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BSI Standards Publication

Continuously organic coated (coil coated) steel flat products — Technical delivery conditions

National foreword

This British Standard is the UK implementation of EN 10169:2010+A1:2012. It supersedes BS EN 10169:2010, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by ▌A1⟩ ⟨A1▐.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Continuously organic coated (coil coated) steel flat products - Technical delivery conditions

Produits plats en acier revêtus en continu de matières organiques (prélaqués) - Conditions techniques de livraison

Kontinuierlich organisch beschichtete (bandbeschichtete) Flacherzeugnisse aus Stahl - Technische Lieferbedingungen

This European Standard was approved by CEN on 7 August 2010 and includes Amendment 1 approved by CEN on 14 February 2012.

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Foreword

This document (EN 10169:2010+A1:2012) has been prepared by Technical Committee ECISS/TC 109 [A1] "Coated and uncoated flat products to be used for cold forming" [A1], the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by September 2012, and conflicting national standards shall be withdrawn at the latest by September 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes [A1] EN 10169:2010 [A1].

This document includes Amendment 1 approved by CEN on 2012-02-14.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] [A1].

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

1 Scope

This European Standard specifies requirements for continuously organic coated (coil coated) steel flat products. It particularly specifies the performance requirements.

The products covered are wide strip, sheet cut from wide strip, slit wide strip, strip rolled in widths less than 600 mm and cut lengths (from sheet or strip).

NOTE This document is not applicable to continuously organic coated flat products made of:

— tinmill products,
— electrical steels.

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

EN 10021:2006, 〚A1〛 *General technical delivery conditions for steel products* 〚A1〛

EN 10025-1, *Hot-rolled products of structural steels — Part 1: General technical delivery conditions*

EN 10025-2, *Hot-rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10048, *Hot rolled narrow steel strip — Tolerances on dimensions and shape*

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 10111, *Continuously hot rolled low carbon steel sheet and strip for cold forming — Technical delivery conditions*

EN 10130, *Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions*

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 10139, *Cold rolled uncoated mild steel narrow strip for cold forming — Technical delivery conditions*

EN 10140, *Cold rolled narrow steel strip — Tolerances on dimensions and shape*

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

EN 10152, *Electrolytically zinc coated cold rolled steel flat products for cold forming — Technical delivery conditions*

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

EN 10268, *Cold rolled steel flat products with high yield strength for cold forming — Technical delivery conditions*

prEN 10338:2007, *Hot rolled and cold rolled non-coated flat products of multiphase steels for cold forming — Technical delivery conditions*

EN 10346, *Continuously hot-dip coated steel flat products — Technical delivery conditions*

EN 13523-0, *Coil coated metals — Test methods — Part 0: General introduction and list of test methods*

EN 13523-1, *Coil coated metals — Test methods — Part 1: Film thickness*

EN 13523-2, *Coil coated metals — Test methods — Part 2: Specular gloss*

EN 13523-3, *Coil coated metals — Test methods — Part 3: Colour difference — Instrumental comparison*

EN 13523-4, *Coil coated metals — Test methods — Part 4: Pencil hardness*

EN 13523-5, *Coil coated metals — Test methods — Part 5: Resistance to rapid deformation (impact test)*

EN 13523-6, *Coil coated metals — Test methods — Part 6: Adhesion after indentation (cupping test)*

EN 13523-7, *Coil coated metals — Test methods — Part 7: Resistance to cracking on bending (T-bend test)*

EN 13523-8, *Coil coated metals — Test methods — Part 8: Resistance to salt spray (fog)*

EN 13523-9, *Coil coated metals — Test methods — Part 9: Resistance to water immersion*

EN 13523-10, *Coil coated metals — Test methods — Part 10: Resistance to fluorescent UV light and water condensation*

EN 13523-11, *Coil coated metals — Test methods — Part 11: Resistance to solvents (rubbing test)*

EN 13523-12, *Coil coated metals — Test methods — Part 12: Resistance to scratching*

EN 13523-14, *Coil coated metals — Test methods – Part 14: Chalking (Helmen method)*

EN 13523-15, *Coil coated metals — Test methods — Part 15: Metamerism*

EN 13523-18, *Coil coated metals — Test methods — Part 18: Resistance to staining*

