SLOVENSKI STANDARD
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Elektrolizno cinkani hladno valjani ploġ ati izdelki za hladno preoblikovanje - Tehni ni dobavni pogoji

Electrolytically zincdip coated cold rolled steel flat products for cold forming - Technical delivery conditions

Elektrolytisch verzinkte kaltgewalzte Flacherzeugnisse aus Stahl zum Kaltumformen - Technische Lieferbedingungen

Produits plats en acier, laminés à froid, revêtus de zinc par voie électrolytique pour formage à froid - Conditions techniques de livraison

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EUROPEAN STANDARD

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English Version

Electrolytically zinc coated cold rolled steel flat products for cold forming - Technical delivery conditions

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Foreword

This document (EN 10152:2009) 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 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2009, and conflicting national standards shall be withdrawn at the latest by September 2009.

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This document supersedes EN 10152:2003 and – together with EN 10346:2009 – EN 10336:2007.

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1 Scope

This European Standard specifies requirements for continuously electrolytic zinc coated cold rolled flat products of low carbon steels suitable for cold forming according to Table 1 in rolled widths ≥ 600 mm and thicknesses from 0,35 mm up to and including 3 mm, delivered as strip (in coil form), sheet, slit strip or cut lengths obtained from slit strip or sheet.

NOTE 1 This European Standard can also be applied to continuously electrolytic zinc coated flat products of:

a) steels according to EN 10139 (cold rolled strip in rolled widths < 600 mm),

b) steels normally characterized by minimum yield strength or minimum tensile strength values in addition to formability parameters, e. g.

1) steels with high yield strength and improved formability according to EN 10268 (cold rolled flat products),

2) multiphase steels (cold rolled or hot rolled) according to prEN 10338,

3) steels for construction according to national or regional standards (see e. g. DIN 1623).

NOTE 2 By agreement at the time of enquiry and order this European Standard can be applied to continuously electrolytic zinc coated hot-rolled steel flat products (e.g. according to EN 10025-1 and -2, EN 10111, EN 10149-1 to EN 10149-3, etc.).

NOTE 3 As the mass of the zinc coating applied is relatively small, the material is not intended to withstand outside exposure without further chemical treatment and painting.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10002-1:2001, *Metallic materials – Tensile testing – Part 1: Method of test at ambient temperature*

EN 10020:2000, *Definition and classification of grades of steel*

EN 10021:2006, *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 10051, *Continuously hot rolled uncoated plate, sheet and strip of non-alloy and alloy steels – Tolerances on dimensions and shape*

EN 10079:2007, *Definition of steel products*

EN 10131, *Cold rolled uncoated and zinc or zinc-nickel electrolytically coated low carbon and high yield strength steel flat products for cold forming – Tolerances on dimensions and shape*

EN 10204:2004, *Metallic materials – Types of inspection documents*

EN ISO 7438, *Metallic materials – Bend test (ISO 7438:2005)*

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 document the terms and definitions given in EN 10020:2000, EN 10021:2006, EN 10079:2007, EN 10204:2004 and the following apply.

3.1
electrolytic zinc coating (ZE)
application of a zinc coating by electrolysis on a suitably prepared steel surface from an aqueous zinc salt solution by the use of an electric current

NOTE Flat products can have a zinc coating on one or both surfaces. If both surfaces are zinc coated, a different coating thickness can be applied on each side (this process being referred to as differential zinc coating).

4 Classification and designation

4.1 Classification

The steel grades specified in this European Standard are classified in accordance with EN 10020:2000 as non-alloy quality steels (DC01, DC03, DC04, DC05) and alloy quality steels (DC06, DC07) and by their increasing suitability for cold forming as follows:

— DC01: drawing quality;

— DC03: deep drawing quality;

— DC04, DC05: special deep drawing quality;

— DC06: extra deep drawing quality;

— DC07: super deep drawing quality.

4.2 Designation

4.2.1 The steel names are allocated in accordance with EN 10027-1. The steel numbers are allocated in accordance with EN 10027-2.

