

CONFIRMED
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Metric units

Methods of test for printing inks —

(Resistance of prints to various physical
and chemical agents)

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Co-operating organizations

The Printing, Stationery and Allied Trades Standards Committee under whose supervision this British Standard was prepared consists of representatives from the following Government department and scientific and industrial organizations:

- Advertisement Typesetting and Foundry Employers' Federation
- British Federation of Master Printers*
- British Paper and Board Makers' Association (Incorporated)
- British Printing Machinery Association
- British Stationery and Office Equipment Association
- Business Equipment Trade Association
- Envelope Makers' and Manufacturing Stationers' Association
- Federation of Master Process Engravers
- H.M. Stationery Office*
- National Association of Paper Merchants
- Newspaper Society
- Society of British Printing Ink Manufacturers*

The Government department and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- British Carton Association
- British Closure Manufacturers' Association
- British Colour Makers' Association
- British Tin Box Manufacturers' Federation
- Cake and Biscuit Alliance Limited
- Food Manufacturers' Federation Incorporated
- Incorporated Society of British Advertisers Limited
- Institute of Packaging
- Institute of Printing Limited
- London College of Printing
- Research Association for the Paper and Board, Printing and Packaging Industries (PIRA)
- Technical Section of British Paper and Board Makers' Association

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Foreword

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook.

BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

BS 350, *Conversion factors and tables*.

BS 1006, *Methods of test for colour fastness of textiles and leather*.

BS 1006-A02, *Grey scale for assessing change in colour*.

BS 1006-A03, *Grey scale for assessing staining (including half-steps)*.

BS 3591, *Industrial methylated spirits*.

BS 3649, *Original printing plates*.

BS 3978, *Water for laboratory use*.

The European Committee of the Paint and Printing Ink Manufacturers' Association prepared a draft in 1963 on Test Methods for Printing Inks which was widely adopted by printing ink manufacturers in this country. On the recommendation of the Society of British Printing ink Manufacturers this draft served as a basis for this British Standard, prepared under the authority of the Printing, Stationery and Allied Trades Standards Committee.

A fundamental distinction should be made between the testing and evaluation of printing inks, for which specified print specimens are to be prepared on a specified substrate as laid down in Test Method 1, and of prints, which are produced by any printing procedure on any substrate without specified conditions.

Tests are carried out on the prints according to the use to which they will be put. Further tests may be added to the standard at a later date as the need for them is considered to arise.

The standard distinguishes between letterpress and lithographic inks on the one hand, and other printing inks, e.g. intaglio, flexographic. At present no agreed method exists for producing a standard print from the other inks.

The papers selected for the purposes of these tests are those defined in 1.2.2. Since more precisely standardized papers are not yet available, it has been agreed that those specified in Test Method 1 should be used. If an undefined substrate is used, by agreement between purchaser and manufacturer, the measurements are relative only.

NOTE 1 This standard should be read in conjunction with BS 1006, "Methods of test for colour fastness of textiles and leather", Section A02, "Grey scale for assessing change in colour", and Section A03, "Grey scale for assessing staining".

NOTE 2 Where imperial equivalents have been given, the metric units are to be regarded as the standard. The conversions are approximate. More accurate conversions should be based on the tables in BS 350, "Conversion factors and tables".

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 20 and a back cover

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard describes methods of determining the resistance of printing inks and prints to various physical and chemical agents. The applicability of these tests is indicated in each method.

Test method 1 Preparation of a standard print of letterpress and lithographic inks

1.1 Applicability

This method deals with the preparation of a standard print using air-drying letterpress or lithographic ink. A print is made by applying a defined volume of ink per unit area evenly distributed over a specified substrate by an appropriate method.

1.2 Apparatus and materials

1) *Press-ready ink.*

2) *Paper.*

a) Coated paper: two-sided coated paper, light fast, with no optical bleaching agent, free from mechanical woodpulp, white, substance not less than 150 g/m^2 ¹⁾.

b) Uncoated paper: paper for half-tone prints, with a high satin finish, free from mechanical woodpulp, white, substance not less than 100 g/m^2 ¹⁾.

3) *Equipment.*

Laboratory apparatus such as proofing and printability testers, proof presses, or all production machines using the letterpress or lithographic process.

