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### High-pressure decorative laminates (HPL, HPDL) — Sheets based on thermosetting resins (usually called laminates) —

Part 3:

### Classification and specifications for laminates less than 2 mm thick and intended for bonding to supporting substrates

*Stratifiés décoratifs haute pression (HPL, HPDL) — Plaques à base de résines thermodurcissables  
(communément appelées stratifiés) —*

*Partie 3: Classification et spécifications des stratifiés d'épaisseur moins de 2 mm d'épaisseur et destiné  
pour le collage de support*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). (standards.iteh.ai)

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This second edition cancels and replaces the first edition (ISO 4586-3:2015), which has been technically revised.

The main changes compared to the previous edition are as follows:

— correction of errors due to typographical, formatting, and omission issues.

A list of all parts in the ISO 4586 series can be found on the ISO website.

## Introduction

High-pressure decorative laminates are characterized by their qualities, durability, and functional performance. High-pressure laminate sheets are available in a wide variety of colours, patterns and surface finishes. They are resistant to wear, scratching, impact, moisture, heat, and staining; and possess good hygienic and anti-static properties, being easy to clean and maintain.

In an effort to harmonize ISO 4586 with other high-pressure decorative laminate standards, multiple methods may be published that demonstrate similar properties. In these instances, the same test method title is given and is annotated as either “Method A” or “Method B”. This is the case in the following tests: Edge squareness — 8/9, Dry heat — 17/18 Dimensional stability at elevated temperatures — 19/20, Dimensional stability at ambient temperature — 21/22, Staining — 30/31, Lightfastness — 32/33, Formability — 36/37, and Blistering — 38/39. In these instances, either method may be utilized in testing. Compliance to both methods is not required. While these tests are similar they are by no means identical and results of one method do not necessarily correspond to the results of the accompanying test. In these situations, it is intended that specific parts of ISO 4586 for performance requirements be consulted. Each specific method has performance requirements particular to that method for individual grades of high-pressure decorative laminate.

This document has been harmonized with EN 438-3 whenever possible.

In addition, [Annex C](#) provides information on electrostatic properties and is included as a convenient reference to answer common questions.

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# High-pressure decorative laminates (HPL, HPDL) — Sheets based on thermosetting resins (usually called laminates) —

## Part 3:

## Classification and specifications for laminates less than 2 mm thick and intended for bonding to supporting substrates

### 1 Scope

This document applies to high-pressure laminates (HPL) less than 2 mm thick normally intended for bonding to supporting substrates to produce HPL composite panels and establishes a classification system for high-pressure decorative laminates according to their performance and main recommended fields of application, including materials with special characteristics, for example formability or defined reaction to fire. This document also specifies requirements for the properties of the various types of laminates covered by this classification system.

ISO 4586-2 specifies the methods of test relevant to this document. ISO 4586-4 through ISO 4586-8 are reserved for other types of HPL materials.

### 2 Normative references

ISO/DIS 4586-3

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

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.

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

ISO 4586-2:2018, *High-pressure decorative laminates (HPL, HPDL) — Sheets based on thermosetting resins (usually called laminates) — Part 2: Determination of properties*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

**3.1**  
**high-pressure decorative laminate**  
**HPL**  
**HPDL**

sheet consisting of layers of cellulosic fibrous material (normally paper) impregnated with thermosetting resins and bonded together by the *high-pressure process* (3.2)

Note 1 to entry: This is a general definition of high-pressure decorative laminate(s). More specific product definitions can be found in ISO 4586-3 to ISO 4586-8.

