

**SPECIFICATION FOR
RADIO INTERFERENCE
LIMITS AND MEASUREMENTS
FOR THE ELECTRICAL
IGNITION SYSTEMS OF INTERNAL
COMBUSTION ENGINES**

BS 833: 1970

THIS BRITISH STANDARD, having been approved by the Electrical Industry Standards Committee, was published under the authority of the Executive Board on 31 July 1970.

First published, November 1937

First revision, March 1939

Second revision, September 1951

Third revision, January 1954

SBN: 580 06221 X

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 5000, fully indexed and with a note of the contents of each, will be found in the British Standards Yearbook, price £1. The BS Yearbook may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

BS 727. Radio-interference measuring apparatus for the frequency range 0.015 MHz to 1000 MHz.

BS 6862. Cables for vehicles.*

*In course of preparation.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following BSI references relate to the work on this standard:
Committee reference ELE/ELCP/1, ELE/ELCP/1/4
Draft for comment 69/16024

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CO-OPERATING ORGANIZATIONS

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

Associated Officers' Technical Committee
 Association of Consulting Engineers
 Association of Mining Electrical and Mechanical Engineers
 Association of Supervisory and Executive Engineers
 *British Electrical and Allied Manufacturers' Association
 *British Radio Equipment Manufacturers' Association
 British Railways Board
 Crown Agents for Oversea Governments and Administrations
 Department of Employment and Productivity
 Electric Cable Makers' Confederation
 Electric Contractors' Association (Incorporated)
 Electrical Contractors' Association of Scotland
 *Electrical Research Association
 *Electricity Council, the Central Electricity Generating Board
 and the Area Boards in England Wales
 *Electronic Engineering Association
 Engineering Equipment Users' Association
 Institution of Electrical Engineers
 Lighting Industry Federation Limited
 Ministry of Defence
 *Ministry of Defence, Army Department
 Ministry of Defence, Navy Department
 *Ministry of Posts and Telecommunication
 Ministry of Public Building and Works
 Ministry of Technology
 Municipal Passenger Transport Association (Incorporated)
 National Inspection Council for Electrical Installation Contracting
 National Physical Laboratory (Ministry of Technology)
 Oil Companies Materials Association
 Public Transport Association (Incorporated)
 South of Scotland Electricity Board

The Government departments and scientific and industrial organizations 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 Broadcasting Corporation
 Cycle and Motor Cycle Association Ltd
 Home Office
 Institution of Electronic and Radio Engineers
 Ministry of Transport
 Radio and Electronic Component Manufacturers' Federation
 Society of Motor Manufacturers and Traders Ltd

BRITISH STANDARD SPECIFICATION FOR
RADIO INTERFERENCE LIMITS AND
MEASUREMENTS FOR THE ELECTRICAL
IGNITION SYSTEMS OF INTERNAL
COMBUSTION ENGINES

FOREWORD

This British Standard has been prepared under the authority of the Electrical Industry Standards Committee and is a fourth revision of BS 833, 'Radio interference suppression for automobile and stationary internal combustion engines (Limits and methods of suppression)', which was first issued in 1937. It is one of an existing series dealing with the abatement of radio interference: a list of British Standards comprising the series is given at the end of this Foreword.

The main changes from the 1953 version are:

- (1) The title has been amended in order to make it clear that the standard applies to spark-ignited internal combustion engines, with the exception of those fitted in aircraft.
- (2) The change of frequency range covered by this specification, has been made in order to implement international agreements to which the United Kingdom is a party.

Limits and methods of measurements specified are in accordance with the Recommendations of the International Special Committee for Radio Interference (CISPR) and with the Regulations of the Inland Transport Committee of the United Nations Economic Commission for Europe.

In addition, Appendices have been included to give examples of the present techniques for suppression arrangements for ignition systems (which are also in accordance with the CISPR Reports and Recommendations) and for guidance for the testing of components which might be used in such suppression systems.

LIST OF RELATED BRITISH STANDARDS AND CODES OF PRACTICE

BS 613.	Components and filter units for radio interference suppression.
BS 727	Radio interference measuring apparatus for the frequency range 0.015 MHz to 1000 MHz.

- BS 800. Limits of radio interference.
- BS 827. Radio interference suppression for trolley-buses and tramways.
- BS 905. Radio interference limits and measurements for television and v.h.f. sound receivers.
- BS 1597. Radio interference suppression on marine installations.
- CP 327: 201. The reception of sound and television broadcasting.
- CP 1001. Abatement of radio interference caused by motor vehicles and internal-combustion engines.
- CP 1002. Abatement of radio interference from electro-medical and industrial radio-frequency equipment.
- CP 1006. General aspects of radio interference suppression.

SPECIFICATION

1. GENERAL

1.1 SCOPE

This British Standard is designed primarily to provide for protection of the reception of sound and television signals in the frequency range 40 MHz to 250 MHz and prescribes limits of radiation from the ignition systems of internal combustion engines. It specifies the method of measurement to be used for testing for compliance with the limits.

