BRITISH STANDARD

BS 3962-1: 1980

Methods of test for

Finishes for wooden furniture —

Part 1: Assessment of low angle glare by measurement of specular gloss at 85°

UDC 684.4.041.059.1:667.638.6:535.312

Cooperating organizations

The Pigments, Paints and Varnishes Standards Committee, under whose direction this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

British Colour Makers' Association
Builders' Merchants' Federation
Consumers' Association*
Department of the Environment (Building Research Establishment)
Department of the Environment (PSA)*
Department of Industry (Chemicals and Textiles)
Department of Industry (Laboratory of the Government Chemist)
Greater London Council
London Transport Executive
Ministry of Defence
Oil and Colour Chemists' Association
Paint Research Association
Paintmakers' Association of Great Britain Ltd
Post Office
Royal Institute of British Architects
Society of Chemical Industry
Titanium Pigment Manufacturers' Technical Committee
White Lead Manufacturers' Association
Zinc Development Association
Zinc Pigment Development Association

The 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:

Association of County Councils
British Woodworking Federation
Department of Education and Science
Department of the Environment (Joint Fire Research Organisation of the Department of the Environment and Fire Offices Committee)
Furniture Industry Research Association

This British Standard, having been prepared under the direction of the Pigments, Paints and Varnishes Standards Committee, was published under the authority of the Executive Board and comes into effect on 30 May 1980

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The following BSI references relate to the work on this standard:
Committee reference PVC/5
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Amendments issued since publication

Amd. No.	Date	Comments

Contents

Foreword

This Part of this British Standard has been prepared under the direction of the Pigments, Paints and Varnishes Standards Committee as one of a series of standard methods for testing and assessing the performance of finishes for wooden furniture. It is based on ISO 2813-1978, prepared by Technical Committee 35, Paints and varnishes, of the International Organization for Standardization (ISO) and implemented as BS 3900-D5. However, BS 3962-1 differs in that, for this application, measurement of gloss is required only at 85 °. For convenience, an appropriately modified version, including instructions for preparation and ageing of the test surface, is issued as this Part of BS 3962.

The high level of illumination now commonly used can produce a reflected glare from the surface of furniture which can be a nuisance in certain situations. This test method enables the tendency of finishes to produce this low angle glare to be assessed and, hence, controlled.

This Part was first published in 1965 as one of a series of standard methods for testing the performance of clear finishes for wooden furniture. An increase in the use of pigmented finishes for furniture has now made it desirable to broaden the scope of the test method to include such finishes.

In view of the diversity of woods and finishing systems used in the furniture industry, it is impracticable to specify a uniform standard test substrate and method of preparation of the finishing system. These should be the subject of agreement between the purchaser and the supplier. This method seeks only to stipulate a standard procedure for testing wooden surfaces coated with the appropriate finishing system. The method is non-destructive and can, therefore, be applied to articles of wooden furniture as well as to test panels.

This Part of this British Standard describes a method of test only, to which reference may be made in a specification in which performance levels have been specified. A statement that a wood finishing system complies with the requirements of BS 3962 should not be used, as it is meaningless.

Other Parts of this standard are:

— *Part 2: Assessment of surface resistance to wet heat*;

— *Part 3: Assessment of surface resistance to dry heat*;

— *Part 4: Assessment of surface resistance to cold liquids*;

— *Part 5: Assessment of surface resistance to cold oils and fats*;

— *Part 6: Assessment of resistance to mechanical damage.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 4, an inside back cover 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 Part of this British Standard describes a method of test for assessing the low angle glare of a finished surface by measurement of the specular gloss at 85°.

It is applicable to finishes applied to test panels and to flat surfaces of finished articles of wooden furniture.

NOTE For the purposes of this British Standard, the terms "wood" and "wooden" include the range of materials manufactured from wood, e.g. blockboard, particle board, etc., used in the furniture industry.

2 References

The titles of the publications referred to in this standard are listed on the inside back cover.

3 Principle

The principle of the test is photoelectric comparison of the specular gloss of the test specimen relative to that of a gloss standard.

4 Apparatus

4.1 *Glossmeter.* The glossmeter shall consist of a light source and a lens that directs a parallel or slightly converging beam of light on to the surface under test, and a receptor housing containing a lens, field stop and photoelectric cell to receive the required cone of reflected light.