**3.2**  
**high-pressure process**

simultaneous application of heat (temperature  $\geq 120$  °C) and high specific pressure ( $\geq 5$  MPa), to provide flowing and subsequent curing of the thermosetting resins to obtain a homogeneous non-porous material with increased density ( $\geq 1,35$  g/cm<sup>3</sup>), and with the required surface finish

**3.3**  
**surface layer**

upper decorative layer consisting in one or more sheets of fibrous material (usually paper) impregnated with aminoplastic thermosetting resins (usually melamine based resins) or other curable resins or other decorative design surfaces such as metal foils, wood-veneers, and textiles, etc. which are not necessarily treated with thermosetting resin

**3.4**  
**core layer**

fibrous material (usually paper) impregnated with thermosetting resins (usually phenolic based resins) or other curable resins, possibly reinforced by metal layer(s) or metal mesh(es) and others which are not necessarily treated with thermosetting resin

**4 Material types**

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**4.1 Type S — Standard grade decorative laminates.**

**4.2 Type P — Postformable decorative laminates**, similar to type S but can also be formed at elevated temperature.

**4.3 Type F — Decorative laminates with improved fire retardance**, similar to types S or P but also meeting special requirements of specified fire tests which may vary according to the application (e.g. construction, marine, transport) and the country of use (see 6.4.3 and Annex B).

**5 Requirements**

**5.1 General**

Two different HPL classification systems are commonly used and both have been included in this document as alternatives.

**5.2 Numerical classification system**

In this system the classification of a letter denoting material type (see Clause 4) followed by three index numbers showing the levels of performance for wear resistance, impact resistance and scratch resistance respectively.

Table 1 shows the performance levels corresponding to the index numbers.



**Table 1 — Numerical classification**

| Initial point(revs)         | First index number — Wear resistance    |       |       |
|-----------------------------|---|-------|-------|
|                             | 2                                       | 3     | 4     |
|                             | ≥ 50                                    | ≥ 150 | ≥ 350 |
| Small diameter ball (N)     | Second index number — Impact resistance |       |       |
|                             | 2                                       | 3     | 4     |
|                             | ≥ 15                                    | ≥ 20  | ≥ 25  |
| Scratch resistance (Rating) | Third index number — Scratch resistance |       |       |
|                             | 2                                       | 3     | 4     |
|                             | 2                                       | 3     | 4     |

NOTE Index numbers 2, 3, and 4 are specified to maintain consistency with earlier editions of ISO 4586 parts. Index number 1 represents a lower quality level that does not apply to HPL as defined by the scope of this document.

### 5.3 Alphabetical classification system

This system uses three letters to classify laminates as shown in [Table 2](#).

**Table 2 — Alphabetical classification**

| First letter                                  | Second letter                            | Third letter  |
|---|--|---|
| H (Horizontal grade)<br>or V (Vertical grade) | G (General purpose)<br>or D (Heavy duty) | S (Standard grade)<br>or P (Postformable grade)<br>or F (Flame-retardant grade) |

[Table 3](#) compares the alternative classification systems and shows how different HPL products relate to some typical applications. The list of typical applications shown for each category is for guidance only and is not intended to be comprehensive.

**Table 3 — Classification system and typical applications**

| Performance category   | Material type | Numerical classification |                   |                    | Equivalent alphabetical classification  | Examples of typical applications  |
|--|---------------|--------------------------|-------------------|--------------------|---|---|
|  |               | Wear resistance          | Impact resistance | Scratch resistance |   |   |
| Very high resistance to surface wear<br>Very high resistance to impact<br>Very high resistance to scratching | S, F or P     | 4                        | 4                 | 4                  | HDS (Horizontal Heavy Duty Standard),<br>HDF (Horizontal Heavy Duty Flame-retardant),<br>or<br>HDP (Horizontal Heavy Duty Post-forming) | Countertops, institutional applications (prisons, military, barracks, etc.) |

Combinations of wear, impact and scratch resistance index numbers other than those shown in [Table 3](#) are possible and can be specified using the numerical classification system. In such cases properties other than wear resistance, impact resistance and scratch resistance shall meet the requirements specified for type VG in [Table 5](#).

