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

Kontinuierlich schmelztauchveredeltes Band und Blech aus weichen Stählen zum
Kaltumformen - Technische Lieferbedingungen

Bandes et tôles en acier doux revetues en continu par immersion a chaud pour formage
a froid - Conditions techniques de livraison

Ta slovenski standard je istoveten z: EN 10327:2004

ICS:

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English version

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

Bandes et tôles en acier doux revêtues en continu par
immersion à chaud pour formage à froid - Conditions
techniques de livraison

Kontinuierlich schmelztauchveredeltes Band und Blech aus
weichen Stählen zum Kaltumformen - Technische
Lieferbedingungen

This European Standard was approved by CEN on 23 April 2004.

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. 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.

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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Foreword

This document (EN 10327:2004) 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of an identical text or by endorsement, at the latest by January 2005, and conflicting national standards shall be withdrawn at the latest by January 2005.

This European Standard supersedes EN 10142:2000 and, together with EN 10326, it also supersedes EN 10154:2002, EN 10214:1995 and EN 10215:1995.

This document includes a Bibliography.

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

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1 Scope

1.1 This document specifies requirements for continuously hot-dip coated products made of low carbon steels for cold forming coated with zinc (Z), zinc-iron alloy (ZF), zinc-aluminium alloy (ZA), aluminium-zinc alloy (AZ) and aluminium-silicon alloy (AS) (see Table 1) with thicknesses of 0,35 mm to 3,0 mm unless otherwise agreed (see 1.2). The thickness is the final thickness of the delivered product after coating.

This document applies to strip of all widths and to sheets cut from it (≥ 600 mm width) and cut lengths (< 600 mm width).

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

1.3 The products covered by this document are mainly used where cold formability and corrosion resistance are the most important factors. Corrosion resistance of the alloy is proportional to the coating thickness, hence to its mass (see also 7.3.2).

1.4 This document is not applicable to:

- continuously hot-dip coated structural steel flat products (see EN 10326);
- electrolytically zinc coated cold rolled steel flat products (see EN 10152);
- continuously organic coated (coil coated) steel flat products (see EN 10169-1, ENV 10169-2 and EN 10169-3);
- continuously hot-dip coated strip and sheet of steels with higher yield strength for cold forming (see EN 10292).

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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).

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

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

EN 10021:1993, *General technical delivery requirements for steel and steel products.*

EN 10027-1, *Designation systems for steels – Part 1: Steel names, principal symbols.*

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

EN 10079:1992, *Definition of steel products.*

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

EN 10204:1991, *Metallic products – Types of inspection documents.*

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.*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10020:2000, EN 10021:1993, EN 10079:1992 and EN 10204:1991 and the following apply.

NOTE 1 General guidelines for the protection of iron and steel can be found in EN ISO 14713.

NOTE 2 In the present cases, strip is continuously hot-dip coated in a bath the composition of which is given in 3.1 to 3.4.

3.1

hot-dip zinc coating (Z)

application of a zinc coating by immersing the prepared products in a molten bath containing a zinc content of at least 99 % (see also 7.4.2)

3.2

hot-dip zinc-iron coating (ZF)

application of a zinc coating by immersing the prepared products in a molten bath containing a zinc content of at least 99 % ; subsequent annealing produces an iron-zinc coating with an iron content of normally 8 % to 12 % (see also 7.4.3)

3.3

hot-dip zinc-aluminium alloy coating (ZA)

application of a zinc-aluminium coating by immersing the prepared products in a molten bath which is composed of zinc and approximately 5 % aluminium

3.4

hot-dip aluminium-zinc alloy coating (AZ)

application of an aluminium-zinc coating by immersing the prepared products in a molten bath which is composed of 55 % aluminium, 1,6 % silicon and the balance zinc

3.5

hot-dip aluminium-silicon alloy coating (AS)

application of an aluminium-silicon coating by immersing the prepared products in a molten bath which is composed of aluminium and 8 % to 11 % silicon

3.6 coating mass

total mass of coating including both surfaces of the product (expressed in grams per square metre)

4 Classification and designation

4.1 Classification

In accordance with EN 10020 the steel grades covered by this document are alloy quality steels. They are classified in accordance with their increasing suitability for cold forming as follows (see Table 1):

DX51D: bending and profiling quality;

DX52D: drawing quality;

DX53D: deep drawing quality;

DX54D: special deep drawing quality;

DX55D: special deep drawing quality, (only +AS), heat resistance up to 800 °C;

DX56D: extra deep drawing quality;

DX57D: super deep drawing quality.

4.2 Designation

4.2.1 Steel names

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

4.2.3 Steel numbers

For the steel grades covered by this document, the steel numbers as given in Table 1 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 supplied by the purchaser at the time of enquiry and order:

- a) quantity to be delivered;
- b) type of product (strip, sheet, cut length);
- c) number of the dimensional standard (EN 10143);
- d) nominal dimensions and the tolerances on dimensions and shape and, if applicable, letters denoting relevant special tolerances;
- e) term "steel";
- f) number of this document (EN 10327);
- 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 3 to 6);
- i) letter denoting the coating finish (N, M or R, see 7.3 and Tables 4 and 5);
- j) letter denoting the surface quality (A, B or C, see 7.5);
- k) letter denoting the surface treatment (C, O, CO, S, P or PO, see 7.6).