The preferred equipment is a cylinder printing press with mechanical ink distribution inking a printing plate $80 \text{ mm} \times 160 \text{ mm}$ ($3 \text{ in} \times 6 \text{ in}$). The plate is prepared in accordance with the sizes and face divisions shown in Figure 1.

The half-tone images on the screen parts are as follows:

Coated paper: cross line screen, 54 lines per centimetre (133 lines per inch). Uncoated paper: cross line screen, 40 lines per centimetre (100 lines per inch). Screen value: 70 % density.

The letterpress plates shall comply with BS 3649²⁾.

If the ink transfer is checked by weighing the plate before and after printing, the screen ends may be omitted and a solid plate $80 \text{ mm} \times 120 \text{ mm}$ ($3 \text{ in} \times 4 \text{ in}$) or other suitable dimensions may be used.

1.3 Procedure

A print of press-ready ink is made as follows:

1.3.1 On the coated paper an ink volume of $1.50 \pm 0.15 \text{ ml/m}^2$ (or an ink thickness of $1.50 \pm 0.15 \mu\text{m}$).

1.3.2 On the uncoated paper an ink volume of $2.00 \pm 0.20 \text{ ml/m}^2$ (or an ink thickness of $2.00 \pm 0.20 \mu\text{m}$).

NOTE 1 The correct ink film thickness will be achieved when the largest quantity of ink is applied to the paper consistent with clean printing of the 70 % screen density portion, with no filling in of the non-image areas.

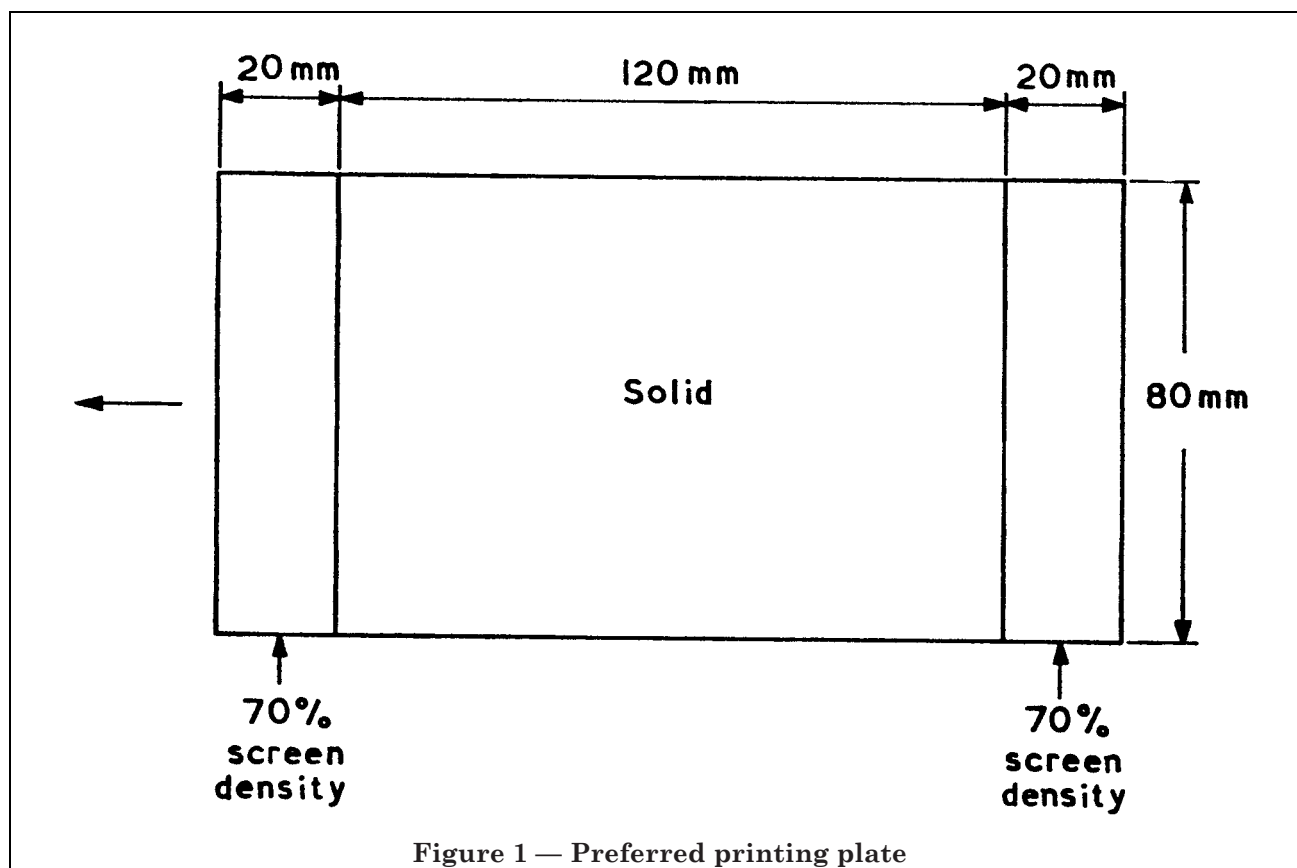
NOTE 2 The plate is inked in the direction shown by the arrow and a print is made.