EN 13523-19, *Coil coated metals — Test methods — Part 19: Panel design and method of atmospheric exposure testing*

EN 13523-21, *Coil coated metals — Test methods — Part 21: Evaluation of outdoor exposure panels*

EN 13523-22, *Coil coated metals — Test methods — Part 22: Colour difference — Visual comparison*

EN 13523-23, *Coil coated metals — Test methods — Part 23: Colour stability in humid atmospheres containing sulphur dioxide*

EN 13523-24, *Coil coated metals — Test methods—— Part 24: Resistance to blocking and pressure marking*

EN 13523-25, *Coil coated metals — Test methods — Part 25: Resistance to humidity*

EN 13523-26, *Coil coated metals — Test methods — Part 26: Resistance to condensation of water*

EN 13523-27, *Coil coated metals — Test methods — Part 27: Resistance to humid poultice (Cataplasm test)*

EN ISO 2815, *Paints and varnishes — Buchholz indentation test (ISO 2815:2003)*

EN ISO 4618:2006, *Paints and varnishes — Terms and definitions (ISO 4618:2006)*

EN ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering (ISO 4628-2:2003)*

EN ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking (ISO 4628-4:2003)*

EN ISO 4628-5, P*aints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of the degree of flaking (ISO 4628-5:2003)*

EN ISO 8044:1999, *Corrosion of metals and alloys — Basic terms and definitions (ISO 8044:1999)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227:2006)*

EN ISO 12944-2:1998, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments (ISO 12944-2:1998)*

ISO 4997, *Cold-reduced carbon steel sheet of structural quality*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in EN 10020:2000, EN 10021:2006, EN 10079:2007, EN 10204:2004, EN ISO 4618:2006, EN ISO 8044:1999, EN ISO 12944-2:1998 and the following apply.

3.1
accessibility
ease of access to the steel components for the purpose of inspection and maintenance without any work over and above that concerned with routine inspection

3.2
ambience
environmental conditions which prevail in the interior of the building

NOTE 1 These conditions determine the corrosivity category of the ambience and include different parameters such as the air temperature, the relative humidity, the operating conditions in the building (e.g. use of aggressive chemical products, refrigerated areas).

NOTE 2 It should be noted that the atmosphere surrounding the building can influence the ambience.

NOTE 3 Annex A gives an example of classification of types of ambience.

3.3
building interior application
application in buildings for which the concerned construction products (i.e. components of the building fabric) are submitted to the influence of interior ambiences without significant exposure of any side of the product to the influence of exterior atmospheres

NOTE 1 Building products include, for example: liner trays, ribbed profiles for roofing and walling, curved profiles, brake-pressed profiles, interior wall panels for partitions, ceiling panels, suspended frames (for suspended ceilings), factory foamed (or mineral wool) sandwich panels for cold rooms or rooms with controlled ambience, interior door frames, interior metal doors, interior metal windows.

NOTE 2 Some coil coated products can be used for interior applications having special performance requirements, e.g. lighting. In such cases, these particular requirements should also be considered in consultation with the manufacturer.

NOTE 3 For interior building elements, it is important that the risk of corrosive attack on the reverse side of the element should also be considered. This can be especially important in double-skin assemblies (e.g. built up insulated cladding) where the reverse side of the interior element is not easily accessible for maintenance and/or in situations where the interior element is expected to provide long-term durability.

NOTE 4 Besides the requirements written in this document, there can be other international or national requirements or regulations regarding fire, safety, food contact etc. that should be considered at the time of enquiry and order.

3.4
building exterior application
application in buildings for which the concerned products are submitted to the influence of exterior atmospheres

NOTE 1 Building products include, for example, ribbed profiles for roofing and walling, curved profiles, brake-pressed profiles, concealed fix roofing and walling, standing seam roofing, corrugated sheeting, cladding goods, sandwich panels for roofing and walling, roof tiles, accessories (flashings, trims), rainwater goods (gutters, down pipes), metal doors and garage doors.

NOTE 2 For exterior building elements, it is important that the risk of corrosive attack on internal, i.e. reverse side surfaces, should also be considered. In particular, buildings with wet or chemically polluted internal environments can require a reverse side organic coating selected to provide enhanced corrosion protection.

