,0$ m. In this case, the mechanical property, adhesion of coating and surface condition requirements shall also be agreed at the time of ordering.

1.3 The products covered by this European Standard are suitable for applications where the minimum yield strength values and resistance to corrosion are of prime importance. Corrosion protection afforded by the coating is directly proportional to the mass of coating (see also **5.2.2**).

1.4 This European Standard is not applicable to

- continuously hot-dip zinc coated low carbon steel strip and sheet for cold forming (see EN 10142);
- electrolytically zinc coated cold rolled steel flat products (see EN 10152);
- continuously organic coated (coil coated) flat steel products (see EN 10169).

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of testing (at ambient temperature)*.

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

EN 10021, *General technical delivery requirements for steel, and steel products*.

EN 10027-1, *Designation system for steels — Part 1: Steel name, principal symbols*.

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

EN 10079, *Definition of steel products*.

EN 10143, *Continuously hot-dip metal coated steel sheet and strip tolerances on dimensions and shape*.

EN 10204, *Metallic products — types of inspection documents*.

ECISS IC 10, *Designation systems for steel — additional symbols for steel names*.

EURONORM 12, *Bend test for steel sheet and strip less than 3 mm thick*¹⁾.

3 Definitions

For the purposes of this European Standard the following definitions apply in addition to the definitions in EN 10020, EN 10021, EN 10079 and EN 10204 (see clause 2):

3.1 hot-dip zinc coating

application of zinc coating by immersing the prepared products in molten zinc. In this case, wide strip of steel is continuously hot-dip coated; the zinc content of the bath shall be at least 99 %

3.2 coating mass

total mass including both surfaces (in g/m²)

4 Designation

4.1 The steel names are allocated in accordance with EN 10027-1 and ECISS Information Circular IC 10; the steel numbers are allocated in accordance with EN 10027-2.

4.2 The products covered by this European Standard shall be designated as follows in the order given:

- a) type of product (e.g. strip, sheet or cut length);
- b) number of this standard (EN 10147);
- c) steel name or steel number and symbol for the type of hot-dip coating as given in Table 1,
- d) letter indicating the type of coating:

Z	Zinc coating
ZF	Zinc-iron alloy coating

¹⁾ Until they are transformed into European Standards, either the EURONORMS listed or the corresponding national standards of this European Standard may be applied.

e) number denoting the nominal mass of coating (e.g. 275 = 275 g/m² including both surfaces, see Table 4),

f) letter denoting the coating finish (N, M or R, see Table 2 and Table 3),

g) letter denoting the surface quality (A, B or C, see Table 2 and Table 3),

h) letter denoting the surface treatment (C, O, CO or U, see 5.5).

Examples:

Designation of strip made of steel S250GD+Z, coating mass 275 g/m² (275), coating finish normal spangle (N), surface quality A; surface treatment chemical passivation (C):

Strip EN 10147-S250GD+Z275-N-A-C

or: Strip EN 10147-1.0242+Z275-N-A-C

Designation of sheet made of steel S320GD+ZF, coating mass 100 g/m² (100), coating finish regular spangle (R), surface quality B, surface treatment oiled (O):

Strip EN 10147-S320GD+ZF100-R-B-O

or: Strip EN 10147-1.0250+ZF100-R-B-O

4.3 Where appropriate, additional information to the designation as specified in 4.2 shall be given to describe clearly the delivery requirements (see clause 12).

5 Classification of grades and types of delivery

5.1 Steel grades

Table 1 gives a summary of the steel grades available.

5.2 Coatings

5.2.1 Zinc (Z) or zinc-iron alloy (ZF) coatings as given in Table 2 and Table 3 are applicable for the products.

5.2.2 The available coating masses given in Table 2 and Table 3 may be supplied. Other coating masses shall be agreed separately at the time of ordering.

Thicker zinc coatings limit the formability and weldability of the products. Therefore, the forming and weldability requirements should be taken into account when ordering the coating mass.

5.2.3 If agreed at the time of ordering, different coating masses on each surface may be supplied for the hot-dip zinc coated flat products. The two surfaces may have a different appearance as a result of the manufacturing process.

