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Interested committees:

Title: Draft BS EN 10346 BS Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions

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

Kaltgewalzte kontinuierlich schmelztauchveredelte Flacherzeugnisse aus Stahl - Technische Lieferbedingungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 459/SC 9.

If this draft becomes a European Standard, 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.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 10346:2025) has been prepared by Technical Committee CEN/TC 459/SC 9 “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 10346:2015.

prEN 10346:2025 includes the following significant technical changes with respect to EN 10346:2015:

- scope and normative references have been updated;
- addition of normative reference to:
 - o EN 10373, Determination of the physical and mechanical properties of steels using models;
 - o EN 1090-4, *Execution of steel structures and aluminium structures - Part 4: Technical requirements for cold-formed structural steel elements and cold-formed structures for roof, ceiling, floor and wall applications*
 - o EN 1993-1-1, *Eurocode 3 - Design of steel structures - Part 1-1: General rules and rules for buildings*
 - o EN 1993-1-3, *Eurocode 3 - Design of steel structures - Part 1-3: General rules - Supplementary rules for cold-formed members and sheeting*
- definitions have been added in Clause 3;
- addition of hot-dip aluminium coating and deletion of hot-dip aluminium-zinc alloy coating;
- addition of three new steel families: dual-phase steels with improved formability (XH), complex-phase steels with improved formability (CH) and multi-phase steels with improved formability (AH);
- addition of options referring to new steel grades S550GDR and S650GDR in Clause 5.2;
- addition of three new steel grades for construction: S500GD, S550GDR and S650GDR;
- addition of two new micro-alloyed steel grades: HX600LAD and HX700LAD;
- addition of minimum requirements regarding proportional elongation of steel grades for construction and micro-alloyed steel grades with thickness $\geq 3,0$ mm;
- addition of cold-rolled multiphase steels for cold forming: HCT780XG, HCT1180X, HCT1180XG, HCT590XH, HCT780XH, HCT980XH, HCT1180XH, HCT1180C, HCT980CH, HCT1180CH, HCT1370CH, HCT980AH and HCT1180AH;
- addition of hot-rolled multiphase steels for cold forming: HDT760C and HDT950C;
- addition of an informative Annex about tensile tests results and coating impact;
- addition of an informative Annex about steel designations for multiphase steels for cold forming.

1 Scope

This document specifies requirements for continuously hot-dip coated products made of low carbon steels for cold forming, of steels for construction and of steels with high proof strength for cold forming coated with zinc (Z), zinc-iron alloy (ZF), zinc-aluminium alloy (ZA), zinc-magnesium alloy (ZM), aluminium-silicon alloy (AS) or aluminium (A) 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 $0,20 \text{ mm} \leq t \leq 6,5 \text{ mm}$.

By agreement at the time of enquiry and order, this document is applicable to continuously hot-dip coated flat products of an expanded validity range defined for thicknesses $t < 0,20 \text{ mm}$ with agreed mechanical properties and test specimens, adhesion of coating and surface condition requirements. 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 The products covered by this document are used where cold formability, high strength, a defined minimum yield strength and/or corrosion resistance are the most important factors. Corrosion resistance of the product is depending on coating type and coating thickness, hence to its mass (see also 7.3.2). The products covered by this document can be used as substrates for organic coated flat products specified in EN 10169 for building and general engineering applications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 10020, *Definition and classification of grades of steel*

EN 10021, *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 10049, *Measurement of roughness average Ra and peak count R_{Pc} on metallic flat products*

EN 10079, *Definition of steel products*

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

EN 10204, *Metallic products — Types of inspection documents*

EN 10325, *Steel — Determination of yield strength increase by the effect of heat treatment [Bake-Hardening-Index]*

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

EN ISO 10113, *Metallic materials — Sheet and strip — Determination of plastic strain ratio (ISO 10113)*

EN ISO 10275, *Metallic materials — Sheet and strip — Determination of tensile strain hardening exponent (ISO 10275)*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

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

3.1

nominal (specified) thickness

ordered thickness of the metallic coated product

Note 1 to entry: Nominal thickness includes both steel core and coating (t_{nom})

3.2

steel core thickness

nominal (specified) thickness minus the metallic coating layers

Note 1 to entry: The steel core thickness is in accordance with the definition in EN 1993-1-3 (t_{cor}). It is the design thickness for calculations in accordance with EN 1993-1-3.

3.3

hot-dip zinc coating

Z

application of a zinc coating by immersing the prepared strip in a molten bath of zinc

Note 1 to entry: The zinc content is at least 98,5 mass %.

Note 2 to entry: See also 7.4.2.

3.4

hot-dip zinc-iron alloy coating

ZF

application of a zinc-iron coating by immersing the prepared strip in a molten bath of zinc and a subsequent annealing

Note 1 to entry: The zinc content of the bath is at least 99 mass %.

Note 2 to entry: The annealing produces an iron-zinc coating with an iron content of normally 8 mass % to 12 mass %.

Note 3 to entry: See also 7.4.3.