This can be especially important in double-skin assemblies (e.g. built-up insulated cladding) where the reverse side of the exterior element is not easily accessible for maintenance and/or in situations where the exterior element is expected to provide long-term durability.

NOTE 3 Besides the requirements written in this document, other international or national requirements regarding reaction to fire , safety etc. can be agreed on at the time of enquiry and order.

3.5
coating flexibility
ability of a coating to follow without [A1] damaging [A1] the deformation [A1] *deleted text* [A1] of the substrate [A1] to which it is applied [A1]

[A1] NOTE 1 The flexibility is determined during cold forming of the coated product by the T-bend test.[A1]

[A1] NOTE 2 [A1]Cold forming is the process where the main forming is done without heating the working piece.

3.6
coating material
material comprising organic polymers, i.e. synthetic resin or plastics, to which pigments, additives and solvents (if required) have generally been added, suitable for coil coating

NOTE These may be paints (in liquid or powder form) that when applied form an opaque film or plastic film providing protective, decorative and/or specific properties.

3.7
coating systems

3.7.1
coating system, general
combination of the coatings applied on either the top side or the reverse side consisting of one or more coats of one or more coating materials, the designation of which is derived from the relevant coating material

3.7.2
multiple-coat system
system comprising a priming coat, possibly intermediate coat(s) and a top coat with particular requirements on appearance, corrosion protection, formability, etc.

3.7.3
one-coat system
single coating either with requirements on appearance (see 3.17), formability, corrosion protection, subsequent painting, foam adhesion, etc., or as a priming coat with special properties regarding adhesion and corrosion protection for post-finishing applications

3.8
〚A1〛 nominal organic coating thickness 〚A1〛
thickness of the organic coating system 〚A1〛 either 〚A1〛 on top side 〚A1〛 or 〚A1〛 on reverse side

〚A1〛 *deleted text* 〚A1〛

3.9
nominal thickness of a coil coated product
thickness of the metal substrate including metallic coating and excluding thickness of organic coating system

3.10
coating types

3.10.1
backing coat
coating of any type on reverse side with no particular requirements on appearance, corrosion protection, formability, etc.

NOTE In the case of particular requirements, see 3.7.2.

3.10.2
film coating, permanent
plastic film applied to the substrate to which generally an adhesive and, if appropriate, a priming coat has been applied beforehand

3.10.3
film coating, temporary
strippable plastic film applied to the coated surface in order to afford a temporary protection against mechanical damage (see also 6.1.2.3)

3.10.4
intermediate coat
coat between the priming coat and the top coat

3.10.5
priming coat
first coat of a multiple-coat system

〚A1〛 NOTE 〚A1〛 In the case of particular requirements, see 3.7.2 and 3.7.3.

〚A1〛 *deleted text* 〚A1〛

3.10.6
top coat (finishing coat)
final (uppermost) coat of a multiple-coat system

3.11
coil coating
process in which an (organic) coating material is applied on rolled metal strip in a continuous process which includes cleaning, if necessary, and chemical pre-treatment of the metal surface and either:

— one-side or two-side, single or multiple application of (liquid) paints or coating powders which are subsequently cured or/and

— laminating with permanent plastic films

NOTE 1 Curing processes include those by convective or inductive heating or by radiation.

NOTE 2 Laminating with metal strip resulting in a sandwich system is possible.

NOTE 3 A one-coat chemical pre-treatment and priming coat is possible.

3.12
colour
sensation resulting from the visual perception of radiation of a given composition (related to EN 13523-22)

NOTE A colour is uniquely characterized for a defined observer and a defined light source as well as illuminating and viewing geometry by the coordinates of a point in a space (colorimetric specification with tristimulous values).

3.13
colour difference
magnitude and character of the visually perceived, i.e. qualitative, difference between two colours under daylight and artificial light respectively, or the magnitude and direction of the (instrumentally) measured and calculated difference of two colours (related to EN 13523-3)

3.14
corrosion protection (interior) category
CPI
category of coating which presents a certain level of corrosion protection, the choice of which depends on the corrosivity category, the period of protection and the accessibility

3.15
corrosion resistance (outdoor) category
RC
category of product which presents a certain level of corrosion resistance, the choice of which depends on the corrosivity category, the period of resistance and the accessibility

NOTE 1 Different categories of organic coil coated products for outdoor application classified following their level of corrosion resistance are defined. Criteria of classification are related to their level of natural and artificial outdoor corrosion resistance.