The standard also gives a method of measurement of the insertion loss of components used in making up radio interference suppression devices for use with ignition systems.

The requirements of the standard are not intended to apply to ignition systems fitted in aircraft.

NOTE 1. It is intended that this standard shall apply to all internal combustion engines using spark ignition with the exception of those fitted in aircraft. The following are examples of the wide range of equipment which may incorporate this type of engine:

Road vehicles, such as cars, vans, lorries, motor cycles (including scooters and mopeds), go-karts and racing cars.

Portable prime movers, such as generating sets, concrete vibrators and power drills.
Construction equipment, such as cement mixers, winches, hoists and stone breakers.
Agricultural machinery, such as tractors, cultivators, combine harvesters, hay loaders and chain saws.

Maintenance machinery, such as mowers, rollers and sweepers.

Boats with inboard and outboard motors.

NOTE 2. For the frequency range 250 MHz to 1000 MHz it is considered that suppression arrangements specifically fitted for the 40 MHz to 250 MHz range would probably prove adequate up to 1000 MHz.

1.2 DEFINITIONS

For the purposes of this British Standard the following definition applies:

Radiation figure. The greatest value of radiation found, following the procedure described in Clause 3, is the radiation figure of the equipment under test at the stated measurement frequency.

2. LIMITS

2.1 LIMITS OF RADIATION

The radiation field when measured in accordance with Clause 3 using a quasi-peak meter, shall not exceed the limits given in Table 1.

TABLE 1. LIMITS OF RADIATION

Frequency range (MHz)	Limit	
	$\mu\text{V/m}$	Approximate dB ($\mu\text{V/m}$) equivalent
40 to 75 75 to 250	50 50 at 75 MHz then increasing linearly with frequency to 120 at 250 MHz	34 34 at 75 MHz increasing to 42 at 250 MHz

NOTE. Under certain conditions of engine operation, it has been established that a peak reading meter will give readings 10 times (20 dB) greater than those obtained with a quasi-peak meter.

Compliance with the above limits at spot frequencies of 45, 65, 90, 150, 180 and 220 MHz (all ± 5 MHz) shall give compliance with the requirements of Table 1. A graphical presentation of the limits over the frequency range 40 MHz to 250 MHz is given in Fig. 1.

NOTE 1. The tolerance of ± 5 MHz is specified in order to avoid interference from transmissions operating on the nominal spot frequencies during the time of measurement.

NOTE 2. In the majority of cases for engines with metallic enclosures and for vehicles with metallic engine enclosures, the requirements for the limits in Table 1 will be met by using arrangement D (all leads) of Table 2 of Appendix A where the d.c. resistance of the resistive cables used is not less than 15 000 ohms per metre, or by using arrangement A with 3 or 4 where the insertion loss of the individual suppressors at the frequencies given above is not less than 24 dB when measured in accordance with the provisions of Clause 4.

3. METHOD OF MEASUREMENT

3.1 MEASURING APPARATUS

The measuring apparatus shall comply with the requirements of BS 727* Sections 1 or 2. Section 1 (Quasi-peak measuring sets) shall be used for all classes of equipment covered by this standard. Apparatus conforming to BS 727*, Section 2 (Peak measuring sets) may be used for measurement on road vehicles as specified in 3.5.

3.2 MEASURING SITE

The measuring site shall be a level area free from appreciable wave reflecting surfaces within an ellipse having a major axis of 20 m and a minor axis of 17.3 m, the aerial and the point of the equipment under test which is nearest to the aerial being located at the focal points. The measuring set, or the test hut or vehicle in which the set is located, may be within the ellipse but horizontally not closer than 3 m to the aerial, in a direction opposite from the equipment being measured.

3.3 DISPOSITION OF MEASURING AERIAL WHEN TESTING ROAD VEHICLES AND BOATS

The centre of the dipole aerial of the measuring set shall be 3 m above the ground and its horizontal distance from the nearest point of the equipment under test shall be 10 m. For the measurement of the horizontal component of the radiation the aerial shall be horizontal and positioned at right angles to the line joining the centre of the aerial to the nearest point of the equipment under test. Measurements on road vehicles and motor boats shall be made with the aerial placed successively on the left and right hand sides of the equipment under test, at positions of measurement which are located in a plane perpendicular to the plane of symmetry of the equipment and passing approximately through the centre of the engine. (See Fig. 2.)

At each of the measuring points readings shall be taken with the aerial in the horizontal and in the vertical positions. The radiation figure at each test frequency shall be taken to be the maximum of the readings at that frequency.

3.4 DISPOSITION OF THE MEASURING AERIAL FOR ALL OTHER EQUIPMENT

For all other equipment the direction of maximum radiation shall first be established, and measurements of the vertical and horizontal interference fields shall then be made in this direction with the aerial of the measuring set at the

* BS 727, 'Radio-interference measuring apparatus for the frequency range 0.015 MHz to 1000 MHz'.