

BS 2869:2023



BSI Standards Publication

Fuel oils — Agricultural, domestic, commercial and industrial fixed combustion applications — Specification

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Summary of pages

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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 July 2023. It was prepared by Technical Committee PTI/2, *Liquid fuels*. A list of organizations represented on this committee can be obtained on request to the committee manager.

Supersession

This British Standard supersedes BS 2869:2017+A1:2022, which is withdrawn.

Information about this document

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

- class A2 – Automotive distillate fuel for non-road mobile machinery has been deleted/discontinued (see [BS EN 590](#));
- a new grade I has been added for industrial furnace oil, which is class C2 kerosene typically blended with waste oils;
- the standard has been brought into line with the latest edition of [BS EN 590](#), in particular the particle contamination in class D has been fully incorporated (see [BS EN 590:2022](#));
- class C2 – kerosene: after kerosene the maximum density has been reduced and a maximum net specific energy has been added;
- class D – middle distillate fuel: after fuel a maximum density requirement has been added. Cetane requirements have been deleted as this fuel is no longer to be used in internal combustion engines;
- [Annex B](#) includes information on actual values for the specific energy of all the grades of fuel listed.

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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”).

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1 Scope

This British Standard specifies requirements for eight classes of fuel oils for agricultural, domestic, commercial and industrial fixed combustion applications.

This British Standard does not apply to fuels for use in internal combustion engines in on-road and non-road mobile and stationary applications, which are covered in [BS EN 590](#). This British Standard does not cover special applications, which are the subject of agreements between the supplier and purchaser of fuel oils.

NOTE 1 [Annex A](#) and [Annex B](#) provide information on storage, handling and properties of fuels. Additional information on storage and handling is given in [BS 6380](#), PD CEN/TR 15367-1, PD CEN/TR 15367-3 and PD CEN/TR 17548.

This British Standard is aimed at those who bring to market liquid fuels for fixed combustion applications, such as fuel producers, importers and blenders.

NOTE 2 There are some applications for which, for technical or other reasons, limits are different to those in this British Standard or additional requirements might be necessary.

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.

ASTM D56, *Standard test method for flash point by tag closed cup tester*

ASTM D664, *Standard test method for acid number of petroleum products by potentiometric titration*

ASTM D3338, *Standard test method for estimation of net heat of combustion of aviation fuels*

ASTM D3828, *Standard test methods for flash point by small scale closed cup tester*

[BS 2000-10](#), *Methods of test for petroleum and its products – Part 10: Determination of kerosine burning characteristics – 24 hour method*

[BS 2000-12](#), *Methods of test for petroleum and its products – Part 12: Determination of specific energy*

[BS 2000-74](#) (ISO 3733), *Methods of test for petroleum and its products – Part 74: Petroleum products and bituminous materials – Determination of water – Distillation method*

[BS EN 116](#) (BS 2000-309), *Diesel and domestic heating fuels – Determination of cold filter plugging point – Stepwise cooling bath method*

[BS EN 12662](#) (BS 2000-440), *Liquid petroleum products – Determination of total contamination in middle distillates, diesel fuels and fatty acid methyl esters*

[BS EN 14078](#) (BS 2000-579), *Liquid petroleum products – Determination of fatty methyl ester (FAME) content in middle distillates – Infrared spectrometry method*

[BS EN 14214](#), *Liquid petroleum products – Fatty acid methyl esters (FAME) for use in diesel engines and heating applications – Requirements and test methods*

[BS EN 14275](#) (BS 2000-509), *Automotive fuels – Assessment of petrol and diesel fuel quality – Sampling from retail site pumps and commercial site fuel dispensers*

[BS EN 15751](#) (BS 2000-574), *Automotive fuels – Fatty acid methyl ester (FAME) fuel and blends with diesel fuel – Determination of oxidation stability by accelerated oxidation method*

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

[BS EN 16091](#) (BS 2000-595), *Middle distillates and fatty acid methyl ester (FAME) fuels and blends – Determination of oxidation stability by rapid small scale oxidation method*

[BS EN 16329](#) (BS 2000-612), *Diesel and domestic heating fuels – Determination of cold filter plugging point – Linear cooling bath method*

[BS EN ISO 2160](#) (BS 2000-154), *Petroleum products – Corrosiveness to copper – Copper strip test*

[BS EN ISO 2719](#) (BS 2000-34), *Determination of flash point – Pensky-Martens closed cup method*

[BS EN ISO 3104](#) (BS 2000-71.1), *Petroleum products – Transparent and opaque liquids – Determination of kinematic viscosity and calculation of dynamic viscosity*

[BS EN ISO 3170](#) (BS 2000-475), *Methods of test for petroleum and its products – Petroleum liquids – Manual sampling*

[BS EN ISO 3171](#) (BS 2000-476), *Methods of test for petroleum and its products – Petroleum liquids – Automatic pipeline sampling*

