
British Standard Specification for

Leaded petrol (gasoline) for motor vehicles

Essence au plomb pour véhicules automobiles — Spécifications

Verbleites Benzin für Motorfahrzeuge

Foreword

This British Standard which has been prepared under the direction of the Petroleum Standards Committee was first published in 1967 in response to a request from the then Consumer Council for a standard grading nomenclature to cover grades of petrol* available to the public as motor fuel in the United Kingdom. The grading system adopted was based on the research octane number (RON).

The first revision of the standard published in 1971 incorporated a revision of the method for determination of RON and gave a fuller treatment of the interpretation of a single RON test result. Four amendments published during the period 1971 to 1976 provided for a progressive reduction in the limiting requirements for lead content.

The second revision published in 1978 introduced a requirement for an additional grading in terms of motor octane number (MON) as being a more adequate representation of anti-knock performance. The method for expression of distillation limits was modified to align with the then current international practice and minimum limits for evaporation at 70 °C and 100 °C were introduced. The limit for existent gum was revised. A clause on sampling was introduced in the light of user experience with the standard. A minimum limiting requirement for lead content was introduced in addition to the existing maximum limit to protect certain types of engine from valve seat recession.

The third revision published in 1985 reduced the limiting requirement for lead content to 0.15 g/L maximum from 31 December 1985. It also recognized the increased sensitivity of some modern vehicle designs to petrol volatility by introducing recommended volatility levels appropriate to seasonal temperature variations in the UK for petrol supplied to service stations. As five star petrol was no longer in commercial use this grade was deleted from the 1985 revision.

This revision makes provision for the future introduction of a limiting requirement for benzene content to be applicable from 1 October 1989 in accordance with EEC Directive 85/210/EEC of 20 March 1985. It also includes provision to implement the EEC Directive on permitted levels of oxygenates in petrol (85/536/EEC). The test method in appendix B has been included in accordance with EEC Directive 87/441/EEC permitting the use of national test methods in national specifications for petrol pending the preparation of a European Standard. The

method will be replaced by the European Standard method when available.

The main purpose of this standard is to provide an indication to the retail buyer of the relative anti-knock qualities of petrols on the market as defined by RON and MON values. It also defines limiting requirements for other essential properties. The quality of marketed petrol may be expected to vary within the limits specified for these properties according to the way in which various aspects of performance, notably road anti-knock performance and volatility are controlled by each manufacturer or modified for seasonal requirements. Furthermore, both the RON and MON values can vary over a range within each star grade designation. The motorist should be guided by the motor vehicle manufacturers' recommendations on the minimum star grading for petrol for the car concerned.

The fuels covered by this standard are intended for use in road vehicles whose engines are designed to use leaded petrol, including those vehicles designed to meet Economic Commission for Europe (ECE) of the United Nations and European Community emission standards.

This standard covers requirements for leaded petrols. Requirements for unleaded petrol are specified in BS 7070 : 1988 which was published to implement the provisions of EEC Directive 85/210/EEC concerning unleaded petrol.

To allow time for producers to ensure that the quality of petrol at point of sale complies with the requirements of this British Standard, this revision of BS 4040 is effective from 29 July 1988 at which date BS 4040 : 1985 will be withdrawn.

NOTE. Testing. In the laboratory testing of petrol against the requirements of clause 4 of this British Standard it is necessary to use equipment and procedures exactly as laid down in the appropriate test methods. In particular it is essential to use properly inspected and maintained standard CFR† engines for the determination of both RON and MON. A useful guide to the satisfactory operation and test precision of a CFR engine can be obtained by including it in the Engine Test Correlation Programme of the Institute of Petroleum. Details of this Programme are available from the Institute of Petroleum or the British Standards Institution.

