BRITISH STANDARD

BS 245:1976

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Specification for

Mineral solvents (white spirit and related hydrocarbon solvents) for paints and other purposes

UDC 667.629.2:66.061:665.73.033.2

Cooperating organizations

The Petroleum Standards Committee, under whose supervision this British Standard was prepared, consists of representatives of the following Government departments and scientific and industrial organizations:

British Lubricants Federation Ltd
Chemical Industries Association
Department of Industry, National Engineering Laboratory
Hydrocarbon Solvents Association Ltd*
Institute of Petroleum
London Transport Executive
Ministry of Defence

The industrial organization 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 Railways Board
Dyers and Cleaners Research Organization
Paint Research Association
Paintmakers' Association of Great Britain
White Spirit Association

This British Standard, having been prepared under the direction of the Petroleum Standards Committee, was published under the authority of the Executive Board on 30 November 1976

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Third revision November 1976

The following BSI references relate to the work on this standard:
Committee reference PTC/8
Draft for comment 74/54719

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Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

Foreword

This British Standard was originally published in 1926 and revised in 1936 and 1956 under the title "White spirit".

The present edition has been prepared to bring the standard substantially into line with International Standard ISO 1250 "*Mineral solvents for paints — White spirits and related hydrocarbon solvents*", but it has been considered not necessary to include all the details of the test methods given in ISO 1250 as some are already published in British Standard methods. In preparing this British Standard it has also been considered necessary to deviate from ISO 1250 in some details, notably in specifying a lower limit for residue on evaporation and the deletion of method B in the distillation test corresponding to Institute of Petroleum method IP 195/73; this method is not normally used in the UK for white spirit solvents.

This British Standard is intended to cover the essential requirements for mineral solvents used in the paint industry and in other industries; these solvents may be considered as falling into two categories according to aromatics content, namely:

Type A, having an aromatics content less than 25 % (*v*/*v*);

Type B, having an aromatics content of 25 % to 50 % (*v*/*v*).

In the International Standard it was at first intended to use the simple title "White spirit", but discussion showed that this term would not be generally acceptable for such a wide range of solvents because in some countries it is used with a much more restricted meaning. Accordingly a longer, but more explanatory, title was adopted for the International Standard and, therefore, for this corresponding British Standard.

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 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 and field of application

This British Standard specifies the requirements for two categories of mineral solvents for use in paints and varnishes, and for other purposes, as follows:

Type A, having an aromatics content below 25 % (*v*/*v*);

Type B, having an aromatics content of 25 % to 50 % (*v*/*v*).

These materials meet the requirements of the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 as not constituting "highly flammable liquids".

2 References

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

3 Required characteristics and their tolerances

Mineral solvents consist essentially of a mixture of hydrocarbons, but the presence of a denaturant is permitted when agreed between the interested parties; the materials shall have the characteristics shown in Table 1.

4 Samples

4.1 Representative samples, each having a volume of not less than 500 ml, shall, wherever possible, be taken in triplicate from one or more original and previously unopened containers or from the bulk during packing, as may be agreed between the interested parties. Samples shall be packed in clean, dry, airtight bottles of dark glass, or of clear glass provided they are protected from light. The containers shall be of such a size that they are nearly filled by the sample. Each sample container so filled shall be sealed with a material unaffected by the contents and marked with the full details and date of sampling.

Guidance on sampling is given in BS 4726.

4.2 If an agreed sample is required for the purpose of clause **3** in relation to odour, it shall comply in all other respects with the requirements of this specification. It shall have a volume of not less than 500 ml and shall be packed in the manner described in **4.1**.

