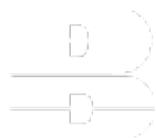


Continuously hot-dip zinc coated low carbon steels strip and sheet for cold forming — Technical delivery conditions

The European Standard EN 10142:2000 has the status of a
British Standard

ICS 77.140.50



National foreword

This British Standard is the official English language version of EN 10142:2000. It supersedes BS EN 10142:1991 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee ISE/10, Flat rolled steel products, to Subcommittee ISE/10/8, Coated steel flat rolled products, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 21 and a back cover.

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April 2000

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English version

Continuously hot-dip zinc coated low carbon steels strip and sheet for cold forming – Technical delivery conditions

Bandes et tôles en aciers doux galvanisées à chaud et en continu pour formage à froid – Conditions techniques de livraison

Kontinuierlich feuerverzinktes Band und Blech aus weichen Stählen zum Kaltumformen – Technische Lieferbedingungen

This European Standard was approved by CEN on 1 April 2000.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 27, Surface coated flat products - Qualities, dimensions, tolerances and specific tests, the secretariat of which is held by DIN.

This European Standard supersedes EN 10142:1990.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2000, and conflicting national standards shall be withdrawn at the latest by October 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

1.1 This European Standard specifies requirements for continuously hot-dip zinc coated flat products in thicknesses up to and including 3,0 mm, unless otherwise agreed at the time of ordering, made of the steel given in 4.1 and 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 Tables 2 to 4 (see also 7.2 to 7.4).

1.2 The products covered by this European Standard are suitable for applications where suitability for forming and resistance to corrosion are of prime importance. Corrosion protection afforded by the coating is directly proportional to the mass of coating (see also 7.2.2).

1.3 This European Standard is not applicable to:

- continuously hot-dip zinc coated structural steel strip and sheet (see EN 10147);
- electrolytically zinc coated cold rolled steel flat products (see EN 10152);
- continuously organic coated (coil coated) steel flat products (see EN 10169-1 and ENV 10169-2);
- continuously hot-dip coated strip and sheet of steels with higher yield strength for cold forming (see EN 10292).

2 Normative references

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate points in the text and the publications are listed hereafter. Subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. In the case of undated references, the most recent edition of the publications referred to applies (including amendments).

EN 10002-1, *Metallic materials. Tensile testing – Part 1: Method of test (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 systems for steel – Part 1: Steel names, 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.*

CR 10260, *Designation systems for steel – Additional symbols.*

EURONORM 12¹⁾, *Bend test for steel sheet and strip less than 3 mm thick.*

ISO 10113, *Metallic materials – Sheet and strip – Determination of plastic strain ratio.*

ISO 10275, *Metallic materials – Sheet and strip – Determination of tensile strain hardening exponent.*

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply in addition to the terms and 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 a molten bath containing a zinc content of at least 99 %

In this case, the wide strip steel is continuously hot-dip coated.

3.2

coating mass

total mass including both surfaces (expressed in grams per square metre)

4 Classification and designation

4.1 Classification

The steel grades according to this European Standard are classified according to their increasing suitability for cold forming as follows:

DX51D+Z, DX51D+ZF:	bending and profiling quality;
DX52D+Z, DX52D+ZF:	drawing quality;
DX53D+Z, DX53D+ZF:	deep drawing quality;
DX54D+Z, DX54D+ZF:	special deep drawing quality;
DX56D+Z, DX56D+ZF:	extra deep drawing quality.

¹⁾ Until it is transformed into an European Standard, either EURONORM 12 or the corresponding national standard may be applied.

4.2 Designation

4.2.1 Steel names

For the steel grades covered by this European Standard, the steel names as given in Table 1 are allocated in accordance with EN 10027-1 and CR 10260.

4.2.2 Steel numbers

For the steel grades covered by this European Standard, the steel numbers as given in Table 1 are allocated in accordance with EN 10027-2 and CR 10260.

