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Kontinuirno vroče prevlečeni jekleni ploščati izdelki - Tehnični dobavni pogoji

Continuously hot-dip coated steel flat products - Technical delivery conditions

Kontinuierlich schmelztauchveredelte Flacherzeugnisse aus Stahl - Technische Lieferbedingungen

Produits plats en acier revêtus en continu par immersion à chaud - Conditions techniques de livraison

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77.140.50	Ploščati jekleni izdelki in polizdelki	Flat steel products and semi-products
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Continuously hot-dip coated steel flat products - Technical delivery conditions

Produits plats en acier revêtus en continu par immersion à chaud - Conditions techniques de livraison

Kontinuierlich schmelztauchveredelte Flacherzeugnisse aus Stahl - Technische Lieferbedingungen

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Foreword

This document (prEN 10346:2013) has been prepared by Technical Committee ECISS/TC 109 “Coated and uncoated flat products to be used for cold forming”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 10346:2009.

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1 Scope

This European Standard specifies requirements for continuously hot-dip coated products made of low carbon steels for cold forming, of steels for construction, of steels with high proof strength for cold forming and coated with zinc (Z), zinc-iron alloy (ZF), zinc-aluminium alloy (ZA), aluminium-zinc alloy (AZ), aluminium-silicon alloy (AS) or zinc-magnesium alloy (ZM) and for continuously hot-dip coated products made of multiphase steels for cold forming coated with zinc (Z), zinc-iron alloy (ZF), zinc-aluminium alloy (ZA) or zinc-magnesium alloy (ZM) in thicknesses of $0,20 \text{ mm} \leq t < 3,0 \text{ mm}$.

By agreement at the time of enquiry and order, this European Standard is applicable to continuously hot-dip coated flat products of an expanded validity range defined for thicknesses $t < 0,20\text{mm}$ or in thicknesses $3,0\text{mm} < t \leq 6,5\text{mm}$ with agreed mechanical properties and test specimens, adhesion of coating and surface condition requirements.

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 ($\geq 600 \text{ mm}$ width) and cut lengths ($< 600 \text{ mm}$ width).

NOTE 1 Products coated with (pure) aluminium can also be available, but are not covered by this European standard.

NOTE 2 The products covered by this European Standard are used where cold formability, high strength, a defined minimum yield strength and corrosion resistance are the most important factors. Corrosion resistance of the product is proportional to the coating thickness, hence to its mass (see also 7.3.2). The products covered by this European Standard can be used as substrates for organic coated flat products specified in EN 10169 for building and general engineering applications.

NOTE 3 By agreement at the time of enquiry and order, this European standard is applicable to other continuously hot-dip coated hot rolled steel flat products (e.g. in accordance with EN 10149-2).

2 Normative references

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

EN 606, Bar coding – *Transport and handling labels for steel products*

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 steel – Part 2: Numerical system*

EN 10049:2005, *Measurement of roughness average R_a and peak count RP_c on metallic flat products*

EN 10079:2007, *Definition of steel products*

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

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

EN 10325:2006, *Steel – Determination of yield strength increase by the effect of heat treatment (Bake-Hardening-Index)*

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

ISO 10113:2006, *Metallic materials – Sheet and strip – Determination of plastic strain ratio*

ISO 10275:2007, *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.

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

3.1 hot-dip zinc coating (Z)
application of a zinc coating by immersing the prepared strip in a molten bath containing a zinc content of at least 99 % (see also 7.4.2)

3.2 hot-dip zinc-iron alloy coating (ZF)
application of a zinc coating by immersing the prepared strip in a molten bath containing a zinc content of at least 99 % and a subsequent annealing which 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 strip in a molten bath which is composed of zinc and approximately 5 % aluminium and small amounts of mischmetal (see also 7.4.4)

3.4 hot dip zinc-magnesium coating (ZM)
application of a zinc-magnesium coating by passing the prepared strip through a molten zinc bath with aluminium and magnesium contents in sum of 1,5 to 8 % by mass (see also 7.4.5)

3.5 hot-dip aluminium-zinc alloy coating (AZ)
application of an aluminium-zinc coating by immersing the prepared strip in a molten bath which is composed of 55 % aluminium, 1,6 % silicon and the balance zinc (see also 7.4.6)

3.6 hot-dip aluminium-silicon alloy coating (AS)
application of an aluminium-silicon coating by immersing the prepared strip in a molten bath which is composed of aluminium and 8 % to 11 % silicon (see also 7.4.7)

3.7 bake-hardening steel (B)¹⁾
steel exhibiting an increase in proof strength following heating in the region of 170 °C for 20 min

Note 1 to entry: These steels have a good suitability for cold forming and present a high resistance to plastic straining (which is increased on finished parts during heat treatment) and a good dent resistance.

