

Specification for

**High octane (super)
unleaded petrol
(gasoline) for motor
vehicles**

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Petroleum Standards Policy Committee (PTC/-) to Technical Committee PTC/11, upon which the following bodies were represented:

Association of United Kingdom Oil Independents
Automobile Association
Bus and Coach Council
Chemical Industries' Association
Consumer Policy Committee of BSI
Department of Energy (Oil Division)
Department of Transport
Federation of Petroleum Suppliers
Freight Transport Association
Institute of Petroleum
Institute of Trading Standards Administration
Ministry of Defence
Motor Cycle Industry's Association of Great Britain Ltd.
Petrol Retailers' Association
Road Haulage Association Ltd.
Royal Automobile Club
Society of Motor Manufacturers and Traders Limited
United Kingdom Petroleum Industry Association Ltd.

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Foreword

This British Standard has been prepared under the direction of the Petroleum Standards Policy Committee to provide a specification for the quality of high octane unleaded petrol¹⁾ consistent with the provisions of EEC Directive 85/210/EEC of 20 March 1985 concerning the lead and benzene contents of petrol. The quality of leaded petrol is specified in BS 4040, and of 'premium' and 'regular' grades of unleaded petrol in BS 7070. All these fuels are also covered by the same EEC Directive.

Subject to approval from Parliament, it is intended to amend UK Regulations so that this standard will be placed on a similar legal footing to BS 7070 and BS 4040. By thus allowing the proper identification of this higher grade petrol, the risk to consumers of purchasing a higher grade, more costly fuel than required is minimized.

This standard is published at the request of the Department of Transport to enable oil companies who wish to market a grade of unleaded petrol with a higher octane rating than that defined as 'premium' in BS 7070 to identify such fuels as separate from the 'premium' grade. In this British Standard, provision is made for a high octane grade of unleaded petrol with a minimum research octane number (RON) of 98 and for uniform marking.

This standard specifies maximum lead and benzene contents, minimum values for research octane number (RON) and motor octane number (MON), and defines limiting requirements for other essential properties. It also incorporates recommendations for volatility levels appropriate to seasonal temperature variations in the UK for petrol supplied to filling stations, in line with those recommended for petrol in BS 4040 and BS 7070.

The fuels covered by this standard are intended for use in petrol-engined road vehicles intended for use with high octane unleaded petrol.

This standard includes provisions to implement the EEC Directive on substitute fuel components (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 for oxygenates pending the preparation of a European Standard. The method in appendix B will be replaced by the European Standard method when available.

Technical Committee 19 'Test Methods and Specifications for Petroleum Products' of the European Committee for Standardization (CEN) is working, under a mandate from the Commission of the European Economic Community (EEC), on the preparation of a revision of EN 228. With the publication of the revision of EN 228, it will be implemented as a revision of BS 7070 and this British Standard will be revised to align, where possible, with its requirements.

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 CFR²⁾ 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.

¹⁾ 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.

²⁾ Co-operative Fuel Research Committee.

Specification

1 Scope

This British Standard specifies requirements for one grade of high octane unleaded petrol 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 1. Attention is drawn to the special precautions needed for samples for the determination of Reid vapour pressure (see BS 2000 : Part 69).

NOTE 2. The method described in 2.2 is designed for sampling the bulk of fuel being fed to the offtake point. The examination of equipment, e.g. pumps to detect faulty operation, may require the use of different techniques.

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. Cans shall be constructed from lead-free material except that lead solder may be used for the attachment of external fittings. 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 samples of high octane unleaded petrol. Such cans shall be clearly identified and kept separate from cans used for the purpose of taking samples of leaded petrol in accordance with BS 4040, or of 'premium' or 'regular' grades of unleaded petrol in accordance with BS 7070.

NOTE. Attention is drawn to the fact that sampling cans will need to comply with the statutory safety requirements for the classification, packaging and labelling of dangerous substances.

2.2.2 Preparation of cans

New cans shall be rinsed with high octane unleaded 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 clean 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 the 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 these shall be 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 maximum lead content shall be 0.013 g/l (see 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) *Ether*. 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 limiting requirements given in that table.

4 Requirements

4.1 General requirements

4.1.1 General

When tested by the methods given in table 1, the petrol shall comply with the limiting requirements given in that table.

NOTE. Recommendations for Reid vapour pressure and percentage distillate evaporated at 70 °C for petrol delivered from bulk storage to filling stations during summer, winter and intermediate seasons are given in appendix A.

4.1.2 Storage grade

Petrol which has to be stored for extended periods and for which the normal limiting requirement for oxidation stability is not adequate, shall have an oxidation stability of not less than 480 min. In all other respects it shall comply with the limiting requirements given in table 1.

4.2 Grade designations and requirements for anti-knock values

Petrol supplied to this standard shall be designated as 'Unleaded BS 7800 — Super'.

When determined by the methods referred to in BS 2638 and BS 2637 respectively the anti-knock values expressed as RON and MON shall be not less than the minimum values given in table 3 (see the note on testing in the foreword).

4.3 Interpretation of single RON and MON test results: testing margin at the recipient

A recipient who has no other source of information of the true value of a characteristic than a single result shall consider that the product fails the specification limit, with 95 % confidence, only if the result X is such that:

$$X < A - \frac{0.84R}{\sqrt{2}}$$

where

R is the reproducibility of the test method given in tables 4 and 5;

A is the minimum RON or MON.

NOTE. Reproducibility is a quantitative expression of the random error associated with operators working in different laboratories, each obtaining a single result on a portion of the same sample. It is the difference between two such single and independent results that would be exceeded in the long run in only one case in twenty in the normal and correct operation of the test method. This is known as the 95 % probability level.

Extensive data obtained from consumer and producer laboratories over a number of years for many samples of conventional petrols have shown that the reproducibility of fuel rating between laboratories varies with octane number level.

5 Precision and interpretation of test results

Most of the methods of test given in table 1 contain a statement of the precision, i.e. repeatability and reproducibility, to be expected from them but, in cases of dispute, the procedure described in BS 4306, which uses precision data in the interpretation of test results, shall be used.