Table 1 — Steel grades and mechanical properties of steels (for thicknesses ≤ 3 mm)

Designation			Yield strength	Tensile strength	Elongation
Steel grade		Symbol for the type of hot-dip coating	R_{eH} N/mm ² min.	R_m N/mm ² min.	A_{80} % min. ^a
Steel name	Steel number				
S220GD	1.0241	+ Z	220	300	20
S220GD	1.0241	+ ZF			
S250GD	1.0242	+ Z	250	330	19
S250GD	1.0242	+ ZF			
S280GD	1.0244	+ Z	280	360	18
S280GD	1.0244	+ ZF			
S320GD	1.0250	+ Z	320	390	17
S320GD	1.0250	+ ZF			
S350GD	1.0529	+ Z	350	420	16
S350GD	1.0529	+ ZF			
S550GD	1.0531	+ Z	550	560	—
S550GD	1.0531	+ ZF			

^a For product thicknesses ≤ 0,7 mm (including zinc coating) the minimum elongation values (A_{80}) shall be reduced by 2 units.

5.3 Coating finish (see Table 2 and Table 3)

Table 2 — Available coatings, finishes and surface qualities for zinc coatings (Z)

Steel grade	Coating ^{ab}	Coating finish			
		N	M		
		Surface qualities ^b			
		A	A	B	C
All	100	×	×	×	×
	140	×	×	×	×
	200	×	×	×	×
	225	×	×	×	×
	275	×	×	×	×
	350	×	×	—	—
	(450)	(×)	—	—	—
	(600) ^c	(×)	—	—	—

^a See also 5.2.2.

^b The coatings and surface qualities given in brackets are available on agreement.

^c Not for steel grade S550GD+Z.

Table 3 — Available coatings, finishes and surface qualities for zinc-iron alloy coatings (ZF)

Steel grade	Coating ^a	Coating finish		
		B		
		Surface qualities		
		A	B	C
All	100	×	×	×
	140	—	×	—

^a See also 5.2.2.

5.3.1 Normal spangle (N)

The finish is obtained when the zinc coating is left to solidify normally. Either no spangle or zinc crystals of different sizes and brightness appear depending on the galvanizing conditions. The quality of the coating is not affected by this.

NOTE If a pronounced spangle is desired, this shall be indicated specially at the time of ordering.

5.3.2 Minimized spangle (M)

The surface has minimized spangles obtained by influencing the solidification process in a specific way. The finish may be ordered if the normal spangle (see 5.3.1) does not satisfy the surface appearance requirements.

5.3.3 Regular zinc-iron alloy coating (R)

This coating results from heat treatment in which iron diffuses through the zinc. The surface has a uniform matt grey appearance.

5.4 Surface quality (see Table 2 and Table 3 and 6.6)

5.4.1 As coated surface (A)

Imperfections such as small pits, variations in spangle size, dark spots, stripe marks and light passivation stains are permissible. Stretch levelling breaks or zinc run-off marks may appear.

5.4.2 Improved surface (B)

Surface quality B is obtained by skin passing.

With the surface quality, small imperfections such as stretch levelling breaks, skin pass marks, scratches, indentations, spangle structure and zinc run-off marks and light passivations marks are permissible. The surface has no pits.

5.4.3 Best quality surface (C)

Surface quality C is obtained by skin passing.

The better surface shall not impair the uniform appearance of a high-class paint finish. The other surface shall have at least the characteristics of surface quality B (see 5.4.2).

5.5 Surface treatment (surface protection)

5.5.1 General

Hot-dip zinc coated flat products generally receive surface protection at the producer's plant as specified in 5.5.2 to 5.5.4.

The period of protection afforded depends on the atmospheric conditions.

5.5.2 Chemical passivation (C)

Chemical passivation protects the surface against humidity and reduces the risk of formation of white rust during transportation and storage. Local discolouring as a result of this treatment is permissible and does not impair the quality.

5.5.3 Oiling (O)

This treatment also reduces the risk of corrosion of the surface.