[BS EN ISO 3405](#) (BS 2000-123), *Petroleum and related products from natural or synthetic sources – Determination of distillation characteristics at atmospheric pressure*

[BS EN ISO 3675](#) (BS 2000-160), *Crude petroleum and liquid petroleum products – Laboratory determination of density – Hydrometer method*

[BS EN ISO 3679](#) (BS 2000-523), *Determination of flash no-flash and flash point – Rapid equilibrium closed cup method*

[BS EN ISO 3924](#) (BS 2000-582), *Petroleum products – Determination of boiling range distribution – Gas chromatography method*

[BS EN ISO 4259-2](#) (BS 2000-367.2), *Petroleum and related products – Precision of measurement methods and results – Part 2: Interpretation and application of precision data in relation to methods of test*

[BS EN ISO 6245](#) (BS 2000-4), *Methods of test for petroleum and its products – Determination of ash*

[BS EN ISO 8754](#) (BS 2000-336), *Petroleum products – Determination of sulfur content – Energy-dispersive X-ray fluorescence spectrometry*

[BS EN ISO 10370](#) (BS 2000-398), *Petroleum products – Determination of carbon residue – Micro method*

[BS EN ISO 12156-1](#), *Diesel fuel – Assessment of lubricity using the high-frequency reciprocating rig (HFRR) – Part 1: Test method*

[BS EN ISO 12185](#) (BS 2000-365), *Methods of test for petroleum and its products – Crude petroleum and petroleum products – Determination of density – Oscillating U-tube method*

[BS EN ISO 12205](#) (BS 2000-388), *Methods of test for petroleum and its products – Petroleum products – Determination of the oxidation stability of middle-distillate fuels*

[BS EN ISO 12937](#) (BS 2000-438), *Methods of test for petroleum and its products – Petroleum products – Determination of water – Coulometric Karl Fischer titration method*

[BS EN ISO 13032](#) (BS 2000-600), *Petroleum products – Determination of low concentration of sulfur in automotive fuels – Energy-dispersive X-ray fluorescence spectrometric method*

[BS EN ISO 13736](#) (BS 2000-170), *Determination of flash point – Abel closed-cup method*

[BS EN ISO 20846](#) (BS 2000-490), *Petroleum products – Determination of sulfur content of automotive fuels – Ultraviolet fluorescence method*

[BS EN ISO 20884](#) (BS 2000-497), *Petroleum products – Determination of sulfur content of automotive fuels – Wavelength-dispersive X-ray fluorescence spectrometry*

[BS ISO 10307-1](#) (BS 2000-375), *Petroleum products – Total sediment in residual fuel oils – Part 1: Determination by hot filtration*

IP 406, *Petroleum products – Determination of boiling range distribution by gas chromatography*

IP 470, *Determination of aluminium, silicon, vanadium, nickel, iron, calcium, zinc and sodium in residual fuel oil by ashing, fusion and atomic absorption spectrometry*

IP 501, *Determination of aluminium, silicon, vanadium, nickel, iron, sodium, calcium, zinc and phosphorous in residual fuel oil by ashing, fusion and inductively coupled plasma emission spectrometry*

IP 596, *Petroleum products – Determination of distillation characteristics of petroleum products – Micro distillation method*

IP 598, *Petroleum products – Determination of the smoke point of kerosine, manual and automated method*

IP 630, *Determination of the level of dispersed particles in diesel fuel – Generic Automatic Particle Counter Method*

3 Terms and definitions

No terms and definitions are listed in this document.

4 Sampling

COMMENTARY ON CLAUSE 4

Additional information and safety advice is given in HM 93, A Guide to manual sampling of hydrocarbon liquids [1].

4.1 Sampling from storage tanks

All sampling from storage tanks shall be carried out in accordance with [BS EN ISO 3170](#).

4.2 Sampling from pipelines

All sampling from pipelines shall be carried out in accordance with either [BS EN ISO 3170](#) or [BS EN ISO 3171](#).

4.3 Sampling middle distillate fuels from retail site pumps and commercial site fuel dispensers

All sampling of middle distillate fuels from retail site pumps and commercial site fuel dispensers shall be carried out in accordance with [BS EN 14275](#).

4.4 Storage, labelling and transport

Samples shall be kept in a cool place in accordance with the lab risk assessment, away from sources of direct heat, although it is not necessary to keep them refrigerated.

CAUTION. If left in direct sunlight, there is a danger that the cans could become pressurized through expansion of their contents.

Full and legible information relating to the source of the sample shall be attached to the can in such a manner that it cannot easily become subsequently detached.

NOTE 1 Attention is drawn to The Carriage of Dangerous Goods and Use of Transportable Pressure Receptacles Regulations 2009 (CDG 2009) [2] and the European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) 2021 [3], with reference to sampling cans.

