BRITISH STANDARD

BS 2713:1966

Incorporating Amendment No. 1

Specification for

2-Ethoxyethanol (Ethylene glycol monoethyl ether)

Confirmed January 2011

Co-operating organizations

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

Board of Trade
British Iron & Steel Federation
Chemical Industries Association*
Fertilizer Manufacturers' Association
Gas Council
Institute of Vitreous Enamellers
Institution of Gas Engineers
Ministry of Defence, Army Department*
Ministry of Health
National Sulphuric Acid Association
Royal Institute of Public Health & Hygiene

The Government department and 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 Pharmacopœia Commission
British Plastics Federation
Ministry of Defence, Navy Department
Ministry of Technology — Laboratory of the Government Chemist
Oil and Colour Chemists' Association
Pharmaceutical Society of Great Britain
Research Association of British Paint, Colour & Varnish Manufacturers
Royal Institute of Chemistry
Society for Analytical Chemistry
Society of Chemical Industry
Society of Motor Manufacturers and Traders Ltd.
Toilet Preparations Federation

This British Standard, having been approved by the Chemicals Industry Standards Committee and endorsed by the Chairman of the Chemical Divisional Council, was published under the authority of the General Council on 28 October 1966

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The following BSI references relate to the work on this standard:
Committee references CIC/4 and CIC/4/5
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Amendments issued since publication

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7628	May 1993	Indicated by a sideline in the margin

Contents

Foreword

This standard makes reference to the following British Standards:

BS 593, *Laboratory thermometers.*

BS 604, *Graduated measuring cylinders.*

BS 612, *Nessler cylinders.*

BS 658, *Apparatus for the determination of distillation range.*

BS 1792, *One-mark volumetric flasks.*

BS 2511, *Methods for the determination of water (Karl Fischer method).*

BS 3591, *Industrial methylated spirits.*

BS 3978, *Water for laboratory use.*

BS 4591, *Method for determination of distillation characteristics of organic liquids (other than petroleum products).*

This standard forms one of a series of British Standards for solvents and allied products. The preparation of this standard was authorized originally by the Fine Chemicals Industry Standards Committee (now merged in the Chemicals Industry Standards Committee).

This British Standard was first issued in 1956. In the present revision the limits for relative density, water content and acidity have been made more stringent. The requirements in respect of distillation range now specify initial boiling point and dry point. A specific colour requirement has been included.

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 3 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 specifies requirements for 2-ethoxyethanol suitable for industrial purposes.

2 Description

British Standard 2-ethoxyethanol shall be clear and free from matter in suspension, and shall consist essentially of 2-ethoxyethanol, $C_2H_5O.CH_2.CH_2OH$.

3 Colour

The colour of the material shall not exceed 15 Hazen units when measured by the method described in Appendix A or by a suitable instrumental method.

4 Relative density

The relative density[1)] of the material at any one of the following temperatures shall be within the appropriate values as shown below:

Temperature	Relative density	
°C	min.	max.
15.5/15.5	0.934	0.937
20/20	0.931	0.934
25/25	0.928	0.931

5 Distillation range

When the material is distilled by the method described in Appendix B, the initial boiling point at 760 mmHg pressure shall not be below 133.5 °C and the dry point at 760 mmHg pressure shall not be above 136.5 °C.

6 Miscibility with water

The material shall not show any opalescence when mixed with distilled water by the method described in Appendix C.

7 Water

The material shall not contain more than 0.1 % by mass of water, determined by the method described in Clause **2** of BS 2511:1970[2)] and using 20 ml of the material.

8 Alkalinity or acidity

The material shall not be alkaline to phenolphthalein and shall not contain more than 50 parts per million by mass of acid, calculated as acetic acid CH_3COOH, determined by the method described in Appendix D.

9 Sampling and size of sample

A representative sample of the material measuring not less than one litre shall be taken from the bulk for the purpose of examination in accordance with this specification. The sample shall be placed in a clean, dry and air-tight glass-stoppered bottle of such a size that it is nearly filled by the sample.

When it is necessary to seal the container, care shall be taken to avoid the risk of contaminating the contents in any way.

[1)] Formerly "specific gravity": "relative density" is the term adopted for this concept, with water as the reference substance, by the International Organization for Standardization (ISO).

[2)] BS 2511, *"Methods for the determination of water (Karl Fischer method)".*

Appendix A Limit test for colour

A.1 Apparatus

a) *Two Nessler cylinders*[3], 100 ml capacity.

b) *One-mark volumetric flask*[4], 500 ml capacity.

c) *One-mark volumetric flask*[4], 250 ml capacity.

A.2 Reagents

The reagents used shall be of a recognized analytical reagent quality. Water complying with BS 3978[5] shall be used throughout.

a) *Cobaltous chloride*, hexahydrate.

b) *Hydrochloric acid*, concentrated, d = 1.18.

c) *Chloroplatinic acid reagent*. Dissolve 250 mg of platinum in a small quantity of aqua regia contained in a glass or porcelain basin by heating on a water bath. When the metal has dissolved evaporate the solution to dryness. Add 1 ml of the hydrochloric acid and again evaporate to dryness. Repeat this operation twice more.