4.2.2 The products covered by this document shall be designated as follows in the given order:

1) Type of product (e. g. strip, sheet, cut length);

2) Number of this European Standard (EN 10152);

3) Steel name or steel number and symbol for the type of electrolytical coating (see Table 1);

4) Numbers denoting the nominal coating thickness on each surface (e. g. 50/50 = nominal coating thickness of 5,0 µm on each side, see Table 2 and 6.9.2);

5) Letters A or B indicating the surface quality (see 6.11.2);

6) Letters denoting the surface treatment (see 6.12 and Table 3).

EXAMPLE 1 Designation of strip made of steel DC03+ZE (1.0347+ZE), electrolytically zinc coated with a nominal thickness of 5,0 µm on each surface (50/50), surface quality A, surface treatment phosphated (P):

Strip EN 10152-DC03+ZE50/50-A-P

or

Strip EN 10152-1.0347+ZE50/50-A-P

EXAMPLE 2 Designation of sheet made of steel DC05+ZE (1.0312+ZE), electrolytically zinc coated with a nominal thickness of 7,5 µm on one surface and of 2,5 µm on the other surface (75/25), surface quality B, surface treatment phosphated and oiled (PO):

Sheet EN 10152-DC05+ZE75/25-B-PO

or

Sheet EN 10152-1.0312+ZE75/25-B-PO

4.2.3 Where appropriate, additional information to the designation as specified in 4.2.2 shall be given to describe clearly the delivery requirements (see Clause 5).

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) complete designation (see 4.2.2);

b) nominal dimensions (thickness, width and, in the case of sheet and cut lengths, length);

c) quantity;

d) limiting mass and sizes of the coils and individual bundles of sheets;

e) surface quality and surface finish (see 6.11);

f) type of surface treatment (see 6.12 and Table 3).

5.2 Options

A number of options are specified in this document and listed below; if the purchaser does not indicate a wish to implement any of these options, the products shall be supplied in accordance with the basis specification of this document (see 5.1):

1) Delivery of hot rolled products (see NOTE 2 to Clause 1);

2) Use of substrates not specified in Table 1 (see 6.1);

3) Steelmaking and manufacturing processes (see 6.2);

4) Non-skin passed products (see 6.5);

5) Products supplied suitable for the manufacture of a specific part (see 6.6);

6) Delivery of several steel grades as alloy steels (see Table 1, footnote f);

7) Differential coatings (see 6.9.4);

8) One-side coated products (see 6.9.5);

9) Maximum coating mass per product surface (see 6.9.6);

10) Quality of the uncoated surface for one-side coated products and/or testing of both surfaces (see 6.11.2.1);

11) Range for surface roughness *Ra* (see 6.11.3);

12) Specification of dimensional tolerances different from those in EN 10131 or EN 10051, respectively (see 6.14.2);

13) Type of inspection and inspection document to be delivered (see 7.1.1 to 7.1.3);

14) Certificate of compliance with order (see 7.1.2);

15) Marking by branding (see 8.2);

16) Requirements for packaging (see Clause 9).

6 Requirements

6.1 General

The requirements according to 6.2 to 6.5 and 6.13 apply to products made of the steel grades given in Table 1.

For other steels used as substrate for electrolytically deposited coatings of zinc the requirements shall be based on the appropriate quality standard for the non-coated steel product.

6.2 Steelmaking and manufacturing processes

Unless otherwise agreed at the time of enquiry and order, the steelmaking and manufacturing processes are left to the discretion of the manufacturer. The purchaser shall be informed of these processes, if required.

6.3 Deoxidation

The method of deoxidation shall be in accordance with that specified in Table 1.

6.4 Chemical composition

The chemical composition based on cast analysis shall be as given in Table 1.

6.5 Delivery condition

The steel substrates are normally supplied in the skin-passed condition. By agreement at the time of enquiry and order non skin-passed products may be supplied.

6.6 Choice of properties

The products covered by this document shall comply with the requirements of Table 1. By agreement at the time of enquiry and order, they can be supplied with suitability for manufacturing a specific part. In this case a specific proportion exceeding the reject tolerances may be agreed and acceptance on the basis of mechanical properties is not applicable.

6.7 Mechanical properties

6.7.1 The mechanical properties are given in Table 1; they apply only to skin-passed products.

NOTE 1 The properties in Table 1 are those specified for cold rolled non-coated low carbon steel flat products according to EN 10130 with the exception of the R_e, A_{80} and n_{90} values for the grades DC04+ZE, DC05+ZE, DC06+ZE and DC07+ZE which have been altered with respect to the influence of the electrolytical treatment on those properties.