Table 1 — Required characteristics and their tolerances

Characteristic	Requirement	Test method (see note)
Clarity	Clear, no solid matter present	Visual inspection
Undissolved water at 20 °C	Absent	Visual inspection
Odour	If required by purchaser, to conform to agreed sample	As agreed between the interested parties
Colour	Not darker than standard colour solution	Appendix A
Distillation at 1013 mbar: volume of condensate recovered	These limits apply to mineral solvents with or without denaturant: not more than 1 ml below 130 °C not more than 10 ml below 145 °C not less than 90 ml below 200 °C end point, not above 220 °C	BS 4349
Aromatics content	Type A: less than 25% (*v*/*v*) Type B: 25% to 50 % (*v*/*v*) If required, more precise limits may be agreed between the interested parties	BS 4712
Residue on evaporation	Not more than 5 mg per 100 ml	BS 4348 using the method described for aviation and motor gasoline and the air-jet apparatus
Neutrality	Neutral By agreement between the interested parties, this requirement may be waived or modified in relation to denatured materials	When 50 ml of sample is shaken with 10 ml of distilled water, the water layer shall be neutral to methyl orange
Freedom from objectionable sulphur compounds	No more than slight tarnish of copper strip	BS 4351:1971 using the procedure given in **7.1.2**
Aniline point	If required, to be agreed between the interested parties	BS 4715 using 10 ml of both the sample and of aniline
Flash point	Not flashing at 32 °C (90 °F)	BS 3900-A8
Viscosity reduction power	If required, to be agreed between the interested parties	Appendix B

NOTE The following methods published by the Institute of Petroleum are technically identical with the test methods specified:

Technically identical with	
BS 4348	ASTM D 381:IP 131
BS 4349	ASTM D 86:IP 123
BS 4351:1971	ASTM D 130 – 68:IP 154/69
BS 4712	ASTM D 1319:IP 156
BS 4715	IP 2

Appendix A Method for the comparison of colour

A.1 Standard colour solution. Dissolve 4.8 mg of pure anhydrous potassium dichromate in 1 litre of distilled water or deionized water of at least equal purity.

A.2 Apparatus. *Two* 50 ml *Nessler cylinders* complying with BS 612 with the height of the 50 ml mark above the inside of the base matched to within 1 mm in the range 110 mm to 116 mm.

A.3 Procedure. Pass the sample through a filter paper about 150 mm in diameter and reject the first 10 ml of filtrate. Fill one of the Nessler cylinders to the mark with the filtered sample, and the other with the standard colour solution. Place the cylinders vertically 75 mm above the surface of an opaque opal glass sheet reflecting diffuse daylight, and compare the colour of the sample with that of the standard colour solution. Report the colour of the sample as being equal to, or lighter or darker than the colour of the standard colour solution.

A.4 Alternative methods. Alternative methods, employing permanent colour standards and giving results equivalent to the specified colour, may be used by agreement between the interested parties.

Appendix B Method for the determination of viscosity reduction power

B.1 Field of application. Viscosity reduction power is defined as the ratio of the viscosity of a resin dissolved in a control hydrocarbon solvent to the viscosity of a solution of the same resin at the same concentration in the hydrocarbon solvent under test.

This method of test specifies a procedure for determining the comparative viscosity reduction power of mineral solvents for various types of resinous materials.

B.2 Reagents

B.2.1 *Control solvent*, a hydrocarbon solvent as agreed between the interested parties.

B.3 Apparatus

B.3.1 *Glass bottles* of about 500 ml capacity, some having a narrow mouth with a cork to fit, others having a wide mouth with screw cap and seal of aluminium foil.

NOTE If desired 500 ml friction-top cans may be substituted.

B.3.2 *Balance*, sensitivity of 0.05 g.

B.3.3 *Mortar and pestle*, or other suitable equipment for grinding hard resin.

B.3.4 *Mechanical agitator*

B.3.5 *Temperature regulator*, suitable for maintaining temperature at 25 ± 0.5 °C.

B.3.6 *Viscometers*, of any approved type agreed between the interested parties, giving accurate results in centistokes, or results that can be converted to centistokes[1)].

NOTE Suitable capillary viscometers are described in BS 188 and BS 4708.

B.4 Procedure

B.4.1 *Preparation of solutions from hard resins*. Prepare duplicate solutions as follows. Into a clean, dry, narrow-mouth bottle of about 500 ml capacity, weigh the appropriate quantity of freshly ground lump resin to the nearest 0.05 g (see note). Add the necessary volume of control solvent. The mass of resin and the volume of solvent shall be agreed between the interested parties and shall be in such proportion that the resultant solution has a viscosity of between 100 cSt and 500 cSt[1)]. The total volume of the solution shall be at least 300 ml. Prepare a similar solution with an equivalent amount of the resin and the solvent under test. Cork the bottles tightly and dissolve the resin in the solvents by mixing at room temperature with a mechanical agitator until solution is complete.