Table 3 (continued)

| Performance category   | Material type | Numerical classification |                   |                    | Equivalent alphabetical classification   | Examples of typical applications   |
|--|---------------|--------------------------|-------------------|--------------------|--|--|
|  |               | Index numbers            |                   |                    |  |  |
|  |               | Wear resistance          | Impact resistance | Scratch resistance |  |  |
| High resistance to surface wear<br>High resistance to impact<br>High resistance to scratching  | S, F or P     | 3                        | 3                 | 3                  | HGS (Horizontal General purpose Standard),<br>HGF (Horizontal General purpose Flame-retardant), or<br>HGP (Horizontal General purpose Postforming) | Kitchen and office work surfaces, restaurant and hotel tables, doors and wall coverings in public areas, interior walls of public transport vehicles |
| Medium resistance to surface wear<br>Medium resistance to impact<br>Medium resistance to scratching  | S, F or P     | 2                        | 2                 | 2                  | VGS (Vertical General purpose Standard),<br>VGF (Vertical General purpose Flame retardant), or<br>VGP (Vertical General purpose Postforming)       | Front panels for kitchen, office and bathroom furniture, wall coverings, ceiling panels, shelves, and furniture elements                             |
| Combinations of wear, impact and scratch resistance index numbers other than those shown in Table 3 are possible and can be specified using the numerical classification system. In such cases properties other than wear resistance, impact resistance and scratch resistance shall meet the requirements specified for type VG in Table 5. |               |                          |                   |                    |  |  |

## 5.4 Nomenclature

In addition to the abbreviation “HPL” or “HPDL” and the number of this document, materials can be specified either by the numerical classification system, or by the alphabetical classification system. For example, horizontal general purpose post-formable laminate can be specified as HPL/ISO 4586-3/P33, 3 or HPDL/ISO 4586-3/HGP.

## 6 Requirements

### 6.1 Compliance

Laminates classified in Table 3 shall meet all appropriate requirements specified in 6.2, 6.3 and 6.4. This applies to both full-size sheets and cut-to-size panels.

### 6.2 Inspection requirements

#### 6.2.1 General

Inspection shall be carried out in accordance with ISO 4586-2:2018, Clause 4 at a distance of 0,75 m to 1,5 m.

#### 6.2.2 Colour and pattern

When inspected in daylight or D65 standard illuminant and again under tungsten illuminant A, there shall be no significant difference between the corresponding colour reference sample held by the supplier and the specimen under test.

Where colour and surface finish are critical, it is recommended that sheets be checked for colour and surface-finish compatibility before fabrication or installation.

### 6.2.3 Surface finish

When inspected at different viewing angles, there shall be no significant difference between the corresponding surface-finish reference sample held by the supplier and the specimen under test.

Where colour and surface finish are critical, it is recommended that sheets be checked for colour and surface-finish compatibility before fabrication or installation.

### 6.2.4 Reverse side

The reverse side of sheets shall be suitable for adhesive bonding (e.g. sanded). In the case of sanded backs, slight chatter marks are permitted.

### 6.2.5 Visual inspection

#### 6.2.5.1 General

The inspection requirements specified in 6.2.5.2 and 6.2.5.3 are intended as a general guide, indicating the minimum acceptable quality for laminates. Cut-to-size panels and certain applications involving full-size sheets may call for special quality requirements which can be negotiated between supplier and purchaser. In such cases the following requirements may be used as a basis for agreement. It shall be noted that only a small percentage of sheets in a batch (the level to be agreed with the customer) shall contain defects of the minimum acceptable level.

#### 6.2.5.2 Surface quality

The following surface defects are permissible:

- Dirt, spots, and similar surface defects.

The admissible size of such defects is based on a maximum contamination area equivalent to 1,0 mm<sup>2</sup>/m<sup>2</sup> of laminate and is proportional to the sheet size under inspection.

The total admissible area of contamination may be concentrated in one spot or dispersed over an unlimited amount of smaller defects.

- Fibres, hairs, and scratches.

The admissible size of defects is based on a maximum contamination length equivalent to 10 mm/m<sup>2</sup> of laminate and is proportional to the sheet size under inspection.

The total admissible length of contamination may be concentrated in one defect or dispersed over an unlimited amount of smaller defects.

#### 6.2.5.3 Edge quality

Visual defects (e.g. moisture marks, lack of gloss, corner damage, etc.) can be present on all four edges of the laminate, providing the defect-free length and width are at least the nominal size minus 20 mm.

## 6.3 Dimensional tolerance requirements

Dimensional tolerance requirements are specified in [Table 4](#).