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

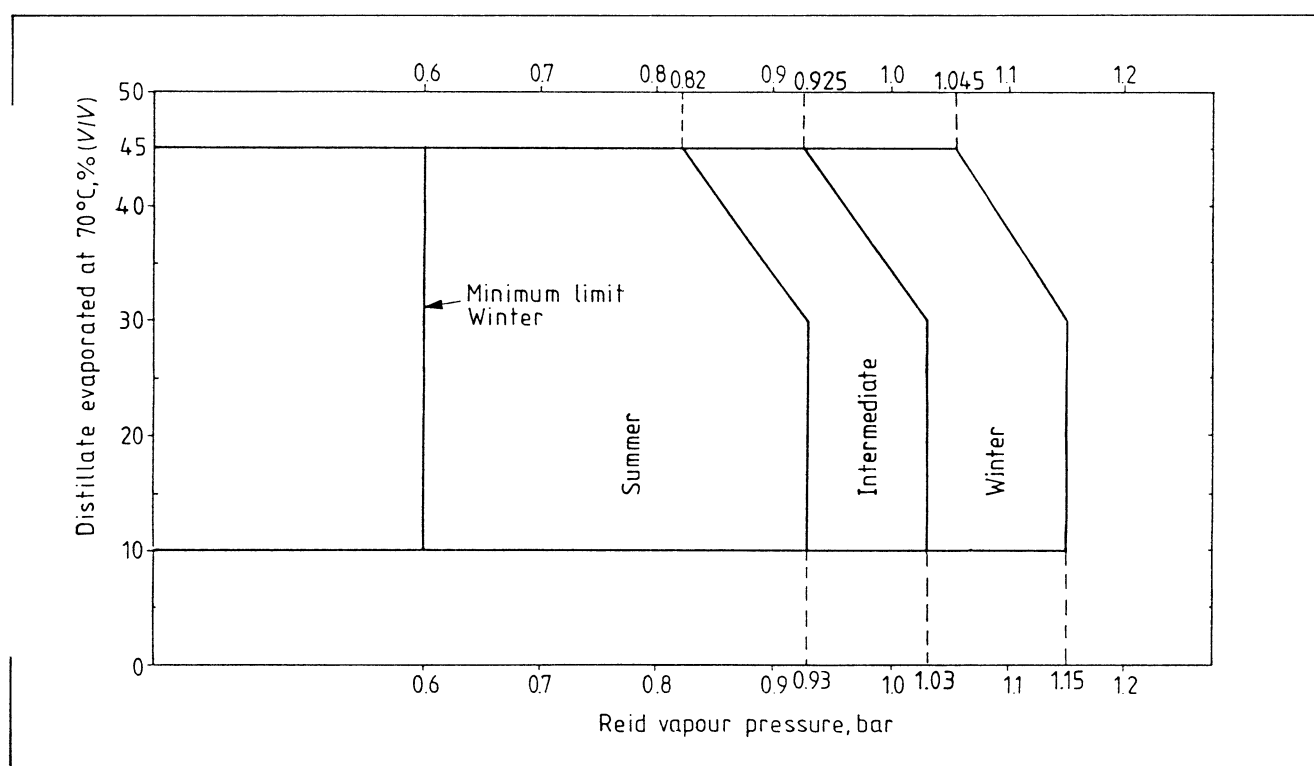
*The term 'petrol' is used in this British Standard as being that most generally used by motorists in the UK: 'gasoline' and 'motor spirit' are alternatives.

†Co-operative Fuel Research Committee.

Revised text

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Figure 2. Seasonal volatility characteristics
Delete the existing figure and substitute the new figure 2.



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Specification

1 Scope

This British Standard specifies requirements for three grades of leaded petrol that cover the current range of quality retailed in the United Kingdom for use in petrol engine vehicles and provides for a storage grade.

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

2 Sampling

2.1 Sampling from storage tanks

For the purposes of this British Standard all sampling shall be carried out in accordance with the relevant procedures of BS 3195 : Part 1 and, additionally, as detailed in 2.2.

NOTE. Attention is drawn to the special precautions needed for samples for the determination of Reid vapour pressure (see BS 2000 : Part 69).