NOTE Since specular reflection is in general spectrally non-selective, the spectral characteristics of the light source and the detector need only be critically controlled when measuring highly chromatic, low-gloss finishes or those whose specular reflectance produces an obvious chromatic shift in the colour of the incident light. In this case, the combination of light source, photoelectric cell and associated colour filters should give a spectral sensitivity approximating to the CIE photopic luminous efficiency function weighted for CIE Standard illuminants C or D_{65}.

4.1.1 *Geometric conditions* (see Figure 1). The axis of the incident beam shall be at an angle of 85 ± 0.1° to the normal to the surface under test, i.e. 5 ± 0.1°, to the surface. The axis of the receptor meter shall coincide with the mirror reflection of the axis of the incident beam. With a flat piece of polished black glass or other front-surface mirror in the specimen position, an image of the source shall be formed at the centre of the receptor field stop (receptor window). The area of the sample illuminated shall not be less than 10 mm wide. The angle between the axis of the receptor beam and the normal to the surface shall be equal to the corresponding angle of the incident beam, i.e. 85 ± 0.1°. The dimensions and tolerances of the source and receptor shall be as indicated in Table 1. The angular dimensions of the receptor field stop shall be measured from the receptor lens.

NOTE The tolerances are chosen such that errors in the source and receptor apertures will not produce an indication error of more than 1 gloss unit at any point on the 100 unit scale (see clause **5**).

4.1.2 *Vignetting.* There shall be no vignetting of rays that lie within the field angles specified in **4.1.1**.

4.2 *Receptor meter.* The receptor measurement device shall give an indication proportional to the light flux passing the receptor field stop to within ± 1% of the full scale reading.

NOTE A commonly used receptor meter arrangement uses a barrier layer photocell in conjunction with a high resistance galvanometer. This is not satisfactory as the galvanometer output is markedly non-linear, but this objection can be overcome by interposing a low input impedance electronic amplifier between the photocell and the galvanometer.

5 Gloss standards[1)]

NOTE For both primary and working standards, the most readily available glass of the required planarity is now manufactured by the "float" process. This glass is unsuitable for use as a primary standard, because the refractive index of the bulk glass differs from that of the surface. It is preferable to use an optically flat glass made by some other process, or to remove the surface of the float glass and repolish it to optical flatness.

[1)] If the absolute reflectance of the primary standard is required, this may be obtained by inserting the refractive index of the standard in the Fresnel equation.

Table 1 — Angle and relative dimensions of source image and receptor

	In plane of measurement			Perpendicular to plane of measurement		
	Degrees	2 tan σ/2	Relative dimension	Degrees	2 tan σ/2	Relative dimension
Source image angle, σ_2	0.75 ± 0.25	0.0131 ± 0.0044	0.171 ± 0.057	3.0 max.	0.0524	0.682
Receptor aperture, σ_B	4.00 ± 0.30	0.0698 ± 0.0052	0.909 ± 0.068	6.0 ± 0.3	0.1048 ± 0.0052	1.365 ± 0.068

5.1 Primary standards. The primary standard shall be highly polished black glass or clear glass with back and edges roughened and coated with black paint, the top surface, when measured by optical interference methods, being plane to within two fringes per centimetre. For the purpose of this standard, glass of refractive index n_D = 1.567 shall be assigned a specular gloss value of 100. If glass of this refractive index is not available, other material of known refractive index may be used, the gloss value being raised or lowered by 0.016 for each 0.001 departure from the standard value. (Example: for glass of refractive index 1.523, the assigned value would be 99.3.)

The refractive index shall be indicated on the primary standard.

NOTE It is not intended that the primary standard should be used for the daily calibration of glossmeters.

5.2 Working standards. Working standards may be of ceramic tile, vitreous enamel, opaque glass or other uniform gloss materials, but shall be of good planarity and shall have been calibrated against a primary standard for an indicated area and direction of illumination. Working standards shall be uniform and stable, and shall be checked and calibrated periodically by comparison with primary standards by technically competent organizations. At least two working standards, of different gloss levels, shall be available, one of which shall have poor image-forming characteristics.

6 Preparation and ageing of test surface

6.1 For test panels, the substrate and its preparation shall be agreed between the purchaser and the supplier.

Apply the full finishing system by the appropriate method of application to the prepared substrate. The application rates of the individual coats of material, the drying period and conditions, and the surface preparation between coats, e.g. sanding, shall be agreed between the purchaser and the supplier.

Allow the final coat to age at a room temperature not lower than 15 °C with free access of air for an agreed period before the test. The period shall be not less than 28 days except for special purposes, in which case the period shall be agreed between the purchaser and the supplier.