NOTE 2 These conditions determine the corrosivity category and include both meteorological and pollution parameters [EN ISO 12944-2].

NOTE 3 It should be recognized that in some local areas within a region, environmental conditions can apply which are not typical of the region as a whole, e.g. in a rural atmosphere close to a fossil fuel burning power generation plant, areas immediately down wind of the prevailing wind direction can be subjected to an environment closer to urban or even industrial atmospheres. Such special cases should be considered when organic coatings are chosen.

3.16
corrosivity category
C
category which indicates the corrosivity of the environment taking into account both atmospheric conditions prevailing around a constituent element of a structure, and micro-environmental effects and shall be used for the selection of the appropriate product (related to EN ISO 12944-2)

NOTE The relationship between corrosivity categories and types of atmospheres is given in Table 6.

3.17
gloss
optical property of a surface, characterized by its ability to reflect light (related to EN 13523-2)

NOTE For qualitative purposes, gloss ranges are often described by the terms "matt", "low gloss" or "semi-matt", "satin", "semi-gloss", "gloss" and "high gloss".

3.18
gloss, specular
ratio of the luminous flux from an object in the specular direction for a specified source and receptor angle to the luminous flux from polished black glass (related to EN 13523-2)

3.19
master coil
coil from which sheets, cut lengths or two or more smaller coils are produced

3.20
organic coating
dry paint film of the coated product or the plastic film of the film/metal laminate

3.21
period of protection
time between the first exposure of the steel component and the moment at which maintenance works need to be carried out to restore corrosion protection

NOTE The need to restore corrosion protection is deemed to arise when failure of the coating has occurred to the point where a significant amount (for example 5 %) of the component surface exhibits corrosion of the substrate.

3.22
reverse side
opposite side of the top side (see ⟨A1⟩ 3.26 ⟨A1⟩)

3.23
saturated colour
colour with Chroma C* $\geq$ 40

NOTE Chroma C* is defined by CIE 15:2004.

3.24
substrate
base material from rolled steel flat products, with or without metallic coating

3.25
time of wetness
period during which a coated surface is covered by a film of electrolyte that is capable of causing atmospheric corrosion (see EN ISO 12944-2)

NOTE Guidance value for time of wetness can be calculated from the temperature and humidity relative by summing the hours where the humidity relative is above 80 % and, at the same time, the temperature is above 0 °C.

3.26
top side
side of the strip with the highest decorative demand and/or corrosion protection and which, in normal production, is uppermost, respectively the exterior side of a coil

3.27
uncoated
condition in which parts of the surface of the substrate (e.g. one side of the strip) remain uncoated

3.28
UV resistance category (R_{uv})
category of coating which presents a certain level of resistance to degradation by UV radiation

NOTE Different categories of organic coil coated products for outdoor application classified following their level of UV resistance are defined. Criteria of classification are related to their level of natural and artificial outdoor UV resistance with relation to the cumulative solar energy of the outdoor exposure site.

4 Designation

4.1 For the steel substrates covered by this document (see 6.1.1), the steel names are allocated in accordance with EN 10027-1, the steel numbers are allocated in accordance with EN 10027-2.

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

a) type of product (e.g. strip, sheet or cut length, see EN 10079);

b) number of this standard (EN 10169);

c) complete designation of the substrate, i.e.:

   1) steel name or number,

   2) type and nominal mass of the metal coating,

   3) number of the standard for the substrate,

   4) dimensions and tolerances (see 6.1.1.2).

d) symbol "OC" for organic coated, when the coating material is not specified;

e) symbol for the organic coating material on the top side and, if applicable, that on the reverse side (see Table B.1);

f) nominal thickness, in µm, of the organic coating on the top side and, if applicable, on the reverse side.

NOTE 1 The information concerning the coating on the top side is separated from that relative to the reverse side by a slash mark.

NOTE 2 If the nature of the coating material on the reverse side is at the discretion of the manufacturer, it is not stated in the designation.

g) product flexibility (see 6.3.2),

h) if applicable, corrosion protection category CPI (see Table 5) or corrosion resistance category RC (see Tables 6 and 7) of the top side followed by the one of the reverse side when required,

i) if applicable, UV resistance category R_{uv} (see Table 8) of the top side.