3.5

hot-dip zinc-aluminium coating

ZA

application of a zinc-aluminium coating by immersing the prepared strip in a molten bath of zinc-aluminium

Note 1 to entry: The composition of the bath is approximately 5 mass % aluminium, small amounts of mischmetal and the balance zinc.

Note 2 to entry: See also 7.4.4.

3.6**hot dip zinc-magnesium coating****ZM**

application of a zinc-magnesium coating by immersing the prepared strip in a molten bath of zinc-aluminium-magnesium

Note 1 to entry: The composition of the bath is sum of aluminium and magnesium from 1,5 mass % to 8 mass %, containing minimum of 0,2 mass % magnesium and the balance zinc.

Note 2 to entry: For information on chemical composition and density, the manufacturer can be asked for advice.

Note 3 to entry: Due to differences in coating bath chemistry, the properties provided by each coating can differ (e.g surface aspect, processability, corrosion resistance) and the manufacturer can be asked for advice.

Note 4 to entry: See also 7.4.5.

3.7**hot-dip aluminium-silicon alloy coating****AS**

application of an aluminium-silicon coating by immersing the prepared strip in a molten bath of aluminium-silicon

Note 1 to entry: The composition of the bath is 8 to 11 mass % silicon, up to 5 mass % iron, up to 1 mass % additional elements and the balance aluminium.

Note 2 to entry: See also 7.4.6.

3.8**hot-dip aluminium coating****A**

application of an aluminium coating by immersing the prepared strip in a molten bath of pure aluminium

Note 1 to entry: The iron content in the bath is less than 5 mass %.

Note 2 to entry: see also 7.4.7.

3.9**coating mass**

total mass of coating given for both surfaces

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

Note 2 to entry: The coating mass is expressed in grams per square metre.

Note 3 to entry: See 7.9.

3.10

bake-hardening steel

B¹

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.

3.11

complex-phase steel

C¹

steel with a multiphase microstructure containing mainly bainite, ferrite, whereas martensite, tempered martensite, retained austenite and pearlite may be present as additional phases

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

3.12

complex-phase steel with improved formability

CH¹

steel consisting mainly of martensite, bainite and retained austenite

Note 1 to entry: Depending on strength class, small amounts of ferrite can also be present.

Note 2 to entry: At a given high tensile strength, complex phase steels with improved formability show a high yield ratio (R_e/R_m).

3.13

dual-phase steel

X¹

steel consisting of mainly ferrite and martensite and possible 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.

3.14

dual-phase steel with improved formability

XH¹

steel consisting mainly of ferrite and martensite and small amounts of bainite and retained austenite

Note 1 to entry: According to their high tensile strength levels, dual phase steels with improved formability show higher uniform elongation.

3.15

ferritic-bainitic steel

F¹

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.

¹ Symbol used in the steel name (see Tables 3, 4 and 5).

3.16**high strength interstitial free steel****Y¹**

steel whose composition is controlled to achieve improved plastic strain ratio r and strain hardening exponent 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.

3.17**low alloy steel****micro-alloyed steel****LA¹**

steel containing one or more of alloying elements Nb, Ti and V to achieve required proof strength levels

Note 1 to entry: Combined precipitation and grain refinement hardening modes allow reaching a high mechanical resistance while reducing the content of alloying elements.

Note 2 to entry: Alternatively, carbon-manganese alloying concepts in combination with grain refinement can be used.

3.18**low carbon steel**

steel with low carbon content characterized by low yield strength and high ductility

3.19**multi-phase steels with high global formability****AH¹**

steel containing a combination of tempered martensite, bainite and retained austenite

Note 1 to entry: Ferrite and martensite can be present.

3.20**steel for construction**

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

3.21**transformation induced plasticity steel****T¹**

steel with a 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.

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

The steels covered by this document are either alloy quality steels or non-alloy quality steels in accordance with EN 10020. All steels in Tables 1, 3, 4, 5 and steel grade S650GDR in Table 2 are alloy quality steels. All steels in Table 2 with the exception of S650GDR are non-alloy quality steels.

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 7):

- 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;
- DX58D: extra super deep drawing quality.

Only steel grades DX51D, DX52D and DX53D can be ordered as hot rolled products.

4.1.3 Steels for construction

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

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 9).

Only low alloy/micro-alloyed steel grades can be ordered as hot rolled products.

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 10 and 11). See Annex E for the steel names and steel numbers of advanced high strength steels (AHSS).

4.2 Designation

4.2.1 Steel names

The steel names shall be in accordance with EN 10027-1.

4.2.2 Steel numbers

The steel numbers shall be 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 in accordance with 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 5;
- h) number designating the nominal mass of coating (e.g. 275 = 275 g/m² including both surfaces, see Table 12);
- i) letter denoting the coating finish (N or M, see 7.4.2 and Table 13);
- j) letter denoting the surface quality (A, B or C, see 7.5 and Tables 13 to 15);
- k) letter denoting the surface treatment (C, O, CO, P, PO or S, see 7.6);
- l) if relevant (see 8.5.1), selection of the test piece (proportional (A_{prop}) or non-proportional (A_{80}) specimen) for determination of the mechanical properties.