2.2 Sampling from petrol pumps

2.2.1 Sampling cans of 5 L and 1 L capacity. The construction of the cans shall comply with the appropriate safety requirements for cans that are to hold highly flammable material. They shall be provided with screw caps incorporating a petroleum resistant washer in good condition. A stock of cans shall be kept solely for the purpose of taking petrol samples.

2.2.2 Preparation of cans. New cans shall be rinsed with petrol before being used, to remove any residual traces of oil left during manufacturing operations, and then allowed to dry. Before use, all cans shall be checked to ensure that they are sound and free from leaks.

2.2.3 Sampling procedure. From the pump nozzle, 5 L of petrol shall be drawn carefully into a cool 5 L can using a clean dry funnel. Immediately afterwards, this sample shall be decanted carefully into the requisite number of 1 L cans, using a funnel, filling the cans within 15 mm of the brim.

If more than 5 L are needed, the operation shall be repeated immediately and before the pump has been used for any other purpose. The screw caps shall be tightened fully and the cans checked to ensure that there are no leaks.

The sampling procedure shall not be carried out in direct sunlight.

NOTE 1. If carried out in direct sunlight, changes in fuel quality, especially octane level, may occur.

NOTE 2. A quantity of 1 L is sufficient for the determination of octane number and certain other tests but it is advisable to provide each laboratory with 2 L of sample in case further work is needed; it is essential that these 2 L be of identical material.

2.2.4 Storage, labelling and transport. Samples shall be kept in a cool place although it is not necessary to keep them refrigerated.

NOTE 1. If left in direct sunlight there is a danger that the cans will 'balloon'.

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

NOTE 2. If required, the sample may be sealed and labelled to maintain its legal integrity.

NOTE 3. If the sample has to be sent to a laboratory by public transport, it will be necessary to comply with the general regulations covering transportation of flammable materials and with the requirements of the transport authority concerned. Information on the appropriate procedures and the type of packaging required should be obtained from the transport authority involved.

3 Composition

3.1 General

The petrol shall consist essentially of volatile hydrocarbons together with additives as required.

If such additives include organic oxygenates used as blending components and/or stabilizing agents as specified in 3.3.1, the amounts of such oxygenates shall comply with the limiting requirements in 3.3.2.

3.2 Lead content

The lead content shall comply with the limiting requirements given in table 1.

3.3 Organic oxygenates

3.3.1 Permitted components. The following components shall be used either singly or as mixtures as blending components or as stabilizing agents to prevent phase separation of the petrol/oxygenate components of the blend.

(a) *Alcohols.* Methanol, ethanol, isopropyl alcohol (propan-2-ol), butyl alcohol (butan-1-ol), tertiary butyl alcohol (2-methylpropan-2-ol), isobutyl alcohol (2-methylpropan-1-ol), and other mono-alcohols with a final distillation point of not higher than 220 °C.

(b) *Ethers.* Methyl tertiary butyl ether (*tert.* butoxy methane), tertiary amyl methyl ether (methoxy-2-methyl butane), ethyl tertiary butyl ether (2-ethoxy-2-methyl propane), and other ethers (R-O-R) with a final distillation point of not higher than 220 °C with molecules containing five or more carbon atoms.

The use of components other than those specified in (a) and (b) at concentrations below 0.5 % (V/V) in total is permitted.

3.3.2 Content. When tested as described in appendix B the content, calculated according to appendix B and appendix C, of the individual components listed in table 2 shall comply with the limiting requirements given in that table.

Mixtures of any of the individual components defined in 3.3.1 are permitted but the total oxygen content in the petrol shall not exceed 2.5 % (m/m) and the content of any of the individual components given in table 2 shall not exceed the corresponding limiting requirements given in that table.

3.4 Future limit for benzene content

With effect from 1 October 1989, the maximum limit for benzene content shall be 5.0 % (V/V).