EXAMPLE 1
Designation of sheet for building interior applications in accordance with EN 10169, substrate made of steel grade DC03 (or 1.0347) according to EN 10130, top side organic coated with epoxide (EP) with a nominal thickness of 10 µm.

Sheet EN 10169 – DC03 EN 10130 – EP10
or
Sheet EN 10169 – 1.0347 EN 10130 – EP10

EXAMPLE 2
Designation of strip for general engineering applications in accordance with EN 10169, substrate made of electrolytically zinc coated steel of grade DC07+ZE (or 1.0898+ZE) with a nominal thickness of 10 µm (100/100) according to EN 10152 on both sides, top side organic coated with polyamide-modified polyester (SP-PA) with a nominal thickness of 25 µm.

Strip EN 10169 –DC07+ZE100/100 EN 10152 – SP-PA25
or
Strip EN 10169 –1.0898+ZE100/100 EN 10152 – SP-PA25

EXAMPLE 3
Designation of strip for building exterior applications in accordance with EN 10169, substrate made of hot-dip zinc coated steel of grade S280GD+Z (or 1.0244+Z) with a coating mass of 275 g/m² (275) according to EN 10346, top side organic coated with polyamide-modified polyester (SP-PA) with a nominal thickness of 25 µm, product flexibility 4T, corrosion resistance category 2 (RC2), UV resistance category 2 (R_{uv2}).

Strip EN 10169 – S280GD+Z275 EN 10346 –SP-PA25 – 4T– RC2 – R_{uv2}
or
Strip EN 10169 – 1.0244+Z275 EN 10346 – SP-PA25 – 4T – RC2 – R_{uv2}

EXAMPLE 4
Designation of sheet for building exterior applications in accordance with EN 10169, substrate made of hot-dip zinc-aluminium coated steel of grade DX53D+ZA (or 1.0355+ZA) with a coating mass of 255 g/m² (255) according to EN 10346, both sides coated with polyester (SP) with a nominal coating thickness of 25 µm each, product flexibility 3T, corrosion resistance category 3 (RC3) on the top side / corrosion protection category 2 (RC2) on the reverse side, UV resistance category 2 (R_{uv2}).

Sheet EN 10169 – DX53D+ZA255 – SP25/SP25 – EN 10346–3T– RC3/RC2 – R_{uv2}
or
Sheet EN 10169 – 1.0355+ZA255 – SP25/SP25 –EN 10346 – 3T – RC3/RC2 – R_{uv2}

4.3 Where appropriate, additional information to the designation as specified in 4.2 shall be given to describe clearly the delivery requirements (see 5.1).

5 Information to be supplied by the purchaser

5.1 Mandatory information

The following information is required from the purchaser so that the manufacturer can supply the products to conform with the requirements:

a) complete designation of the product (see 4.2);

b) where appropriate, details of the required decorative properties (colour, gloss, embossing, printing) and subsequent protection treatment (see 6.1.2.3);

c) nominal dimensions of the substrate;

d) quantity;

e) internal and maximum external diameter and mass limit for coils, or limit dimensions and mass limit for bundles of sheets;

f) type of test and type of inspection document (see 7.1.1 and 7.1.2);

g) requirement concerning marking (see Clause 8);

h) requirements on packing and dispatch (see Clause 9).

5.2 Options

A number of options are specified in this document and listed below. Options may be agreed at the time of enquiry and order between purchaser and manufacturer. If the purchaser does not indicate his wish to implement any of these options the products shall be supplied in accordance with the basic specification (see 5.1).

1) Use of other steel substrates (see 6.1.1.1);

2) Special requirements for strip delivered in coil form (see 6.1.2.2);

3) Tolerances on coating thicknesses ≤ 10 µm and/or specification of a plus tolerance (see 6.2.2.2);

4) Requirements for coating hardness and its testing (see 6.2.5);

5) Other coating properties, if applicable (see 6.2.6);

6) Coating flexibility (T-bend test) for the exposed face (see 6.3.2);

7) Checking the reverse side (see 6.2.3.1, 7.5.3 and 7.5.6);

8) Coating durability (see 6.3.3.1);

9) Exposure conditions for corrosivity category C5, if applicable (see 6.3.3.3.2 a));

10) Method and acceptance value for verification of colour change for saturated or other special colours (see Table 8, footnote a);

11) Deviating test method for determination of coating thickness (see 7.5.2);

12) Accelerated tests for determination of RC and R_{uv} (see 6.3.3.3.1 and 7.5.8.4);

13) Information on tests on durability (see 7.5.8.1);

14) Humidity test by an alternative method (see 7.5.8.2);

15) Cleaning conditions for natural UV radiation resistance test (see 7.5.8.3.3);

16) Use of bar coding (see 8.2).