It shall be possible to remove the oil layer with a suitable degreasing solvent which does not adversely affect the zinc.

5.5.4 Chemical passivation and oiling (CO)

Agreement may be reached on this combination of surface treatment if increased protection against the formation of white rust is required.

5.5.5 Untreated (U)

Hot-dip zinc coated flat products complying with the requirements of this standard are only supplied without surface treatment if expressly desired by the purchaser on his own responsibility. In this case, there is increased risk of corrosion.

6 Requirements

6.1 Manufacturing process

The processes used in steelmaking and manufacturing of the product are left to the discretion of the manufacturer.

6.2 Mechanical properties

6.2.1 The values for mechanical properties given in Table 1 shall apply.

6.2.2 The tensile test values shall apply to longitudinal samples and relate to the test piece cross-section without zinc-coating.

6.2.3 A reduction in the formability of all the hot-dip zinc coated products specified in this standard may occur over time. Therefore it is in the interest of the user to use the products as soon as possible after receiving them.

6.3 Freedom from coil breaks

If the products are to be delivered with freedom from coil breaks (fluting), this shall be indicated separately at the time of order.

6.4 Coating mass

6.4.1 The coating mass shall correspond to the data in Table 4. The values apply for the total mass of the coating of both surfaces for the triple spot test and the single spot test (see 7.4.4 and 7.5.3).

The coating mass is not always equally distributed on both the product surfaces. However, it may be assumed that a coating mass of at least 40 % of the value is given in Table 4 for the single spot test exists on each surface of the product.

Table 4 — Coating masses

Coating ^a	Minimum coating mass in g/m ²) including both surfaces ^c	
	Triple spot test ^c	Single spot test ^c
100	100	85
140	140	120
200	200	170
225	225	195
275	275	235
350	350	300
450	450	385
600	600	510

^a The coatings available for the individual steel grades are given in Table 2 and Table 3.

^b The coating mass of 100 mg/m² (including both surfaces) corresponds to a coating thickness of 7,1 µm per side.

^c See 7.4.4 and 7.5.3.

6.4.2 A maximum or minimum value for the coating mass may be agreed upon per surface of product (single spot test) for each coating given in Table 4.

6.5 Adhesion of coating

The adhesion of the coating shall be tested using the method specified in 7.5.2. After bending, the coating shall show no signs of flaking, but an area of 6 mm from each edge of the specimen shall be disregarded in order to exclude the effect of the cutting. Crazeing and roughening are permissible, as is dusting of zinc-iron alloy (ZF) coatings.

6.6 Surface condition

6.6.1 The surface shall comply with the requirements in 5.3 to 5.5. Unless otherwise agreed at the time of ordering, only one surface shall be inspected at the manufacturer's works. If requested the supplier shall inform the purchaser whether the inspected surface is the top surface or the bottom surface.

Small edge cracks which may occur in the case of uncut edges are not justification for rejection.

6.6.2 When supplying strip in coils, there is greater risk of surface defects than if sheet and cut lengths are supplied as it is not possible for the manufacturer to eliminate all the defects in a coil. This shall be taken into account by the purchaser when evaluating the products.

6.7 Dimensions, tolerances on dimensions and shape

The requirements of EN 10143 shall apply.

6.8 Suitability for further processing

6.8.1 Products complying with the requirements of this standard — with the exception of grades S550GD+Z and S550GD+ZF — are suitable for welding using normal welding methods appropriate for the steel grade and coating mass.

6.8.2 Products complying with the requirements of this standard are suitable for bonding together.

6.8.3 All steel grades and surface qualities are suitable for organic coating. The appearance after this treatment depends on the surface quality ordered (see 5.4).

NOTE Application of surface coatings requires corresponding pre-treatment at the processor's works.

7 Testing

7.1 General

7.1.1 The products may be supplied with or without testing for compliance with the requirements of this European Standard.

7.1.2 If testing is desired, the purchaser shall give the following information at the time of ordering:

- type of test (specific or non-specific test, see EN 10021);
- type of inspection document (see 7.7).