A.3 Preparation of colour standard

Dissolve 0.50 g of the cobaltous chloride hexahydrate and the whole of the chloroplatinic acid (prepared as described above) in 50 ml of the hydrochloric acid. Warm, if necessary, to obtain a clear solution and after cooling, pour into the 500 ml volumetric flask. Dilute with water to the mark.

Pipette 7.5 ml of this solution into the 250 ml volumetric flask. Dilute with water up to the graduation mark. This diluted solution has a colour of 15 Hazen units and should always be freshly prepared.

A.4 Procedure

Fill one of the Nessler cylinders to the mark with the sample, and the other with the colour standard. Using a white background, compare the colours.

Appendix B Method for the determination of distillation range

B.1 Apparatus

The apparatus required is described in BS 658[6] and comprises:

a) *Distillation flask* of 100 ml distillation capacity conforming to BS 658[6].

b) *Thermometer* No. F150C/100 complying with the requirements of BS 593[7].

c) *Condenser*, Type 1, complying with the requirements of BS 658[6].

d) *Draught screen*, Type C, and *non-asbestos heat-resistant flask support sheet* with 50 mm diameter central hole, complying with the requirements of BS 658[6].

B.2 Procedure

Assemble the apparatus as described in BS 658[6]. Measure 100 ml of the sample into the distillation flask from a graduated measuring cylinder[8] and add a few anti-bumping granules. Place the flask, thermometer and a suitable receiver in position and ensure that the condenser has a steady supply of water. Adjust the rate of heating so that the first drop of distillate falls from the end of the condenser in 7 to 12 minutes. Read the temperature at the instant the first drop falls from the end of the condenser and record as the observed initial boiling point.

Further adjust the rate of heating so that the distillate is collected at the rate of 3 to 4 ml per minute. Read the temperature indicated at the instant the last drop of liquid evaporates from the lowest point in the distillation flask and record as the observed dry point. Disregard any liquid on the side of the flask.

B.3 Corrections to be applied to the observed temperatures

i) If the thermometer gives incorrect readings at the observed initial boiling point or observed dry point, correct the readings by subtracting the amount of error if the thermometer is reading high, or adding the amount of error if the thermometer is reading low.

ii) Read the barometer and apply the corrections as described in BS 4591[9].

iii) When the corrected barometric pressure deviates from 760 mmHg, apply further corrections to the observed temperatures by subtracting 0.041 degC for every millimetre above 760 mm or adding 0.041 degC for every millimetre below 760 mm.

NOTE These last corrections are valid only for pressures above 700 mmHg.

[3] BS 612, "*Nessler cylinders*".
[4] BS 1792, "*One-mark volumetric flasks*".
[5] BS 3978, "*Water for laboratory use*".
[6] BS 658, "*Apparatus for the determination of distillation range*".
[7] BS 593, "*Laboratory thermometers*".
[8] BS 604, "*Graduated measuring cylinders*".
[9] BS 4591, "*Method for determination of distillation characteristics of organic liquids (other than petroleum products)*".

Appendix C Test for miscibility with water

To 5 ml of the sample contained in a 100 ml Nessler cylinder, add 95 ml of distilled water, mix thoroughly and adjust to 20 °C.

Examine vertically for opalescence against a black background with side illumination, using as a standard a similar cylinder containing 100 ml of distilled water.

Appendix D Method for the detection of alkalinity or determination of acidity

D.1 Reagents

The reagents used shall be of a recognized analytical reagent quality. Water complying with BS 3978[10] shall be used throughout.

a) *Sodium hydroxide*, 0.1N solution.

b) *Phenolphthalein indicator*. Dissolve 0.5 g of phenolphthalein in 100 ml of ethanol[11] (95 % by volume) and make faintly pink by the addition of dilute sodium hydroxide solution.

D.2 Procedure

Place 100 ml of water and a few clean anti-bumping granules into a 500 ml conical flask of borosilicate glass and boil gently for five minutes to eliminate carbon dioxide. Cool slightly and add 100 ml of the sample. Boil gently for a further five minutes. At the end of this period close the neck of the flask with a stopper carrying a soda-lime tube and allow to cool. When cold, remove the stopper, add 0.5 ml of the phenolphthalein indicator and examine for alkalinity: if not alkaline, titrate with the sodium hydroxide solution using a microburette.

D.3 Calculation

Acidity, calculated as acetic acid, CH_3COOH, parts per million by mass = $\frac{60 \times T}{d}$

where T = volume, in millilitres, of 0.1N sodium hydroxide solution used

and d = relative density of the sample.

[10] BS 3978, "*Water for laboratory use*".

[11] Ethanol may be replaced by industrial methylated spirits, 95 % (*v*/*v*), complying with the requirements of BS 3591. It should be noted that the use of industrial methylated spirits is governed by the Methylated Spirits Regulations, 1983 (S.I. 1983, No. 252). It is not permissible to use duty-free ethanol, received under the provisions of The Alcoholic Liquor Duties Act 1979, Section 10, for purposes for which industrial methylated spirits is an acceptable alternative.

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