5 Information to be supplied by the purchaser

5.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

- a) the quantity to be delivered;
- b) the type of product (strip, sheet, cut length);
- c) the number of the dimensional standard (EN 10143);
- d) the nominal dimensions and the tolerances on dimensions and shape and, if applicable, letters denoting relevant special tolerances;
- e) the term “steel”;
- f) number of this standard (EN 10142);
- g) steel name or steel number and symbol for the type of hot-dip coating as given in Table 1;
- h) number designating the nominal mass of coating (e.g. 275 = 275 g/m² including both surfaces; see Tables 2, 3 and 4);
- i) letter denoting the coating finish (N, M or R; see Tables 2 and 3 and 7.3);
- j) letter denoting the surface quality (A, B or C; see 7.4);
- k) letter denoting the surface treatment (C, O, CO, S, P or U; see 7.5).

EXAMPLE 1 sheet, delivered with dimensional tolerances according to EN 10143 with nominal thickness of 0,80 mm, ordered with special thickness tolerances (S), nominal width 1 200 mm, ordered with special width tolerances (S), nominal length 2 500 mm, ordered with special flatness tolerances (FS) made of steel DX53D+ZF (1.0355+ZF) according to EN 10142, coating mass 100 g/m² (100), coating finish regular (R), surface quality B, surface treatment oiled (O):

1 sheet EN 10143-0,80S×1200S×2500FS
steel EN 10142-DX53D+ZF100-R-B-O

or

1 sheet EN 10143-0,80S×1200S×2500FS
steel EN 10142-1.0355+ZF100-R-B-O

5.2 Options

A number of options are specified in this European Standard and listed below. If the purchaser does not indicate his wish to implement one of these options, the supplier shall supply in accordance with the basis specification of this European Standard (see 5.1):

- a) any steel products suitable for the manufacture of a specific part (see 7.1.2);
- b) any coating masses different from those of Tables 2 and 3 (see 7.2.2);
- c) any special requirements for different coating masses on each surface (see 7.2.3);
- d) any products with pronounced spangle (see 7.3.1);
- e) any products supplied free from coil breaks (see 7.6);
- f) any maximum or minimum value for the coating mass per product surface (see 7.8.2);
- g) notification of which surface has been inspected (see 7.10.1);
- h) any testing for compliance with the requirements of this standard (see 8.1.1 and 8.1.2);
- i) any supply of an inspection document and type of document (see 8.7);
- j) any marking desired by branding of the products (see 9.2);
- k) any requirements for packing (see clause 10).

6 Manufacturing process

The processes used in steelmaking and manufacture of the products are left to the discretion of the manufacturer.

7 Requirements

7.1 Mechanical properties

7.1.1 The products shall be supplied on the basis of the mechanical property requirements in Table 1.

7.1.2 If specially agreed at the time of ordering, products made of steel grades DX52D+Z, DX52D+ZF, DX53D+Z, DX53D+ZF, DX54D+Z, DX54D+ZF, DX56D+Z and DX56D+ZF with suitability for manufacturing a specific part may be supplied. In this case, the values in Table 1 do not apply. The reject tolerances arising when the material is processed shall not exceed a specific proportion to be agreed upon at the time of ordering.

7.1.3 If ordered in accordance with 7.1.1 the mechanical property values in Table 1 apply for the following periods agreed upon at the time of placing the order commencing from the date on which they are made available by the works:

- 8 days for steel grades DX51D+Z, DX51D+ZF, DX52D+Z and DX52D+ZF;

- 6 months for steel grades DX53D+Z, DX53D+ZF, DX54D+Z, DX54D+ZF, DX56D+Z and DX56D+ZF.

7.1.4 The tensile test values apply to transverse samples and relate to the test piece cross-section without zinc coating.

Table 1 - Steel grades and mechanical properties

Designation		Symbol for the type of hot-dip coating	0,2 %-proof strength ^a $R_{p0,2}$ N/mm ²	Tensile strength R_m N/mm ²	Elongation A_{80} ^b % min.	Plastic strain ratio r_{90} min.	Strain hardening exponent n_{90} min.
Steel grade	Steel number						
DX51D DX51D	1.0226 1.0226	+Z +ZF	-	270 to 500	22	-	-
DX52D DX52D	1.0350 1.0350	+Z +ZF	140 to 300 ^c	270 to 420	26	-	-
DX53D DX53D	1.0355 1.0355	+Z +ZF	140 to 260	270 to 380	30	-	-
DX54D DX54D	1.0306 1.0306	+Z +ZF	140 to 220 140 to 220	270 to 350 270 to 350	36 34	1,6 1,4	0,18 0,18
DX56D DX56D	1.0322 1.0322	+Z +ZF	120 to 180 120 to 180	270 to 350 270 to 350	39 37	1,9 ^d 1,7 ^{d,e}	0,21 0,20 ^e

^a If the yield point is pronounced, the values apply to the lower yield point (R_{eL}).