¹⁾ Symbol used in the steel name (see Table 3).

3.8**complex-phase steel****CP steel**

steel with a multiphase microstructure containing mostly a ferritic-bainitic matrix as well as martensite, tempered martensite, retained austenite and pearlite as additional phases

Note 1 to entry: The fine grained microstructure may be generated by retarded recrystallisation or precipitation of micro-alloying elements.

3.9**dual-phase steel****DP steel**

steel with a ferritic matrix containing a martensitic second phase present in the form of islands and possibly bainite as a complementary phase

Note 1 to entry: According to their high tensile strength levels, dual phase steels show a low yield strength ratio and a high work hardening rate.

3.10**ferritic-bainitic steel****FB steel**

Steel with a matrix of ferrite or strengthened ferrite containing bainite or strengthened bainite

Note 1 to entry: The strengthening of the matrix is caused by a high density of dislocations, by grain refinement and precipitation of micro-alloying elements.

3.11**interstitial free steel (Y) ²⁾****IF steel**

steel with a controlled composition to achieve improved r - and n -values

Note 1 to entry: These steels have both, a high mechanical strength and an excellent suitability for cold forming, due to their solid solution hardening and interstitial free microstructure.

3.12**low alloy/micro-alloyed steel (LA)¹⁾**

High strength steels obtained through alloy additions of niobium, titanium, and vanadium.

Note 1 to entry: Those alloying elements can be added either alone or in combination. Alternatively, carbon-manganese alloying concepts in combination with grain refinement can be used.

Note 2 to entry: Combined precipitation and grain refinement hardening modes allow reaching a high mechanical resistance while reducing the content of alloying elements.

3.13**Low carbon steel**

steel designated by rolling type (hot or cold rolled) and a steel name DX51D to DX57D

Note 1 to entry: Higher grades correspond to better formability.

3.14**Steel for construction**

basic steel with different strength levels and no special demand for suitability for cold forming

2) Symbol used in the steel name (see Table 3)

prEN 10346:2013 (E)**3.15****transformation induced plasticity steel****TRIP steel**

steel with a mainly ferritic matrix containing retained austenite capable of transformation into martensite during the forming process (TRIP effect)

Note 1 to entry: Because of high work-hardening rate the steel reaches high uniform elongation values and high tensile strength levels.

3.16**coating mass**

Total mass of coating (expressed in grams per square metre) given for both surfaces (see 7.9)

Note 1 to entry: In combination with the symbol for the coating type (Z, ZF, ZA, ZM, AZ, AS), the nominal coating mass is used as coating designation.

4 Classification and designation**4.1 Classification****4.1.1 General**

The steels covered by this document are alloy quality steels (steels in accordance with Tables 1, 3 and 4) or non-alloy quality steels (steels in accordance with Table 2) in accordance with EN 10020:2000.

4.1.2 Low carbon steels for cold forming

The steel grades are classified in accordance with their increasing suitability for cold forming as follows (see Table 6):

- DX51D: bending and profiling quality;
- DX52D: drawing quality;
- DX53D: deep drawing quality;
- DX54D: special deep drawing quality;
- DX55D: special deep drawing quality (only +AS);
- DX56D: extra deep drawing quality;
- DX57D: super deep drawing quality.

4.1.3 Steels for construction

The steel grades are classified in accordance with their increasing minimum proof strength $R_{p0,2}$ (see Table 7).

4.1.4 Steels with high proof strength for cold forming

The steel grades are classified in accordance with their increasing minimum proof strength $R_{p0,2}$ (see Table 8).

4.1.5 Multiphase steels for cold forming

The steel grades are classified in accordance with their increasing minimum tensile strength R_m (see Tables 9 and 10).

4.2 Designation

4.2.1 Steel names

The steel names in accordance with this document are allocated in accordance with EN 10027-1.

4.2.2 Steel numbers

The steel numbers in accordance with this document 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, i.e. EN 10346;
- g) steel name or steel number and symbol for the type of hot-dip coating as given in Tables 1 to 4;
- h) number designating the nominal mass of coating (e.g. 275 = 275 g/m² including both surfaces, see Table 11);
- i) letter denoting the coating finish (N or M, see 7.4.2 and Table 12);
- j) letter denoting the surface quality (A, B or C, see 7.5 and Tables 12 to 14);
- k) letter denoting the surface treatment (C, O, CO, P, PO or S, 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 1 200 mm, ordered with special width tolerances (S), nominal length 2 500 mm, ordered with special flatness tolerances (FS), made of steel DX53D+Z (1.0355+Z) in accordance with EN 10346, coating mass 100 g/m² (100), surface quality B, surface treatment oiled (O):

1 sheet EN 10143 — 0,80Sx1200Sx2500FS — steel EN 10346 — DX53D+Z100—MB—O

or:

1 sheet EN 10143 — 0,80Sx1200Sx2500FS — steel EN 10346 — 1.0355+Z100—MB—O.