7.1.3 Specific tests shall be carried out in accordance with the requirements in **7.2** to **7.6**.

7.2 Test unit

The test unit consists of 20 t or a fraction of 20 t of hot-dip zinc coated flat products of the same grade and nominal thickness, coating finish and surface appearance. In the case of strip, a coil weighing more than 20 t is regarded as one test unit.

7.3 Number of tests

One series of tests shall be carried out per test unit as specified in **7.2** to determine:

- the mechanical properties (see **7.5.1**);
- the adhesion of the coating (see **7.5.2**); and
- the coating mass (see **7.5.3**).

7.4 Sampling

7.4.1 In the case of strip the samples shall be taken from the beginning or end of the coil. In the case of sheet and cut lengths, the selection of the sample shall be left to the discretion of the inspector carrying out the inspection tests.

7.4.2 The samples for the tensile test (see **7.5.1**) shall be taken in the longitudinal direction at a distance of at least 50 mm from the edges of the product.

7.4.3 The sample for the bend test to determine the adhesion of the coating (see **7.5.2**) may be taken in any direction. The distance from the product edges shall be at least 50 mm. The size of the sample shall be such that the length of the folded edge is at least 100 mm.

7.4.4 The three samples for testing the coating mass (see **7.5.3**) shall be taken as shown in Figure 1 if the product width is adequate. The samples may be round or square and each individual sample shall be at least 5 000 mm² in area.

If sampling as shown in Figure 1 is not possible because the product's width is too small, only one sample shall be taken with an area of at least 5 000 mm². The coating mass determined from it shall comply with the requirements for the single spot test as specified in Table 4.

7.4.5 All the samples shall be taken and, machined if necessary, in such a way that the results of the tests are not affected.

7.5 Methods of test to be used

7.5.1 The tensile test shall be carried out as described in EN 10002-1 using type 2 test pieces (initial gauge length $L_0 = 80$ mm, width $b = 20$ mm) as described in EN 10002-1 (see also **6.2.2**).

7.5.2 The bend test to determine the adhesion of the coating (see also **6.5** and **7.4.3**) shall be carried out as described in EURONORM 12.

The diameters D of the mandrel or bending roll given in Table 5 shall be used. The angle of bend shall be 180° in all cases.

When pressing together with the two legs of the test piece, care shall be taken that the coating is not damaged.

7.5.3 The coating mass shall be determined from the difference in mass of the samples before and after the coating has been removed chemically. In the test with samples as shown in Figure 1, the triple spot test value is the arithmetic mean of the three test results. Each individual result shall meet the requirements of the single spot test as given in Table 4.

However, other methods, e.g. non-destructive tests, may be used for continuous checks at the manufacturer's works.

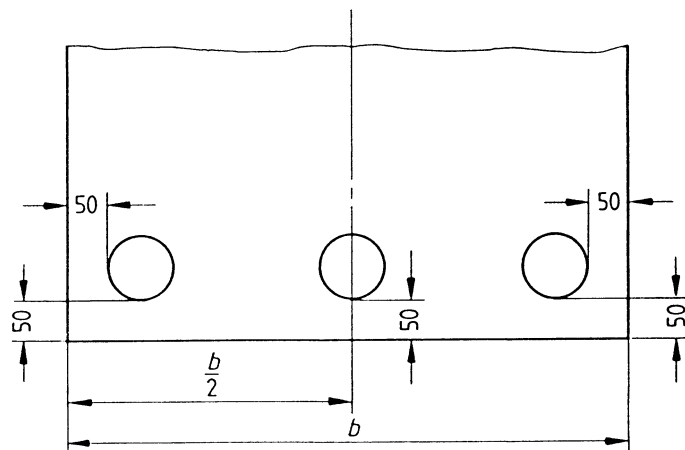
In cases of dispute, the method described in Annex A of this standard shall be used.

7.6 Re-tests

The requirements of EN 10021 shall apply. In the case of coils, the re-test specimens shall be taken from a distance of at least one lap away, but at a maximum of 20 m from the end of the coil.