NOTE 3 The minimum size of a print to be used in Test Methods 3-11 is $20 \text{ mm} \times 50 \text{ mm}$ ($1 \text{ in} \times 2 \text{ in}$).

NOTE 4 The print is allowed to dry for 72 hours in free air (not stacked) unless otherwise specified, at a temperature of $20 \pm 2 \text{ }^\circ\text{C}$ with a relative humidity of not more than 70 %.

¹⁾ BSI will provide upon enquiry information as to where these papers may be obtained.

²⁾ BS 3649. "Original printing plates".



Test method 2 Determination of fastness of printing inks and prints to daylight

2.1 Applicability

A print is exposed to daylight under the specified conditions at the same time as a light fastness scale. Fastness is evaluated by the method given below. This method is applicable to all prints.

2.2 Definitions

For the purposes of this British Standard the following definitions apply:

1) **fastness to daylight of an ink**

the fastness of a standard print, prepared as described in Test Method 1, when tested in accordance with the method described in 2.3

2) **fastness to daylight of a print**

the fastness of a print to daylight when tested by the method described in 2.3

2.3 Procedure and evaluation

2.3.1 Introduction

The method described is based on that of BS 1006³⁾. Ideally, it is necessary to ensure that different people separately testing the same print will cause it to be faded to the same degree before assessment against the similarly faded standard. Since the ultimate users of the prints may differ in what they consider to be significant fading, specimens should be faded to two different degrees to cover most opinions. These degrees of fading are defined by reference to the grey scale for assessing change in colour, BS 1006-A02.

³⁾ BS 1006, "Determination of fastness to daylight of coloured textiles."

One procedure requires a separate set of standards for each sample to be tested, and also frequent inspection of the specimen. It is therefore not practicable when a number of specimens are to be tested simultaneously. In this case an alternative procedure is permissible in which a number of specimens are exposed simultaneously alongside a single set of standards; each specimen and the standards are faded to three degrees by the simultaneous covering of the standards and all the specimens, at intervals so spaced as to enable a reliable assessment of light fastness to be made by comparison of two of the three exposed areas on the specimens with the corresponding areas of the standards.

Both procedures are described in this method, as in BS 1006⁴⁾, but the first is considered ideal and should be used in cases of dispute.

2.3.2 Apparatus

1) *Standards.* The standards for this test are wool cloths dyed with blue dyes of different fastness. The dyes corresponding to each fastness rating are given in the table below. Samples of standard cloths may be purchased from the British Standards Institution, 2 Park Street, London W.1 or 3 York Street, Manchester M2 2AT. Each standard is approximately twice as light fast as the one preceding it numerically.

Fastness rating	Dye	Colour index ^a designation	Colour Index	Interpretation of ratings for prints
1	Acilan Brilliant Blue FFR (FBy)	C.I. Acid Blue 104	42 735	Very low
2	Acilan Brilliant Blue FFB(FBy)	C.I. Acid Blue 109	42 740	Low
3	Coomassie Brilliant Blue R(ICI)	C.I. Acid Blue 83	42 660	Moderate
4	Supramin Blue EG (FBy)	C.I. Acid Blue 121	50 310	Fairly high
5	Solway Blue RN (ICI)	C.I. Acid Blue 47	62 085	High
6	Alizarine Light Blue 4GL(S)	C.I. Acid Blue 23	61 125	Very high
7	Soledon Blue 4BC powder (ICI)	C.I. Solubilised Vat Blue 5	73 006	Excellent
8	Indigosol Blue AGG (DH)	C.I. Solubilised Vat Blue 8	73 801	Exceptional

NOTE It is not usual for prints to have a fastness comparable with the last three of the values given for textiles.