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

^c This value applies to skin passed products only (surface qualities B and C).

^d For thicknesses $> 1,5$ mm, the r_{90} -value shall be reduced by 0,2.

^e For thicknesses $\leq 0,7$ mm, the r_{90} -value shall be reduced by 0,2 and the n_{90} -value shall be reduced by 0,01.

7.2 Coatings

7.2.1 Zinc (Z) or zinc-iron alloy (ZF) coating as given in Tables 2 and 3 are applicable for the products.

7.2.2 The available coating masses are given in Tables 2 and 3. 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.

7.2.3 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.

7.3 Coating finish (see Tables 2 and 3)

7.3.1 Normal spangle (N)

This 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.

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

7.3.2 Minimized spangle (M)

This finish is obtained by influencing the solidification process in a specific way. The surface will have reduced spangles, in some cases, not visible to the unaided eye. The finish may be specified if the normal spangle applicable (see 7.3.1) does not satisfy the surface appearance requirements.

7.3.3 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.

7.4 Surface quality (see Tables 2 and 3 and 7.10)

7.4.1 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.

7.4.2 Improved surface (B)

Surface quality B is obtained by skin passing.

With this surface quality, small imperfections such as stretch levelling breaks, skin pass marks, scratches, indentations, spangle structure and zinc run-off marks and light passivation marks are permissible.

7.4.3 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 7.4.2).

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

Steel grade		Coating designation ^{a,b}	Coating finish			
Name	Number		N	M		
			Surface qualities ^b			
			A	A	B	C
DX51D	1.0226	100	X	X	X	X
		140	X	X	X	X
		200	X	X	X	X
		(225)	(X)	(X)	(X)	(X)
		275	X	X	X	X
		350	X	X	-	-
		(450)	(X)	-	-	-
		(600)	(X)	-	-	-
DX52D	1.0350	100	X	X	X	X
		140	X	X	X	X
		200	X	X	X	X
		(225)	(X)	(X)	(X)	(X)
		275	X	X	X	X
DX53D	1.0355	100	X	X	X	X
DX54D	1.0306	140	X	X	X	X
DX56D	1.0322	200	X	X	X	X
		(225)	(X)	(X)	(X)	(X)
		(275)	(X)	(X)	(X)	(X)
^a See also 7.2.2. ^b The coatings and surface qualities given in brackets are available on agreement.						

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

Steel grades	Coating designation ^a	Coating finish <i>R</i>		
		Surface qualities		
		A	B	C
All	100	X	X	X
	140	X	X	-
^a See also 7.2.2.				

7.5 Surface treatment (surface protection)

7.5.1 General

Hot-dip zinc coated flat products generally receive surface protection at the producer's plant as specified in 7.5.2 to 7.5.6.

The period of protection afforded depends on the atmospheric conditions.

7.5.2 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.

7.5.3 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.

7.5.4 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.

7.5.5 Sealed (S)

Application of a transparent organic film coating of masses about 1 g/m².

This treatment offers additional corrosion protection, specially the protection against fingerprints, it may improve the sliding characteristics during forming operations and can be used as a priming coat for subsequent varnishing.

7.5.6 Phosphated (P)

This treatment improves the adherence and protective effect of a coating applied by the processor. It also reduces the risk of corrosion occurring during transport and storage. Phosphating in conjunction with a suitable lubricating agent may improve workability.

7.5.7 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.

7.6 Freedom from coil breaks

If particular requirements are made for freedom from coil breaks (fluting), it may be necessary to skin pass or stretch level the products. This treatment may limit the formability. Similar conditions exist for the appearance of coil breaks as for the appearance of stretcher strains (see 7.7).