6.2 If the test is on a finished article of furniture, the test surface shall be a flat surface of a finished article of wooden furniture and shall be of sufficient size to accommodate the glossmeter without overlap.

7 Calibration

Calibrate the glossmeter, as follows, at the beginning of every period of operation and during operation at intervals sufficiently frequent to ensure that the response of the instrument is constant.

Adjust the instrument to read correctly the gloss of the high gloss working standard, and then read the gloss of the low gloss working standard. If the instrument reading of the low gloss working standard does not agree to within 1 gloss unit of its assigned value, do not use the glossmeter without further adjustment, preferably by the manufacturer.

8 Procedure

Take six readings at different positions on the test surface, for preference three in each of two directions at right angles, one of which shall be parallel to the direction of the grain of the test surface, if appropriate, checking against the high gloss working standard that there is no drift in calibration. Record the individual, mean and extreme values for each direction.

9 Test report

The test report shall include at least the following information:

a) a reference to this Part of this British Standard, i.e. BS 3962-1;

b) an identification of the coating or article under test;

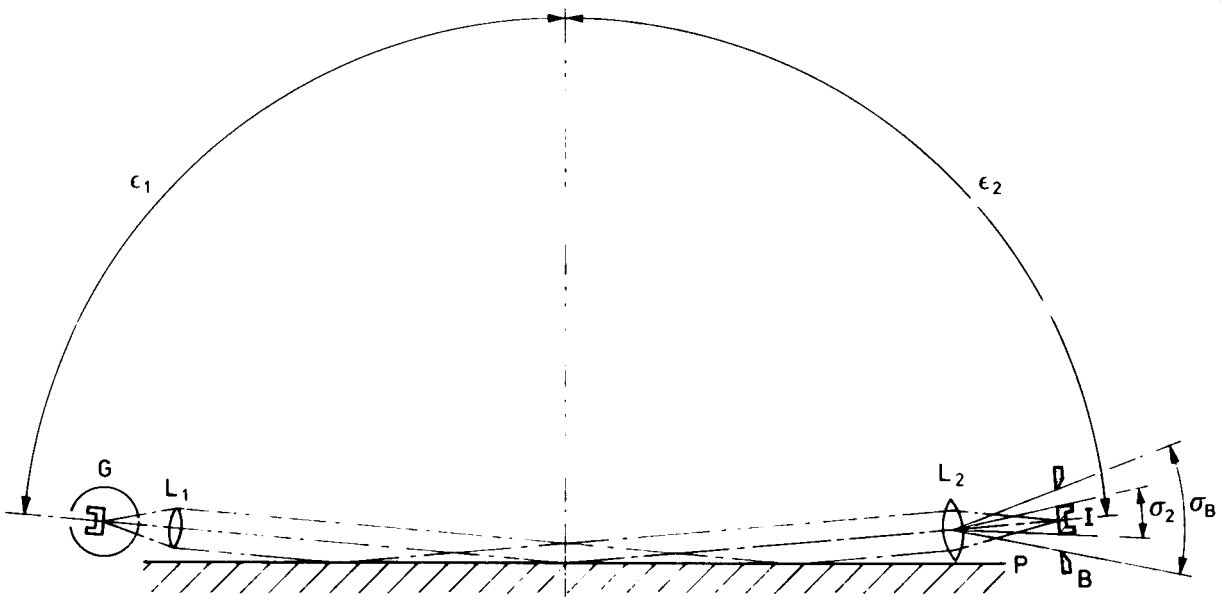
c) the product specification or other document supplying the test requirements and performance levels, if any;

d) any deviation, by agreement or otherwise, from the specified test procedure including the duration and the reasons, if known, for a special ageing period of less than 28 days;

e) the individual readings obtained in each of the two directions at right angles on the test surface;

f) the required performance level and the mean of the readings obtained in each of the two directions at right angles on the test surface;

g) the date of the test.



G = lamp
L_1 and L_2 = lens
B = receptor field stop
P = test surface
ϵ_1 = ϵ_2 = 85° ± 0.1°
σ_B = receptor aperture angle = 4.0° ± 0.3°
σ_2 = source image angle = 0.75° ± 0.25°
I = image of filament

Figure 1 — Schematic diagram of the glossmeter

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Publications referred to

BS 3900, *Methods of test for paints* [2)].

BS 3900-D5, *Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°*.

ISO 2813-1978, *Paints and varnishes — Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°*[2)].

[2)] Referred to in the foreword only.

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