



BSI Standards Publication

Printed pressure-sensitive, adhesive-coated labels for marine use, including requirements for label stock – Specification

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© The British Standards Institution 2024

Published by BSI Standards Limited 2024

ISBN 978 0 539 21056 9

ICS 47.020.05; 55.040

The following BSI references relate to the work on this document:

Committee reference PKW/0/4

Draft for comment 23/30451221 DC

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

Contents

	Page
Foreword	III
Section 1 General	1
0 Introduction	1
0.1 Responsibility of shippers	1
0.2 Summary of legal requirements	1
1 Scope	1
2 Normative references	2
3 Terms, definitions and abbreviated terms	2
Section 2 Pressure-sensitive, adhesive-coated facestock	4
4 Performance requirements	4
4.1 General	4
<i>Table 1 — Summary of Section 2 performance requirements and test methods</i>	4
4.2 Marine performance type test on aluminium and HDPE	5
4.3 Laboratory performance type tests on aluminium test plates	5
4.4 Laboratory performance type tests on HDPE test plates	7
4.5 Fitness for use	7
5 Marking of consignments	7
Section 3 Printed pressure-sensitive, adhesive-coated labels	8
6 Materials	8
<i>Figure 1 — Example test label</i>	8
7 Dimensions	9
8 Performance requirements	9
<i>Table 2 — Summary of Section 3 performance requirements and test methods</i>	9
8.1 Print key effectiveness	9
8.2 Abrasion resistance	10
8.3 Permanence of print: colour fastness and residual contrast	10
8.4 Fitness for use	10
9 Marking of consignments	10
Annex A (informative) Guidance to shippers and users	11
A.1 General	11
A.2 Label selection and application	11
Annex B (normative) Application of label stock for test purposes	13
B.1 Application of label stock to aluminium and HDPE test plates for marine testing	13
<i>Figure B.1 — Application of label stock to test plates for marine testing</i>	13
B.2 Application of label stock to aluminium test plates for dimensional stability tests	14
B.3 Application of label stock to aluminium and HDPE test plates for laboratory adhesion tests	14
Annex C (normative) Preparation of test plates	15
C.1 Aluminium test plates	15
C.2 HDPE test plates	15
Annex D (normative) Method of test for immersion resistance to salt water (marine immersion)	16
Annex E (normative) Method of test for adhesion levels	17
E.1 Apparatus	17
E.2 Test conditions	17
E.3 Procedure	17

Annex F	(normative) Weathering (resistance to light and saline solution)	18
F.1	Apparatus	18
	<i>Figure F.1 — Salt spray cabinet</i>	19
	<i>Figure F.2 — Salt spray jet</i>	20
F.2	Method of operation	20
F.3	Reagents	21
	<i>Table F.1 — Saline solution composition</i>	21
F.4	Procedure	21
Annex G	(normative) Laboratory temperature cycling	22
Annex H	(normative) Legibility	22
H.1	Colour fastness	22
H.2	Residual contrast	22
Annex I	(normative) Print key effectiveness	23
I.1	Apparatus	23
I.2	Procedure	23
Annex J	(normative) Method of test for abrasion resistance	24
J.1	Apparatus	24
	<i>Figure J.1 — Wide-mouthed cylindrical container with rod</i>	24
	<i>Figure J.2 — Typical abrasion test apparatus</i>	25
J.2	Procedure	25
	<i>Figure J.3 — Rod positioning in the container</i>	26
Annex K	(normative) Recommended user laboratory tests for the evaluation of label adhesion for surfaces not covered by Section 2	27
K.1	General	27
	<i>Table K.1 — Summary of recommended minimum values and test methods for adhesion to specific surfaces</i>	27
K.2	Preparation of test specimens	28
K.3	Adhesion tests	28
K.4	Test for effect of migratory plasticizer	28
	Bibliography	29

Summary of pages

This document comprises a front cover, an inside front cover, pages I to IV, pages 1 to 29, and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 December 2024. It was prepared by Subcommittee PKW/0/4, *Packaging – Dangerous goods*, under the authority of Technical Committee PKW/0, *Packaging*. A list of organizations represented on these committees can be obtained on request to the committee manager.

Supersession

This British Standard supersedes [BS 5609:1986](#), which will be withdrawn on 31 December 2030.

Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- inclusion of high density polyethylene (HDPE) test methods in [Section 2](#);
- provision is made to allow for separate testing and certification of [Section 2](#) and [Section 3](#).

Product certification. Users of this British Standard are advised to consider the desirability of third-party certification of product conformity to this British Standard. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at knowledge.bsigroup.com, or by contacting the Customer Services team.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Unless otherwise directed by a certification body:

- labels that were manufactured to [BS 5609:1986](#), Section 2, need only be tested on HDPE; and
- labels that were manufactured to [BS 5609:1986](#), Section 3, do not need to be re-tested.

Use of this document

[Section 2](#) gives methods for determining the performance of unprinted label stock for resistance to marine immersion, weathering, temperature cycling and abrasion. [Section 3](#) determines the performance of the printed facestock for print key adhesion, abrasion and artificial weathering.