EXAMPLE 1 sheet, delivered with dimensional tolerances in accordance with EN 10143 with nominal thickness of 0,80 mm, ordered with special thickness tolerances (S), nominal width 1200 mm, ordered with special width tolerances (S), nominal length 2500 mm, ordered with special flatness tolerances (FS), made of steel DX53D+ZF (1.0355+ZF) in accordance with EN 10327, coating mass 100 g/m² (100), coating finish R, surface quality B, surface treatment oiled (O):

1 sheet EN 10143-0,80Sx1200Sx2500FS
steel EN 10327-DX53D+ZF100-R-B-O

or:

1 sheet EN 10143-0,80Sx1200Sx2500FS
steel EN 10327-1.0355+ZF100-R-B-O

5.2 Options

A number of options are specified in this document and listed below. If the purchaser does not indicate his wish to implement one of these options, the products shall be supplied in accordance with the basis specification of this document (see 5.1).

- a) delivery of products in thicknesses > 3 mm (see 1.2);
- b) verification of the product analysis (see 7.1.2);
- c) products supplied suitable for the manufacture of a specific part (see 7.2.2);
- d) coating masses different from those of Tables 3 to 5 and/or special requirements for different coating masses on each surface (see 7.3.2);
- e) products with pronounced spangle (see 7.4.2.1 or 7.4.5);
- f) special requirements for a maximum Al-Fe-Si alloy layer mass occurring during hot-dip aluminium-silicon coating (see 7.4.6);
- g) requirement for special applications on bright appearance for hot-dip aluminium-silicon coated products (type B surface, see NOTE to 7.5.3);
- h) type of S coating (see 7.6.5);
- i) products supplied free from coil breaks (see 7.7);
- j) products supplied free from stretcher strains when cold forming (see 7.8.2);
- k) special requirements for a maximum or minimum value for the coating mass per product surface (see 7.9.2);
- l) notification of which surface has been inspected (see 7.10.1);
- m) testing for compliance with the requirements of this document (see 8.1.1 and 8.1.2);
- n) supply of an inspection document and type of document (see 8.1.2);
- o) marking desired by branding of the products (see 9.2);
- p) requirement 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 Chemical composition

7.1.1 The chemical composition according to the cast analysis shall be as specified in Table 1.

7.1.2 If a product analysis is agreed at the time of enquiry and order, the permitted deviations from the cast analysis given in Table 1 shall meet the requirements in Table 2.

7.2 Mechanical properties

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

7.2.2 If so agreed at the time of enquiry and order, products specified in Table 1, except those made of steel grade DX51D, may be supplied with suitability for manufacturing a specific part. In this case the values given in Table 1 do not apply. The reject tolerances arising when the material is processed shall not exceed a specific proportion to be agreed at the time of enquiry and order.

7.2.3 If ordered in accordance with 7.2.1, the mechanical property values in Table 1 apply for the following periods commencing from the date on which the products are made available, unless otherwise agreed at the time of enquiry and order:

- 1 month for steel grades DX51 D, DX52D coated in accordance with Table 1;
- 6 months for steel grades DX53D, DX54D, DX55D, DX56D and DX57D coated in accordance with Table 1.

7.2.4 The tensile test values apply to transverse test pieces and are related to the test piece cross section without coating.

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Table 1 — Steel grades and mechanical properties (transverse test pieces)

Designation			Chemical composition % by mass max.					Yield strength R_e^a MPa *	Tensile strength R_m MPa *	Elongation A_{80}^b % min.	Plastic strain ratio r_{90} min.	Strain hardening exponent n_{90} min.	
Steel grade		Symbols for the types of hot-dip coating	C	Si	Mn	P	S	Ti					
DX51D	1.0226	+Z,+ZF,+ZA,+AZ,+AS	0,12	0,50	0,60	0,10	0,045	0,30	-	270 to 500	22	-	-
DX52D	1.0350	+Z,+ZF,+ZA,+AZ,+AS							140 to 300 ^c	270 to 420	26	-	-
DX53D	1.0355	+Z,+ZF,+ZA,+AZ,+AS							140 to 260	270 to 380	30	-	-
DX54D	1.0306	+Z,+ZA							120 to 220	260 to 350	36	1,6	0,18
DX54D	1.0306	+ZF							120 to 220	260 to 350	34	1,4	0,18
DX54D	1.0306	+AZ							120 to 220	260 to 350	36	-	-
DX54D	1.0306	+AS							120 to 220	260 to 350	34	1,4 ^{d,e}	0,18 ^e
DX55D	1.0309	+AS							140 to 240	270 to 370	30	-	-
DX56D	1.0322	+Z,+ZA							120 to 180	260 to 350	39	1,9 ^d	0,21
DX56D	1.0322	+ZF							120 to 180	260 to 350	37	1,7 ^{d,e}	0,20 ^e
DX56D	1.0322	+AS							120 to 180	260 to 350	39	1,7 ^{d,e}	0,20 ^e
DX57D	1.0853	+Z,+ZA							120 to 170	260 to 350	41	2,1 ^d	0,22
DX57D	1.0853	+ZF							120 to 170	260 to 350	39	1,9 ^{d,e}	0,21 ^e
DX57D	1.0853	+AS							120 to 170	260 to 350	41	1,9 ^{d,e}	0,21 ^e

* 1 MPa = 1 N/mm²

^a If the yield point is not pronounced, the values apply to the 0,2 %-proof strength ($R_{p0,2}$); if the yield strength is pronounced, the values apply to the lower yield point (R_e).

^b For product thicknesses 0,50 mm < $t \leq 0,70$ mm (including coating) the minimum elongation values (A_{80}) shall be reduced by 2 units. For $t \leq 0,50$ mm this reduction shall be 4 units.

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

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

^e For $t \leq 0,70$ mm, the r_{90} -value shall be reduced by 0,2 and the n_{90} -value shall be reduced by 0,01.