The test shall be discontinued if the solution is not perfectly clear, because this indicates incomplete compatibility of resin and solvent.

When solution is complete, the bottles shall be allowed to stand at room temperature to eliminate air bubbles, but the viscosity shall be determined as soon as possible after the bubbles have cleared.

NOTE Since many resins are subject to oxidation in storage, only large lumps should be selected for grinding in order to minimize the effects of oxidation. The resin should be ground sufficiently fine to ensure rapid solution of the material but should not be ground to the consistency of a "flour" because it is difficult to handle in that state.

[1)] The SI unit for kinematic viscosity is square metre per second (m^2/s); 1 centistokes (cSt) = $10^{-6} m^2 s/s$ = 1 mm^2/s.

B.4.2 *Preparation of solutions from liquid resins or resin solutions.* Prepare duplicate solutions as follows. Into a clean, dry, wide-mouth bottle of about 500 ml capacity, weigh the appropriate quantity of liquid resin or resin solution to the nearest 0.05 g. If the resin or resin solution is very viscous, mild heating to a maximum temperature of 50 °C will facilitate transfer to the bottle in which the solution is to be prepared, care being taken that solvents in a resin solution are not allowed to evaporate. Add the necessary volume of control solvent. The mass of resin and the volume of solvent shall be agreed between the interested parties and shall be in such proportion that the resultant solution has viscosity of between 100 cSt and 500 cSt. The total volume of the solution shall be at least 300 ml. Prepare a similar solution with an equivalent amount of the liquid resin or resin solution and the solvent under test. Cap the bottles tightly and dissolve the liquid resin or resin solution in the solvents by mixing at room temperature with a mechanical agitator for at least 15 min.

When solution is complete, the bottles shall be allowed to stand at room temperature to eliminate air bubbles, but the viscosity shall be determined as soon as possible after the bubbles have cleared.

B.4.3 *Determination of viscosity*. If there is any lint or dirt in the solution after mixing is complete, the bottle shall be centrifuged before viscosity determinations are made. In order to obtain reliable data, duplicate solutions shall be prepared and tested. Determine the viscosity of each solution at 25 °C, using suitable temperature control, by means of any approved apparatus agreed between the interested parties.

B.5 Calculation. Calculate the viscosity reduction power (VRP) as follows:

$$\text{VRP } \frac{v_1}{v_2} \times 100$$

where

v_1 is the mean value of the viscosity of the solutions made with the control solvent (in cSt)

v_2 is the mean value of the viscosity of the solutions made with the solvent under test (in cSt)

If the result is less than 100, the solvent under test has a lower VRP than the control solvent. If the result is greater than 100, the solvent under test has a higher VRP than the control solvent.

B.6 Reproducibility. Results obtained in any one laboratory (mean of at least two determinations) should not be considered suspect unless they deviate from the average of two or more laboratories by more than 15 %.

Publications referred to

BS 188, *Methods for the determination of the viscosity of liquids in c.g.s. units.*

BS 612, *Nessler cylinders.*

BS 3900, *Methods of test for paints.*

BS 3900-A8, *Danger classification by flashpoint (closed cup method).*

BS 4348, *Method for determination of existent gum in fuels by jet evaporation.*

BS 4349, *Method for distillation of petroleum products.*

BS 4351, *Method for detection of copper corrosion from petroleum products by the copper strip tarnish method.*

BS 4708, *Method for determination of viscosity of transparent and opaque liquids (kinematic and dynamic viscosities).*

BS 4712, *Method for determination of hydrocarbon types in liquid petroleum products by fluorescent indicator adsorption.*

BS 4715, *Method for the determination of aniline point of petroleum products.*

BS 4726, *Methods for sampling raw materials for paints and varnishes.*

ISO 1250, *Mineral solvents for paints — White spirits and related hydrocarbon solvents.*

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