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 (1.0951+Z) in accordance with EN 10346, coating mass 100 g/m² (100), minimized spangle (M), surface quality (B), surface treatment oiled (O):

1 sheet EN 10143 — 0,80Sx1200Sx2500FS — steel EN 10346 — DX53D+Z100–M–B–O

or:

1 sheet EN 10143 — 0,80Sx1200Sx2500FS — steel EN 10346 — 1.0951+Z100 –M–B–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) (see Scope);
- 2) verification of the product analysis (see 7.1);
- 3) date of supply for products free from stretcher strains when cold forming (see 7.2.1.3);
- 4) products supplied suitable for the manufacture of a specific part (see 7.2.2.2 and 7.2.4.2);
- 5) supply of steel grade S550GDR with specified minimum ratio $R_m/Re \geq 1,10$ and $A_{prop} \geq 15\%$ for dimensioning in accordance with EN 1993-1-1 (see 7.2.3 – Table 8), where Re is either $R_{p0.2}$ or Re_H in dependence of yield point phenomenon (footnote b, Table 8).

In case of organic coated steel, this option 5 is upon agreement of the manufacturer.

- 6) Supply of steel grade S550GDR or S650GDR with specified minimum ratio $R_m/Re \geq 1,05$ for dimensioning in accordance with EN 1993-1-1 (see 7.2.3 – Table 8), where Re is either R_{p02} or Re_H in dependence of yield point phenomenon (footnote b, Table 8).

In case of organic coated steel, this option 6 is upon agreement of the manufacturer.

- 7) coating masses different from those of Table 12 and/or special requirements for different coating masses on each surface (see 7.3.2);
- 8) special coatings and/or surface qualities (see Tables 13 and 15, footnote a);
- 9) hot-dip zinc coated products with pronounced spangle (see 7.4.2.1);
- 10) special requirements for a maximum Al-Fe-Si alloy layer mass occurring during hot-dip aluminium-silicon coating (see 7.4.7);
- 11) hot-dip coated products with surface quality A without skin passing (see 7.5.2.1);
- 12) requirement for special applications on bright appearance for aluminium-silicon coated products (type B surface, see NOTE to 7.5.2.2);
- 13) range and verification of surface roughness (see 7.5.3);
- 14) selection of the protective oil (see 7.6.1);
- 15) type of S coating (see 7.6.6);
- 16) products free from coil breaks (see 7.7.1);
- 17) type of inspection and, if applicable, inspection document to be delivered (see 8.1);
- 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);
- 21) according to EN 1090-4
- i) determination of the ratio bend radius to thickness, if relevant;
 - ii) display of the result of the adhesion test in the inspection document (see 7.10).

6 Manufacturing and processing

6.1 Manufacturing

Unless there are restrictions by the selected steel grade, the processes used in steelmaking and 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.

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 max.					
Steel grade		Symbols for the types of available coatings	C	Si	Mn	P	S	Ti ^a
Steel name	Steel number							
DX51D	1.0917	+Z,+ZF,+ZA,+ZM, +AS	0,18		1,20	0,12		
DX52D	1.0918	+Z,+ZF,+ZA,+ZM, +AS	0,12	0,50	0,60	0,10	0,045	0,30
DX53D	1.0951	+Z,+ZF,+ZA,+ZM, +AS						
DX54D	1.0952	+Z,+ZF,+ZA,+ZM, +AS						
DX55D	1.0962	+AS						
DX56D	1.0963	+Z,+ZF,+ZA,+ZM, +AS						
DX57D	1.0853	+Z,+ZF,+ZA,+ZM,+AS						
DX58D	1.9946	+Z						

^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.

Table 2 — Chemical composition (cast analysis) of steels for construction

Designation			Chemical composition % by mass max.				
Steel grade		Symbols for the types of available coatings	C	Si	Mn	P	S
Steel name	Steel number						
S220GD	1.0241	+Z,+ZF,+ZA,+ZM, +A	0,20	0,60	1,70	0,10	0,045
S250GD	1.0242	+Z,+ZF,+ZA,+ZM, +AS, +A					
S280GD	1.0244	+Z,+ZF,+ZA,+ZM, +AS, +A					
S320GD	1.0250	+Z,+ZF,+ZA,+ZM, +AS, +A					
S350GD	1.0529	+Z,+ZF,+ZA,+ZM, +AS, +A					
S390GD	1.0238	+Z,+ZF,+ZA,+ZM					
S420GD	1.0239	+Z,+ZF,+ZA,+ZM					
S450GD	1.0233	+Z,+ZF,+ZA,+ZM					
S500GD	1.9527	+Z,+ZF,+ZA,+ZM					
S550GD	1.0531	+Z,+ZF,+ZA,+ZM					
Steels for construction with specified minimum ductility (R)							
S550GDR ^a	1.9541	+Z,+ZA,+ZM	0,20	0,60	1,70	0,10	0,045
S650GDR ^a	1.9542	+Z, +ZA,+ZM	0,2	0,6	2,00	0,10	0,045
By agreement at the time of enquiry and order, if other chemical elements are added, they shall be mentioned on the inspection document which may need a change of classification.							
^a R means steel grade with specified minimum ductility, because these steels show a high total elongation in relation to high strengths.							