The mechanical properties are valid for the period specified in Table 1 from the date on which the products are made available. The date of availability shall be notified to the purchaser with reasonable prior notice compatible with the validity of the mechanical properties.

NOTE 2 Prolonged storage of products of grade DC01+ZE could result in some change in the mechanical properties leading to a reduction in formability.

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

6.7.3 Strain ratio r_{90} (see Table 1) and the strain hardening exponent n_{90} shall be determined in the range of homogeneous deformation, within the strain range of 10 % to 20 %.

NOTE The uniform elongation of the material to be tested may be lower than 20 %. In this case an upper limit of the strain range of ≥ 15 % may be applied.

Table 1 — Chemical composition and mechanical properties of electrolytically zinc coated mild steel flat products [a]

Designation			Definition and classification according to EN 10020:2000	Deoxidation	Validity of mechanical properties	Surface appea-rance	Absence of stretcher strain marks	R_e MPa [a]	R_m MPa	A_{80} % min. [b]	r_{90} min. [c, d]	n_{90} min. [c]	Chemical composition (ladle analysis) % by mass max.				
Steel grade		Symbol for the type of coating															
Steel name	Steel number												C	P	S	Mn	Ti
DC01 [e]	1.0330	+ZE	Non alloy quality steel [f]	Manufacturer´s discretion	–	A	–	– / 280 [g,h]	270 to 410	28	–	–	0,12	0,045	0,045	0,60	–
						B	3 months										
DC03	1.0347	+ZE	Non alloy quality steel [f]	Fully killed	6 months	A, B	6 months	– / 240 [g]	270 to 370	34	1,3	–	0,10	0,035	0,035	0,45	–
DC04	1.0338	+ZE	Non alloy quality steel [f]	Fully killed	6 months	A, B	6 months	– / 220 [g]	270 to 350	37	1,6	0,170	0,08	0,030	0,030	0,40	–
DC05	1.0312	+ZE	Non alloy quality steel [f]	Fully killed	6 months	A, B	6 months	– / 200 [g]	270 to 330	39	1,9	0,190	0,06	0,025	0,025	0,35	–
DC06	1.0873	+ZE	Alloy quality steel	Fully killed	6 months	A, B	no limit	– / 180 [i]	270 to 350	41	2,1	0,210	0,02	0,020	0,020	0,25	0,3 [j]
DC07	1.0898	+ZE	Alloy quality steel	Fully killed	6 months	A, B	no limit	– / 160 [i]	250 to 310	43	2,5	0,220	0,01	0,020	0,020	0,20	0,2 [j]

[a] The values of yield strength shall be the 0,2 % proof strength ($R_{p0,2}$) for products which do not present a definite yield point and the lower yield strength (R_{eL}) for the others. When the thickness is less than or equal to 0,7 mm but greater than 0,5 mm the values for yield strength shall be increased by 20 MPa. For thicknesses less than or equal to 0,5 mm the values shall be increased by 40 MPa.

[b] When the thickness is less than or equal to 0,7 mm but greater than 0,5 mm the minimum values for elongation shall be reduced by 2 units. For thicknesses less than or equal to 0,5 mm the minimum values shall be reduced by 4 units.

[c] The values of r_{90} and n_{90} determined in accordance with 7.5.2 only apply to products of thickness equal to or greater than 0,5 mm.

[d] When the thickness is over 2 mm the value for r_{90} is reduced by 0,2.

[e] It is recommended that products in grade DC01+ZE should be formed within 6 weeks from the time of their availability.

[f] Unless otherwise agreed at the time of the enquiry and order DC01+ZE, DC03+ZE, DC04+ZE and DC05+ZE may be supplied as alloy steels (for example with boron or titanium).

[g] For design purposes, the lower limit of Re for grades DC01, DC03, DC04 and DC05 may be assumed to be 140 MPa.

[h] The upper limit of R_e of 280 MPa for the grade DC01+ZE is valid only for 8 days from the time of the availability of the product.

[i] For design purposes, the lower limit of R_e may be assumed to be 130 MPa for the grade DC06 and 110 MPa for the grade DC07.

[j] Titanium may be replaced by niobium. Carbon and nitrogen shall be completely bound.