6 Requirements

6.1 General

6.1.1 Steel substrates

6.1.1.1 The substrate for continuously organic coated flat products according to this document shall be rolled steel strip with or without metallic coating complying with one of the following standards:

EN 10025-1, EN 10025-2, EN 10111, EN 10130, EN 10139, EN 10152, EN 10268, prEN 10338:2007, EN 10346 and ISO 4997.

If so agreed at the time of enquiry and order, the products may be supplied with other steel substrates.

NOTE 1 Uncoated or electrolytically coated strip is normally not suitable as substrate for building exterior applications.

Minimum metal coating masses as specified for certain applications shall be indicated at the time of enquiry and order.

NOTE 2 In order to preserve the decorative appearance and the formability of the coil coated steel flat product it is advised, should the occasion arise, to limit the thickness or mass of the metallic coating applied on certain substrates.

NOTE 3 The mechanical properties of the substrate material can be altered by the coil coating process. The use of substrates which can be subject to ageing will result in an increase in yield point and tensile strength, reduction in elongation and the possibility of appearance of Luders lines and the occurrence of fluting effects.

6.1.1.2 The tolerances on the thickness of the substrate and the width, length, flatness, edge camber and out-of-squareness of the organic coated flat product shall be as specified in the standards for substrates: Applicable standards are: EN 10048, EN 10051, EN 10131, EN 10140, EN 10143.

6.1.2 Organic coatings

6.1.2.1 Coating materials

The more common coating materials used for organic coated flat products, together with their coating thickness (dry film thickness) are given in Annex B.

6.1.2.2 Coil coating systems

The choice of the organic coatings and their face by face combination depends on the end-use to which the coil coated flat products are put.

Depending on the applications, the coil coated steel flat products may be delivered with a specified organic coating:

a) on either side;

b) on one side only, the other one, though generally pre-treated, being uncoated;

c) on one side, the other side (reverse side of the strip) being coated in any organic manner without special properties.

The type of coating on either side of the product shall be agreed at the time of enquiry and order to meet the purchaser's requirements of the product flexibility, the corrosion protection/corrosion resistance category of the top and reverse sides and, where necessary, the UV resistance category of the top side.

NOTE The reverse side coating should be chosen as appropriate. It is normally required to withstand handling and storage. In some circumstances, it can also be required to provide corrosion protection and/or aesthetic appearance or to be compatible with foam or adhesive bonding.

For strip supplied in coil form, the top side is normally the outside of the coil; for sheets and cut lengths (in stacks or bundles) the top side is normally uppermost.

If the purchaser requires an alternative arrangement, this shall be expressly stated at the time of enquiry and order.

6.1.2.3 Temporary protection treatment

Coil coated products may be supplied with the additional temporary protection of a strippable film, wax or oil. Additional temporary protection is recommended, when special requirements during transportation, storage or processing are expected. Strippable films shall be removed within 3 months at the latest.

The type of temporary protection shall be agreed upon at the time of enquiry and order. Type and thickness of the coating shall be taken into consideration when choosing protective films.

NOTE 1 The efficiency of temporary protection treatment is limited in time. The user should ensure proper stock rotation to consider this and to maintain easy removal of strippable films.

NOTE 2 Outdoor weathering exposure time of coated products protected by strippable films should be strictly limited. It is recommended to avoid exposure of products with strippable films to direct sunlight, bad weather conditions, high humidity (e.g. during storage) more than a limited period of time, for instance 2 weeks.

As the efficiency of this treatment is limited in time, the end-user shall ensure a proper stock rotation.

6.1.3 Manufacturing process

Within the context of the data on coil coating (see 6.1.2.2), the details of the manufacture of the product are at the discretion of the manufacturer.