7.7 Inspection documents

If agreed at the time of ordering, one of the inspection documents specified in EN 10204 shall be supplied (see **7.1.2**).



Dimensions in millimetres

b = Strip or sheet width

Figure 1 — Position of the samples for determining the zone coating mass

Table 5 — Bend test for determining adhesion of the coating (for product thicknesses ≤ 3 mm)

Steel grade	Bending mandrel diameter D^a for the coating							
	100	140	200	225	275	350	450	600
S220GD+Z	1a	1a	1a	1a	1a	1a	1a	2a
S220GD+ZF	1a	1a	—	—	—	—	—	—
S250GD+Z	1a	1a	1a	1a	1a	1a	1a	2a
S250GD+ZF	1a	1a	—	—	—	—	—	—
S280GD+Z	2a	2a	2a	2a	2a	2a	2a	3a
S280GD+ZF	2a	2a	—	—	—	—	—	—
S320GD+Z	3a	3a	3a	3a	3a	3a	3a	4a
S320GD+ZF	3a	3a	—	—	—	—	—	—
S350GD+Z ^b	3a	3a	3a	3a	3a	3a	3a	4a
S350GD+ZF ^b	3a	3a	—	—	—	—	—	—
S550GD+Z	—	—	—	—	—	—	—	—
S550GD+ZF	—	—	—	—	—	—	—	—

^a a = Product thickness

^b Bending mandrel diameter = $4a$ for product thicknesses $> 1,5$ mm

8 Marking

8.1 A label shall be attached to each coil or bundle and shall contain at least the following information:

- name or mark of the manufacturer's works;
- full designation (see 4.2);
- nominal dimensions of the product;
- identification number;
- order number;
- mass of the coil or bundle.

8.2 Marking of the products by branding may be agreed upon at the time of ordering.

9 Packing

The packing requirements for the product shall be agreed at the time of ordering.

10 Storage and transportation

10.1 Moisture, in particular condensation between the sheets, laps of the coil or other adjacent parts made of hot-dip zinc coated flat products, may lead to the formation of matt grey to white deposits (white rust).

The possible types of surface protection are given in 5.5. However, if there is lengthy contact with moisture, the corrosion protection may be reduced locally. As a precaution, the product should be transported and stored dry and protected from moisture.

10.2 During transportation, dark spots may appear on the hot-dip zinc coated surfaces as a result of friction. Generally, they only impair the appearance. Friction is reduced by oiling the products. However, the following precautionary measures should be taken: secure packing, laid flat, no local pressure spots.

11 Disputes

EN 10021 is applicable to disputes after delivery and their settlement.

12 Information to be supplied by the purchaser

The following information is required from the purchaser so that the manufacturer may supply the products to conform with the requirements:

- a) product type (strip, sheet, cut length);
- b) nominal dimensions (thickness, width and — in the case of sheet and cut lengths — length);
- c) quantity;
- d) complete designation (see 4.2);
- e) limiting mass and sizes of the coils and individual bundles of sheets;
- f) any products desired with different coating masses on each side (see 5.2.3);
- g) any products with pronounced spangle (see 5.3.1);
- h) any products to be supplied free from coil breaks (see 6.3);
- i) any maximum or minimum value for the coating per product side (see 6.2);
- j) notification of which surface has been inspected (see 6.6.1);
- k) any testing at the manufacturer's works (see 7.1.1 and 7.1.2);
- l) any supply of an inspection document and type of document (see 7.7);
- m) any marking desired by branding of the products (see 8.2);
- n) any requirement for packing (see clause 9)

Annex A (normative)
Reference method for determination
of the zinc coating mass

A.1 Principle

The sample shall be at least 5 000 mm² in area. Using a sample with a surface area of 5 000 mm², the loss of mass in grams when the coating is dissolved, multiplied by 200, will represent the zinc mass in grams per square metre of product, including both sides.

A.2 Reagents and preparation of the solution
Reagent:

- hydrochloric acid (HCl, $\rho_{20} = 1,19 \text{ g/cm}^3$)
- hexamethylenetetramine

Preparation of the solution:

The hydrochloric acid is diluted with deionized or distilled water in the ration one part HCl to one part water (50 % dilution). Hexamethylenetetramine is then added, stirring, in the ratio of 3,5 g per litre of dilute hydrochloric acid solution.