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) Specification of product thicknesses deviating from those generally covered in the scope (i.e. $t < 0,20$ mm or $3 \text{ mm} < t \leq 6,5$ mm for hot-rolled substrates) (see Clause 1);

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- 2) Specification of hot rolled products deviating from those generally covered in the scope (see NOTE 3 to Clause 1);
- 3) verification of the product analysis (see 7.1.2);
- 4) date of supply for products free from stretcher strains when cold forming (see 7.2.1.3);
- 5) products supplied suitable for the manufacture of a specific part (see 7.2.2.2 and 7.2.4.2);
- 6) coating masses different from those of Table 11 and/or special requirements for different coating masses on each surface (see 7.3.2);
- 7) special coatings and/or surface qualities (see Tables 12, 13 and 15 footnote a);
- 8) hot-dip zinc coated products with pronounced spangle (see 7.4.2.1 or 7.4.6);
- 9) special requirements for a maximum Al-Fe-Si alloy layer mass occurring during hot-dip aluminium-silicon coating (see 7.4.7);
- 10) requirement for special applications on bright appearance for aluminium-silicon coated products (type B surface, see NOTE to 7.5.2.2);
- 11) range and verification of surface roughness (see 7.5.3);
- 12) selection of the protective oil (see 7.6.1)
- 13) type of S coating (see 7.6.6);
- 14) products free from coil breaks (see 7.7.1);
- 15) maximum or minimum value for the coating mass on each product side (see 7.9);
- 16) type of inspection and, if applicable, inspection document to be delivered (see 8.1);
- 17) determination of the tensile properties and/or the Bake-Hardening Index BH_2 and/or the coating mass by calculation (see 8.3);
- 18) notification of which surface has been inspected (see 8.5.4.2);
- 19) marking desired by branding of the products (see 9.2);
- 20) requirement for packing (see Clause 10).

6 Manufacturing and processing**6.1 Manufacturing**

The processes used in steelmaking and, unless there are restrictions by the selected steel grade (see footnote a) to Table 4), the manufacture of the products shall be left to the discretion of the manufacturer.

6.2 Processing**6.2.1 Ageing**

Due to ageing, a reduction in formability can take place for all the products supplied according to this document. Coil breaks or fluting can occur additionally during processing. The risk of coil breaks increases, especially for thicknesses > 0,9 mm, with the duration of storage.

Therefore the user should process the products after their receipt as quick as possible (see 7.2.1.3).

6.2.2 Coating appearance

The coating surface can vary and change to a dark appearance by oxidation.

Due to ageing of the coating a certain cracking of the surface can appear during processing which can consequently reduce abrasion resistance.

The user should take these characteristics into account.

6.2.3 Surface protection

Regarding surface protection during transport and storage the following should be taken into consideration:

- Only a temporary corrosion resistance during transportation or storage is provided by any surface protection applied. Colour changes can occur.
- In particular, protection by oiling is dependent on storage time. The primarily uniform oil film becomes more and more unequal, and bare spots can develop. Different oils can show different behaviour.

7 Requirements

7.1 Chemical composition

The chemical composition according to the cast analysis shall be as specified in Tables 1 to 5.

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 Tables 1 to 5 shall meet the requirements in Table 6.

Table 1 — Chemical composition (cast analysis) of low carbon steels for cold forming

Designation			Chemical composition % by mass					
Steel grade			max.					
Steel name	Steel number	Symbols for the types of available coatings	C	Si	Mn	P	S	Ti ^a
DX51D	1.0226	+Z,+ZF,+ZA,+ZM, +AZ,+AS	0,18		1,20	0,12		
DX52D	1.0350	+Z,+ZF,+ZA,+ZM, +AZ,+AS	0,12	0,50	0,60	0,10	0,045	0,30
DX53D	1.0355	+Z,+ZF,+ZA,+ZM, +AZ,+AS						
DX54D	1.0306	+Z,+ZF,+ZA,+ZM, +AZ,+AS						
DX55D	1.0309	+AS						
DX56D	1.0322	+Z,+ZF,+ZA,+ZM, +AZ,+AS						
DX57D	1.0853	+Z, +ZF, +ZA,+ZM, +AS						

^a By agreement at the time of enquiry and order, the content of Ti for the steel grades mentioned in this Table may be lowered to < 0,05% which means that the steel grade is non alloyed.