NOTE 2 If required, the sample can be sealed and labelled to maintain its legal integrity. Attention is also drawn to GB CLP Regulation [4] with reference to the hazard labelling of samples.

5 Composition

5.1 General

Fuels shall be predominantly hydrocarbon oils derived from petroleum refining, except in the case of class D middle distillate fuels (see 7.2) and class I industrial furnace oils (see 7.4).

NOTE 1 Provided that the finished class D or class I fuel conforms to this British Standard, the following may be included:

- a) up to a maximum of 7.0% (V/V) of fatty acid methyl ester (FAME), conforming to [BS EN 14214](#);*
- b) paraffinic hydrocarbons such as hydrotreated vegetable oil (HVO), gas to liquid (GTL) or biomass to liquid (BTL) derived hydrocarbons in any proportions; and*
- c) co-processing of renewable feedstock at refineries in any proportions.*

NOTE 2 Provided that the finished class E, F, G, H residual fuels conform to this British Standard, a finished class D may be used to adjust viscosity.

Fuels shall not contain components or adventitious matter likely to interfere with normal operation of equipment, for which the correct class of product is intended. Fuels shall be free from any adulterant or contaminant that render the fuel unacceptable for use in their intended application.

NOTE 3 Small amounts of additives intended to improve some aspects of performance and/or to ameliorate emissions or deposits can be included. Suitable fuel additives without known harmful side effects should be used in the appropriate amount, to help avoid deterioration of operability, emissions and durability of equipment. Aftermarket combustion enhancing additives containing detergents and dispersants should not be used as they can cause contaminants to be solubilized and damage downstream equipment.

NOTE 4 Attention is drawn to HMRC Excise Notice 75 [5], which prescribes dyes and/or markers to fuels used for certain purposes and stipulates requirements in respect of end use and application.

NOTE 5 Fuels can be dyed for brand identification, although attention is drawn to the Reach Enforcement Regulations SI 2019 No. 758 [6].

NOTE 6 This British Standard applies to fuels predominantly derived from petroleum. Incorporation of significant quantities of components from other sources (other than FAME as described in 5.2) might affect test results obtained by the methods in this British Standard, and equations relating to fuel quality interrelationships, such as those in [Annex B](#), are unlikely to be valid.

NOTE 7 Operators of equipment using class D as a standby fuel should note that this product might contain FAME up to 7.0% (V/V). If FAME is present the fuel is likely to have reduced long-term storage stability performance, which could cause operational problems. Therefore, for fuels intended for long-term storage, FAME content should not exceed 0.5% (V/V).

5.2 Fatty acid methyl ester (FAME)

Distillate fuel shall not contain more than 7.0% (V/V) of FAME, conforming to the requirements of [BS EN 14214](#). The climate-dependent requirements for 100% FAME given in [BS EN 14214](#) shall not apply.

NOTE 1 A suitable method for the separation and characterization of FAME is given in [BS EN 14331](#).

NOTE 2 Industry guidance is available for the selection of materials compatible with FAME, and for operability factors in general, e.g. from the oil companies' European association for environment, health and safety in refining and distribution (CONCAWE), "Guidelines for handling and blending FAME" – Report No. 9/09 [7].

FAME as a blending component for use in distillate fuel specified in this document shall meet the climate-dependent requirements given in [BS EN 14214](#). The chosen grades shall be specified in accordance with the climatic conditions and the FAME volume in the distillate fuel. The finished blend of distillate fuel shall also comply with the climate-dependent requirements given in [Clause 10](#).

To avoid incompatibility, cold flow additives, when used in FAME, shall be specifically matched to the base distillate fuel and FAME quality to achieve performance consistent with the requirements given in this British Standard.

NOTE 3 The choice of cold flow additive is a contractual matter between the fuel blender and the FAME supplier, taking into account the climatic-dependent requirements of the finished distillate fuel.

NOTE 4 Cold flow requirements for FAME as a blend component in distillate fuel are given in [BS EN 14214](#) to achieve trouble-free operation.

NOTE 5 Information regarding the use of additives to enhance oxidation stability is given in BS EN 14214-1.

6 Classification

The class of fuel shall follow the appliance manufacturer's requirements.

NOTE 1 In certain circumstances, it is recognized that many types of oil-consuming appliances that typically use a particular class of fuel can operate with fuel conforming to another class. If a fuel is to be used in appliances other than those for which it is classified, the user should be satisfied that this can be done by both consultation with the equipment manufacturer and any additional applicable tests.

NOTE 2 [Table 1](#) gives information about the fuel classes.

Table 1 — Summary of BS 2869 fuel classes

Fuel class	Common names	Typical applications	Additional notes
C1	Paraffin	Vaporizing heaters and ornamental lights	Flueless applications.
C2	Kerosene	Vaporizing or atomizing burners	Appliances connected to flues.
D	Distillate	Atomizing burners of the type used in commercial and industrial applications	Specified to prevent inclusion of residual components from petroleum processing.