This prepared solution is equally suitable for a zinc coating or zinc-iron alloy coating and permits the execution of numerous successive dissolutions under satisfactory conditions of attack of the coating, both from the point of view of speed and accuracy.

A.3 Apparatus

Balance capable of weighing samples to an accuracy of 0,01 g. For the test, use a take-off device.

A.4 Procedure

The following operations are applied to each sample:

- if necessary, degrease the test piece with an organic solvent which will not attack the zinc, then dry the sample;
- weigh the sample to an accuracy of 0,01 g;
- place the sample in the solution specified in A.2 at ambient temperature (20 °C – 25 °C). Leave the sample immersed in the solution until the release of hydrogen ceases or only a few bubbles are released;
- after the attack, the sample is washed and brushed under running water, dried with a cloth and then by heating to around 100 °C and cooled or dried by blowing with warm air;
- weigh the sample again to an accuracy of 0,01g;
- determine the difference between the mass of the coated sample and that of the sample without its coating. This difference, calculated grams, represents the mass *m* of the coating.

Annex B(informative)
List of corresponding former
designations

The following Table B.1 comprises the former designations according to EN 10147:1991 and the new designations according to EN 10027-1, ECISS-IC 10 and EN 10027-2.

Table B.1 — List of corresponding
designations

Designation according EN 10147-A1:1995			Designation according to EN 10147:1991
Steel name	Steel number	Symbol for the type of hot-dip coating	Steel name
S220GD	1.0241	+ Z	Fe E 220 G Z
S220GD	1.0241	+ ZF	Fe E 220 G ZF
S250GD	1.0242	+ Z	Fe E 250 G Z
S250GD	1.0242	+ZF	Fe E 250 G ZF
S280GD	1.0244	+ Z	Fe E 280 G Z
S280GD	1.0244	+ ZF	Fe E 280 G ZF
S320GD	1.0250	+ Z	Fe E 320 G Z
S320GD	1.0250	+ ZF	Fe E 320 G ZF
S350GD	1.0529	+ Z	Fe E 350 G Z
S350GD	1.0529	+ ZF	Fe E 350 G ZF
S550GD	1.0531	+ Z	Fe E 550 G Z
S550GD	1.0531	+ ZF	Fe E 550 G ZF

National annex NA (informative)**Mechanical properties and bend mandrel diameters for material over 3 mm thick**

For thicknesses above 3 mm, the mechanical properties and bend mandrel diameters for determination of coating adhesion shall be in accordance with Table NA.1, Table NA.2 and Table NA.3.

Table NA.1 — Steel grade and mechanical properties of steel

Steel name	Steel number	Yield strength R_{eH} min.	Tensile strength R_m	Elongation A_{80} min.
		N/mm ²	N/mm ²	%
S220GD	1.0241	220	300	20
S250GD	1.0242	280	330	19
S280GD	1.0244	280	360	18
S320GD	1.0250	320	390	17
S350GD	1.0259	380	420	16

Table NA.2 — Available coatings, finishes and surface qualities

Steel name	Coating designation	Coating finish		
		N	M	
		Surface qualities		
		A	A	B
S220GD S250GD S280GD S320GD S350GD	Z140	×	×	×
	Z200	×	×	×
	Z225	×	×	×
	Z350	×	×	
	Z450	×		
	Z600	×		
NOTE × indicates availability.				

NOTE × indicates availability.

Table NA.3 — Bend test for adhesion of coating

Steel name	Steel number	Bending material diameter D	
		Coating designation $\leq Z 450$ mm	Coating designation < Z 450 mm
S220GD	1.0241	2a	3a
S250GD	1.0242	2a	3a
S280GD	1.0244	3a	3a
S320GD	1.0250	4a	4a
S350GD	1.0259	4a	4a

NOTE a is the thickness of the bend test piece, in millimetres

List of references

See national foreword.

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