The standard is subdivided to separate the requirements for the adhesive-coated facestock from those for the printed label.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. “organization” rather than “organisation”).

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Section 1 General

0 Introduction

0.1 Responsibility of shippers

It is obligatory for shippers to durably mark dangerous goods packagings, including large containers such as portable tanks and freight containers, for carriage by sea. To emphasize that responsibility for this rests with the shipper, BS 5609 includes guidance to shippers to enable them to discharge those responsibilities.

Compliance with [Section 2](#) of this British Standard ensures adequate performance of the facestock, plus adhesive, and its adhesion to both aluminium test surface and polyethylene drum material under marine conditions. Compliance with [Section 3](#) of this British Standard ensures adequate colour fastness and durability of the inks or dyes when used with a particular facestock. Facestock can be tested for compliance with [Section 2](#) and [Section 3](#) separately. [Section 2](#) compliance is not required before [Section 3](#). However, full compliance requires the printed label construction to conform with both [Section 2](#) and [Section 3](#). It remains for the shipper, having noted the points outlined in [0.2](#), to carry out such tests as are necessary to satisfy themselves as to the adequate performance of the labels as applied in normal use to the packages being shipped. Guidance for this purpose is given in [Annex A](#).

0.2 Summary of legal requirements

The International Maritime Dangerous Goods (IMDG) Code [[1](#)] applies to shipment of dangerous goods by sea from most maritime countries. It contains provisions that, unless otherwise provided in the IMDG Code [[1](#)], each package containing dangerous goods is to be durably marked with the proper shipping name of the contents, and durably identified with Dangerous Goods class label(s) (the “diamond” label), or stencil(s) of the labels. It further provides that the method of marking the name and affixing the label is such that the name and label (or stencil) would still be identifiable on packages surviving at least three months’ immersion in the sea.

The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 [[2](#)], Regulation 11(1a), requires such provisions and applies to packaged dangerous goods taken on board a ship within the United Kingdom or its territorial waters and requires compliance with the IMDG Code [[1](#)].

NOTE Attention is drawn to the Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997 [[2](#)] for detailed information, while further guidance can be found in Merchant Shipping Notices issued from time to time by the Department for Transport.

1 Scope

This British Standard specifies requirements for printed pressure-sensitive, adhesive-coated labels suitable for use under marine conditions.

This standard describes methods for determining the performance of label stock for resistance to marine immersion, weathering and temperature cycling. It also determines the performance of the printed facestock for print key adhesion, abrasion and artificial weathering.

Test methods are given in the annexes, including a recommended method for the evaluation of label adhesion to specific surfaces.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions, or limits the application, of this document¹⁾. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

[BS EN 515](#), *Aluminium and aluminium alloys – Wrought products – Temper designations*

[BS EN 20105-A02:1994](#), *Textiles – Tests for colour fastness – Grey scale for assessing change in colour (including half-steps)*

[BS EN 20105-A03:1994](#), *Textiles – Tests for colour fastness – Grey scale for assessing change in colour (including half-steps)*

[BS EN ISO 1183](#) (all parts), *Plastics – Methods for determining the density of non-cellular plastics*

[BS EN ISO 4892-2](#), *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

[BS EN ISO 29862:2019](#), *Self adhesive tapes – Determination of peel adhesion properties*

Other publications

[N1] [ASTM D1505](#), *Standard test method for density of plastics by the density-gradient technique*

[N2] [ASTM D792](#), *Standard test methods for density and specific gravity (relative density) of plastics by displacement*

[N3] [ASTM G155](#), *Standard practice for operating xenon arc lamp apparatus for exposure of materials*

[N4] [ASTM D3330](#), *Standard test method for peel adhesion of pressure-sensitive tape*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

3.1.1 facestock

material that holds ink on one side and adhesive on the other, making it the core of any label construction

3.1.2 hue

property of light by which the colour of an object is classified in reference to the spectrum

NOTE A non-exhaustive list of examples are red, blue, green, yellow or orange.

3.1.3 label stock

flexible facestock material to which a pressure-sensitive adhesive has been applied as an integral part of its construction

3.1.4 pressure-sensitive adhesive

adhesive that produces a permanently tacky film that can stick to a surface when pressure is briefly applied

¹⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

3.1.5 print receptive layer

thin layer applied to the surface of the facestock to aid printability and print adhesion

NOTE This is sometimes referred to as a topcoat.

3.1.6 release liner

material with a releasing surface which is removed from the label stock before application to a surface

NOTE The release liner does not have an impact on [Section 2](#) performance testing of the label stock ([5.1](#) to [5.3](#)). However, changing the release liner can affect the fitness for use.

3.1.7 surface treatment

treatment on one side of the facestock (e.g. flame, corona discharge) to aid adhesion of the print or the pressure-sensitive adhesive

3.1.8 test plate

surface to which the label stock is applied for testing

3.1.9 test specimen

individual replicate of the test material

3.1.10 type test

test directed towards approval of a label stock material type

NOTE This test is used to check compliance with [Section 2](#) of this British Standard.