7.7 Stretcher strains

7.7.1 In order to avoid the formation of stretcher strains when cold forming, it may be necessary for the products to be skin passed at the manufacturer's works. As there is a tendency for stretcher strains to form again after some time, it is in the interest of the purchaser to use the products as soon as possible.

7.7.2 Products with surface qualities B and C are free from stretcher strains for the following periods commencing from the agreed date on which they are made available by the works:

- 1 month for steel grades DX51D+Z, DX51D+ZF, DX52D+Z and DX52D+ZF;
- 6 months for steel grades DX53D+Z, DX53D+ZF, DX54D+Z, DX54D+ZF, DX56D+Z and DX56D+ZF.

7.8 Coating mass

7.8.1 The coating mass shall correspond to the data in Table 4. The values apply for the total mass of the coating on both surfaces for the triple spot test and the single spot test (see 8.4.4 and 8.5.4).

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

Table 4 - Coating masses

Coating designation ^a	Coating mass in g/m ² , including both surfaces ^b	
	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 Tables 2 and 3.

^b The coating mass of 100 g/m² (including both surfaces) corresponds to a coating thickness of approximately 7,1 μ m per surface.

^c See 8.4.4 and 8.5.4.

7.8.2 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 Tables 2 and 3.

7.9 Adhesion of coating

The adhesion of the coating shall be tested using the method specified in 8.5.3. 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.

7.10 Surface condition

7.10.1 The surface shall comply with the requirements in 7.3 to 7.5. 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 bottom surface.

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

7.10.2 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.

7.11 Tolerances on dimensions and shape

The requirements of EN 10143 shall apply.

7.12 Suitability for further processing

7.12.1 Products complying with the requirements of this standard are suitable for welding using the normal welding methods. With larger coating masses, special measures shall be taken for welding, as appropriate.

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

7.12.3 All steel grades and surface qualities are suitable for organic coating. The appearance after this treatment depends on the surface quality ordered (see 7.4).

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

8 Testing

8.1 General

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

8.1.2 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 8.7).

8.1.3 Specific tests shall be carried out in accordance with the requirements in 8.2 to 8.6.

8.2 Test units

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 type and surface condition. In the case of strip, a coil weighing more than 20 t is regarded as one test unit.

8.3 Number of tests

One series of tests shall be carried out per test unit as specified in 8.2 to determine:

- the mechanical properties (see 8.5.1);
- the r - and n -values if specified in Table 1 (see 8.5.2);
- the adhesion of the coating (see 8.5.3); and
- the coating mass (see 8.5.4).

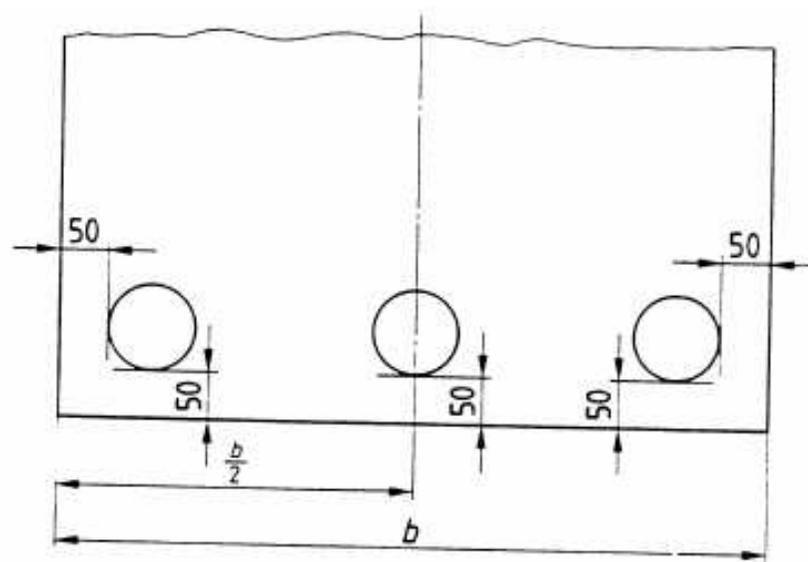
8.4 Sampling

8.4.1 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.