6.2 General coating properties

6.2.1 General

Table 1 gives a summary of the main properties of coil coated flat products according to this document, which may be of importance in their processing and use. The minimum or maximum values to be achieved for the properties referred to in Table 1 shall be specified at the time of enquiry and order, taking the test methods to be used into consideration.

NOTE 1 It should be noted that some properties change during storage (see Annex E).

The properties listed in Table 1 shall be evaluated according to the specifications in 6.2.2 to 6.2.5 and 7.5.2 to 7.5.8.

Table 1 — Survey of important properties

Property	Referenced standards	For details of test methods and other comments see clause
Coating thickness and tolerances		
Coating thickness	EN 13523-1	7.5.2
Appearance (6.2.3)		
Colour/colour difference	EN 13523-3, EN 13523-15, EN 13523-22	7.5.3
Specular gloss	EN 13523-2	7.5.4
Surface condition (freedom of defects)		7.5.6
Adhesive strength/flexibility (6.2.4)		
Adhesion after cupping	EN 13523-6	7.5.5.1
Coating flexibility (T-bend test)	EN 13523-7	7.5.5.2
Adhesion and resistance to crack formation on rapid deformation (impact test)	EN 13523-5	7.5.5.3
Coating hardness (6.2.5)		
Pencil hardness	EN 13523-4	7.5.7.1
Buchholz indentation test	EN ISO 2815	7.5.7.2
Resistance to scratching	EN 13523-12	7.5.7.3
Durability (6.3.3)		
Resistance to humidity	EN 13523-26, EN ISO 4628-2, EN ISO 4628-4, EN ISO 4628-5	7.5.8.1, 7.5.8.2
Behaviour on natural weathering (outdoor exposure)	EN 13523-19, EN 13523-21	7.5.8.1, 7.5.8.3
— Resistance to outdoor corrosion	EN 13523-21, EN ISO 4628-4, EN ISO 4628-5	7.5.8.3.2
— Resistance to natural UV radiation	EN 13523-14, EN 13523-21, EN ISO 4628-4, EN ISO 4628-5	7.5.8.3.3
Behaviour on artificial weathering		7.5.8.1, 7.5.8.4
— Resistance to neutral salt spray (fog)	EN 13523-8, EN ISO 9227, EN ISO 4628-4, EN ISO 4628-5	7.5.8.4.1
— Resistance to intensified UV radiation	EN 13523-10, EN 13523-14	7.5.8.4.2
Other properties	EN 13523-9, EN 13523-11, EN 13523-18, EN 13523-23, EN 13523-24, EN 13523-25, EN 13523-26, EN 13523-27	6.2.6, 7.5.8

NOTE 2 Some methods of those listed in Table 1 can be used either as pass/fail tests or as classification test.

6.2.2 Coating thickness and tolerances

6.2.2.1 The coating thickness shall comply with the requirements specified at the time of enquiry and order (see 4.2.f)).

6.2.2.2 For the ranges of nominal coating thickness, the tolerances given in Table 2 shall apply.

Table 2 — Tolerances on nominal coating thickness

Dimensions in µm

Range of nominal thickness	> 10 ≤ 20	> 20 ≤ 25	> 25 ≤ 35	> 35 ≤ 60	> 60 ≤ 100	> 100 ≤ 150	> 150 ≤ 500	> 500 ≤ 800
Minus tolerance on the average of three measurements	3	4	6	8	15	20	30	40
Minus tolerance on single measurement	4	5	8	12	20	25	35	50

Tolerances on coating thicknesses ≤ 10 µm may be agreed at the time of enquiry and order.

NOTE 1 There are normally no requirements for the plus tolerance, but these can be agreed at the time of enquiry and order.

NOTE 2 There are no requirements for the backing coat.

6.2.3 Appearance

6.2.3.1 General

Colour and colour tolerances and specular gloss shall comply with the specified requirements, where applicable (see 5.1 b)).

Unless otherwise agreed at the time of enquiry and order, only the top side is continuously inspected.

6.2.3.2 Colour and colour difference

The appropriate colour and colour tolerances, the method of measurement and the measurement device shall be agreed at the time of enquiry and order.

NOTE Metallic structured and pearlescent paint may exhibit aspect and colour variation from one production batch to another. Metallic and pearlescent paints exhibit directionality. It is important that this directionality is maintained to ensure colour consistency.