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

HDPE high density polyethylene

RH relative humidity

Section 2 Pressure-sensitive, adhesive-coated facestock

COMMENTARY ON SECTION 2

Section 2 is of relevance to label stock manufacturers (facestock plus adhesive). Facestock can be tested to Section 2 and Section 3 separately. Compliance with Section 2 is not required before Section 3.

Product inspection. Users of this British Standard are advised to consider the desirability of third-party inspection of product conformity to this British Standard, either by inspection of the material data sheets or by test or both. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI to forward their enquiries to the relevant association.

4 Performance requirements

4.1 General

The unprinted adhesive-coated facestock shall meet all the requirements of Section 2 on both aluminium and HDPE test plates.

NOTE 1 A summary of performance requirements and test method references is given in Table 1.

Full testing in accordance with Section 2 shall be repeated whenever changes are made to the label stock.

NOTE 2 A non-exhaustive list of changes which would need retesting include:

- the facestock;
- pressure-sensitive adhesive;
- surface treatment between the facestock and adhesive;
- application of an overlaminating film; or
- changes to material thickness exceeding 10%.

Table 1 — Summary of Section 2 performance requirements and test methods

Property	No. of test specimens	Dimensions of test specimen mm	Preparation annex	Conditioning	Test method annex	Performance requirements	
						Clause reference	Mean value for each test specimen
Marine performance type test of label stock on aluminium and HDPE							
Adhesion after 3 months' marine immersion	3	100 × 200	B.1, C	48 h (23 ±2) °C (50 ±5)% RH	D, E	4.2	Aluminium: Not less than 10.0 N per 25 mm width HDPE: Not less than 6.5 N per 25 mm width
Laboratory performance type tests of label stock on aluminium							
Dimensional stability	3	40 × 40	B.2, C.1	48 h (23 ±2) °C (50 ±5)% RH	F	4.3.1	Not alter by more than +1.0% to −3.0%
Adhesion after 48 h	3	25 × 175	B.3, C.1	48 h to 52 h (23 ±2) °C (50 ±5)% RH	E	4.3.2	Not less than 12.5 N per 25 mm width

Table 1 — Summary of Section 2 performance requirements and test methods (continued)

Property	No. of test specimens	Dimensions of test specimen mm	Preparation annex	Conditioning	Test method annex	Performance requirements	
						Clause reference	Mean value for each test specimen
Adhesion after artificial weathering	3	25 × 175	B.3, C.1	48 h (23 ± 2) °C (50 ± 5)% RH	F, E	4.3.3	Not less than 12.5 N per 25 mm width
Adhesion after temperature cycling	3	25 × 175	B.3, C.1	48 h (23 ± 2) °C (50 ± 5)% RH	G, E	4.3.4	Not less than 12.5 N per 25 mm width
Colour fastness	—	—	—	—	F, H.1	4.3.5	Colour remains recognizable. Colour fastness not less than grade 2 of staining scale in BS EN 20105-A03:1994
Laboratory performance type tests of label stock on HDPE							
Adhesion after 48 h	3	25 × 175	B.3, C.2	48 h to 52 h (23 ± 2) °C (50 ± 5)% RH	E	4.4.1	Not less than 6.5 N per 25 mm width
Adhesion after temperature cycling	3	25 × 175	B.3, C.2	48 h (23 ± 2) °C (50 ± 5)% RH	G, E	4.4.2	Not less than 6.5 N per 25 mm width

4.2 Marine performance type test on aluminium and HDPE

A marine performance type test shall be performed on each adhesive-coated facestock.

After exposure to marine conditions for between 90 days and 110 days, the adhesion of each test specimen shall be not less than 10.0 N per 25 mm width on aluminium test plates and 6.5 N per 25 mm width on HDPE test plates when test specimens have been:

- preconditioned for at least 24 h at (23 ± 2) °C and (50 ± 5)% RH;
- applied as given in [B.1](#) to test plates prepared in accordance with [Annex C](#);
- conditioned when adhered to the test plates, for 48 h at (23 ± 2) °C and (50 ± 5)% RH;
- exposed on the test plates in accordance with [Annex D](#) (exposure to commence within 20 days of being applied to the test plate); and
- tested, after exposure, in accordance with [Annex E](#).

4.3 Laboratory performance type tests on aluminium test plates

4.3.1 Dimensional stability

The dimensions shall not alter by more than +1.0% or –3.0% when test specimens have been:

- preconditioned for at least 24 h at (23 ± 2) °C and (50 ± 5)% RH;
- applied and measured as given in [B.2](#) using test plates prepared in accordance with [C.1](#);
- conditioned when adhered to the test plates, for at least 48 h at (23 ± 2) °C and (50 ± 5)% RH;
- submitted to artificial weathering in accordance with [Annex F](#); and
- re-measured.