8.4.2 The sample for the tensile test (see 8.5.1) shall be taken transversely to the direction of rolling at a distance of at least 50 mm from the edges of the product.

8.4.3 The sample for the bend test to determine the adhesion of the coating (see 8.5.3) 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.

8.4.4 The three samples for testing the coating mass (see 8.5.4) shall be taken as shown in Figure 1 if the product width is adequate. The samples may be round or square and the individual sample shall be at least 5 000 mm² in area.



b = Strip or sheet

width

Figure 1 - Position of the samples for determining the zinc coating mass (dimensions in mm)

If sampling as shown in Figure 1 is not possible because the product 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.

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

8.5 Test methods

8.5.1 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, with $b = 20$ mm) as described in annex A of EN 10002-1 (see also 7.1.4).

8.5.2 The determination of the plastic strain ratio r and the strain hardening exponent n shall be carried out in accordance with ISO 10113 and ISO 10275.

The plastic strain ratio r and the strain hardening exponent n are determined within the strain range of 10 % to 20 %. As the determination shall be carried out in the range of homogeneous deformation, then if the uniform elongation of the tested material is lower than 20 %, values for the upper limit of the strain range of 15 % to 20 % can be applied.

8.5.3 The bend test to determine the adhesion of the coating (see also 7.9 and 8.4.3) 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.

**Table 5 - Mandrel diameter in the bend test to determine the adhesion of the coating
(see 8.5.3)**

Coating	Mandrel diameter D in the bend test ^a
100 140 200 225 275	0
350	1a
450 600	2a
^a a = Product thickness	

8.5.4 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 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.

8.6 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 with a maximum of 20 m from the end of the coil.

8.7 Inspection documents

If agreed at the time of ordering, one of the inspection documents specified in EN 10204 shall be supplied (see 8.1.2).

9 Marking

9.1 A label shall be attached to each coil or bundle containing at least the following information:

- a) name or mark of the manufacturer's works;
- b) designation [consisting of 5.1 b) and 5.1 f) to 5.1 k)];
- c) nominal dimensions of the product;
- d) identification number;
- e) order number;
- f) mass of the coil or bundle.

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

10 Packing

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

11 Storage and transportation

11.1 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 7.5. 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.

11.2 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.

12 Disputes

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

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 Reagent 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 pure HCl to one part water (50 % dilution). Hexamethylenetetramine is then added, stirring, in the ration 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 sample 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 hydrochloric acid solution with hexamethylenetetramine inhibitor at ambient temperature (20 °C to 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 0,01 g;
- determine the difference between the mass of the coated sample and that of the sample without its coating. This difference, calculated in 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 10142:1990 and the new designations according to EN 10027-1, CR 10260 and EN 10027-2.

Table B.1 - List of corresponding designations

Steel name	Designation according to EN 10142:2000		Designation according to EN 10142:1990 Steel name
	Steel number	Symbol for the type of hot-dip coating	
DX51D	1.0226	+Z	Fe P 02 G Z
DX51D	1.0226	+ZF	Fe P 02 G ZF
DX52D	1.0350	+Z	Fe P 03 G Z
DX52D	1.0350	+ZF	Fe P 03 G ZF
DX53D	1.0355	+Z	Fe P 05 G Z
DX53D	1.0355	+ZF	Fe P 05 G ZF
DX54D	1.0306	+Z	Fe P 06 G Z
DX54D	1.0306	+ZF	Fe P 06 G ZF
DX56D	1.0322	+Z	-
DX56D	1.0322	+ZF	-

Bibliography

EN 10147, *Continuously hot-dip coated structural steel strip and sheet – Technical delivery conditions.*

EN 10152, *Electrolytically zinc coated cold rolled steel flat products – Technical delivery conditions.*

EN 10169-1, *Continuously organic coated (coil coated) steel flat products – Part 1: General information (definitions, materials, tolerances, test methods).*

ENV 10169-2, *Continuously organic coated (coil coated) steel flat products – Part 2: Products for building exterior applications.*

EN 10292, *Continuously hot-dip coated strip and sheet of steels with higher yield strength for cold forming – Technical delivery conditions.*



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