6.2.3.3 Gloss

When required, the tolerances shall be as given in Table 3.

NOTE 1 Tighter tolerances may be agreed at the time of enquiry and order.

NOTE 2 For limitations see note to 7.5.4.

Table 3 — Tolerances on specular gloss
(Values in gloss units using a 60° head)

Gloss unit range	Gloss range[a]	Tolerances on nominal gloss
≤ 10	matt	± 3
> 10 ≤ 20	low gloss	± 4
> 20 ≤ 40	satin	± 6
> 40 ≤ 60	semi-gloss	± 8
> 60 < 80	gloss	± 10
≥ 80	high gloss	minimum gloss 80
[a] Informative indications.		

6.2.4 Adhesive strength after cupping or bending

For all coatings with a thickness of up to 60 µm, one of the following requirements applies; the choice is left at the discretion of the manufacturer.

a) No loss of adhesion after taping for a specified minimum indentation depth of 4 mm.

b) No loss of adhesion after a 2 T bend test (see 7.5.5.2).

For other coatings, peeling shall not exceed 75 % after the maximum indentation depth that will not rupture the substrate.

6.2.5 Coating hardness

For coating hardness, specific requirements and its testing in accordance with 7.5.7.1 and/or 7.5.7.2 and/or 7.5.7.3 may be agreed at the time of enquiry and order.

6.2.6 Other coating and performance properties

Other properties, which can be of importance depending on the intended use, such as resistance to abrasion, suitability for overpainting, ability to be printed, compatibility with foam insulating materials or adhesives, resistance to chemicals and staining, reflectance, weldability, resistance and reaction to fire, heat resistance and behaviour on deep drawing, together with the appropriate test methods, shall be the subject of special agreement between the manufacturer and the purchaser.

6.3 Special coating properties

6.3.1 General

A certain range of coating properties are designated as so called "performance properties" which are evaluated by performance tests.

NOTE Performance tests are carried out for the purpose to classify the coatings into categories.

6.3.2 Product flexibility

The products shall pass a T-bend test with a specified bending radius (see Table 4) for evaluation of product flexibility carried out on the exposed face in accordance with 7.5.5.2.

T-bend tests for the unexposed face may be agreed at the time of enquiry and order.

Table 4 — Minimum bending radius for the T-bend test

Flexibility range	Minimum bending radius[a]
High flexibility, for severe forming conditions	0 T, 1 T
Standard flexibility	2 T, 3 T, 4 T, 5 T, 6 T
No requirement on flexibility	no test required
[a] T Nominal thickness of the product.	

6.3.3 Durability

6.3.3.1 General

Durability of coil coated products involves resistance to corrosion as well as resistance to UV weathering in a variety of environments as well as behaviour on weathering and shall be verified by appropriate tests (see 7.5.8.2 to 7.5.8.4) if so agreed at the time of enquiry and order.

6.3.3.2 Products for building interior and general engineering applications

The classification of the coatings into corrosion protection categories CPI in accordance with Table 5 shall be based on the results of tests on appropriate substrates in appropriate artificial atmospheres (see 7.5.8.2) which represent the conditions of use of the product.

NOTE For CPI 1 coatings, no tests are specified.

Table 5 — Test duration for the test of resistance to humidity

Corrosion protection (interior) category (CPI)	CPI2	CPI3	CPI4	CPI5
Test duration, h	500	1 000	1 500	1 500
NOTE For coatings of corrosion protection (interior) category CPI5, additional appropriate tests relevant to the actual corrosive environment could be settled by agreement at the time of enquiry and order.				

6.3.3.3 Products for building exterior applications

6.3.3.3.1 General

The classification of the coatings into corrosion resistance categories RC and UV resistance categories R_{uv} shall be based on the behaviour on natural weathering (see 6.3.3.3.2).

Where not possible, e.g. in the case of a new coating, accelerated tests (see 7.5.8.4) may be agreed.

6.3.3.3.2 Behaviour on natural weathering

a) Natural outdoor corrosion resistance

The products shall pass outdoor exposure tests in a variety of sites representing rural, urban, industrial, maritime, pollution and humidity and sea front environments or combinations thereof in accordance with 7.5.8.3.2.