^a The Colour Index (second edition) is published by the Society of Dyers and Colourists, 19 Piccadilly, Bradford, Yorkshire.

2) *Exposure rack*, facing due south in the Northern Hemisphere, north in the Southern Hemisphere, and sloping at an angle from the horizontal approximately equal to the latitude of the place where the exposure is made. The rack shall be placed so that shadows of surrounding objects do not fall on the exposed prints, and covered with window glass to protect the specimens from the weather, the glass being not less than 50 mm (2 in) from the specimen. Adequate ventilation shall be provided.

3) *Opaque board* or other thin opaque material, e.g. thin sheet aluminium or board covered with aluminium foil.

4) *Grey scale* for assessing change in colour (BS 1006-A02).

2.3.3 Test specimens. The size of each print shall be not less than 10 mm × 60 mm (½ in × 2½ in). To facilitate handling, the specimen or specimens to be tested and similar strips of the standards may be stapled side by side on to a piece of card.

⁴⁾ BS 1006, "Determination of fastness to daylight of coloured textiles."

2.3.4 Procedure

1) *Method 1.* This method is considered best and should be used in cases of dispute. It requires one set of standards for each specimen under test.

The specimen and standards are arranged as shown in Figure 2 with an opaque cover AB across the middle third, and exposed to daylight under the conditions in 2.3.2 2). The effect of light is observed by removing the cover and inspecting the specimen frequently. When a change can just be perceived, the number of the standard showing a similar change is noted. The exposure is continued until the contrast between the exposed and covered portions of the specimen is equivalent to Grade 4 on the grey scale.

The second one-third of the specimen and standards is covered with an additional opaque cover (CD in Figure 2), and exposure is continued until the contrast between the fully exposed and the unexposed portions is equivalent to Grade 3 on the grey scale.

2) *Method 2.* This method may be used when several specimens are to be tested simultaneously.

The specimens and standards are arranged as shown in Figure 3 with an opaque cover AB covering one-quarter of the length, and exposed to daylight under the conditions in 2.3.2 2). The effect of light is observed by lifting the cover periodically and inspecting the standards. When a change in Standard 3 can just be perceived, the light fastness of the specimens is rated by comparing any changes with those which have occurred in Standards 1, 2 and 3.

AB is replaced, in exactly the same position, and exposure continued until a change in Standard 4 can just be perceived. An additional cover CD is fixed in the position shown in Figure 3 overlapping AB and exposure continued until a change in Standard 6 can just be perceived. A further cover EF is added as shown, and exposure, continued until either a contrast is produced in Standard 7 equivalent to Grade 4 on the grey scale; or a contrast equivalent to Grade 3 has been produced in the most resistant specimen, whichever occurs first.

2.3.5 Preliminary assessment of light fastness

1) *Method 1.* When a change in the specimen can just be observed, the number of the standard showing a similar change is noted.

2) *Method 2.* When a change in Standard 3 can just be observed, any change which has occurred in a specimen is assessed in comparison with the changes in Standards 1, 2 and 3.

2.3.6 Assessment of light fastness. The specimens and standards show separate areas — an unexposed region and areas of different fading as a result of exposure for different times.

1) *Method 1.* The changes in the specimen are compared with those in the standards, and the light fastness assessed.

2) *Method 2.* Two areas are chosen from the three exposed areas, which show contrasts with the unexposed region most nearly equivalent to Grades 4 and 3 on the grey scale, and these are compared with the corresponding areas in the standards.

2.3.7 Expression of results. The light fastness of a specimen is reported as the number of the wool standard which it most closely resembles.

If two different assessments are obtained at the two different degrees of contrast, the light fastness is the arithmetic mean. However, should this be intermediate between two standards, an appropriate half-rating may be given; e.g. a value 2-3 means that the print is not as fast as Standard 3, but is faster than Standard 2.

When the light fastness is 4 or higher, the preliminary assessment may be significant. When the two figures differ, that for preliminary assessment should be inserted in brackets after the other. For example, a rating of 4(2) indicates that the specimen changes very slightly in Method 1 when Standard 2 just begins to fade, or in Method 2 shows a fading similar to Standard 2 when Standard 3 just begins to fade, but that on continuing the exposure the resistance to light is equivalent to that of Standard 4.

If the colour of the specimen is more fugitive than that of Standard 1, a rating of 1 is given.