BRITISH STANDARD

BS 3539:1986

Implementing Amendment No. 1, not published separately

Specification for

Sound level meters for the measurement of noise emitted by motor vehicles

Confirmed December 2011

ICS 17.140.30; 17.140.50

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Electronic Equipment Standards Committee (EEL/-) to Technical Committee EEL/24 upon which the following bodies were represented:

British Radio and Electronic Equipment Manufacturers' Association
British Telecommunications plc
Department of Health and Social Security
Department of Trade and Industry (National Physical Laboratory)
Institution of Electronic and Radio Engineers
Royal National Institute for the Deaf
Society of Hearing Aid Audiologists Limited

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Medical Association
British Society of Audiology
Health and Safety Executive
Hearing Aid Industry Association
Institute of Acoustics
Institute of Sound and Vibration Research
Manchester Area Health Authority
Medical Research Council
Ministry of Defence
National Coal Board
Royal Aeronautical Society

The British Standard, having been prepared under the direction of the Electronic Equipment Standards Committee, was published under the authority of the Board of BSI and comes into effect on 28 February 1986

First published September 1962
First revision February 1986

ISBN 0 580 15083 6

Amendments issued since publication

Amd. No.	Date of issue	Comments
10448	April 1999	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the direction of the Electronic Equipment Standards Committee and applies to sound level meters used for the measurement of the noise emitted by motor vehicles, for example, in accordance with the methods described in BS 3425.

It supersedes BS 3539:1962, which is withdrawn, and specifies sound level meters with more stringent tolerances, corresponding to the Type 1 instrument in BS EN 60651:1994, which is identical with IEC 60651:1979.

BS 5969:1981 has been renumbered as BS EN 60651:1994, and all previous references to BS 5969:1981 in this standard have been amended accordingly.

The draft International Standard IEC 61672 *Sound level meters*, when published as a BS EN, will replace BS EN 60651. It specifies wider tolerances to include measurement uncertainties which are not included in BS EN 60651.

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 4, an inside back cover 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 the particular requirements for sound level meters for the measurement of noise emitted by motor vehicles, the procedure for laboratory verification of their accuracy and the information to be shown on a calibration certificate.

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

2 Requirements

2.1 The sound level meter including auxiliary equipment, for example, a microphone extension cable or a windshield, shall comply with the requirements for type 1 meters as specified in BS EN 60651:1994.

2.2 It shall incorporate the frequency weighting characteristic designated A and the time weighting characteristic designated F (as specified in **6.1** and **7.2** respectively of BS EN 60651:1994).

2.3 The minimum range of the sound level meter shall be 70 to 110 dB(A).

2.4 To avoid errors which may arise from the presence of the observer, the sound level meter shall either include a mode in which the maximum weighted sound pressure level in a measuring time interval is held (stored) in the display (see **7.8** of BS EN 60651:1994) or be provided with a microphone extension cable not less than 3 m long.

2.5 Laboratory verification of the accuracy of the meter shall be carried out as specified in clause **3** at regular intervals, normally annually.

3 Laboratory verification of the accuracy

3.1 The procedure for laboratory verification shall be as given in a) to d).

a) To set up the sound level meter, the sound calibrator associated with the sound level meter (see note) shall be applied to the meter and the meter adjusted so that its reading corresponds to the reading obtained as specified in **3.1** d) during the previous verification. If the results for the previous verification are not available (for example, because the sound level meter has not been tested previously) or are invalid (for example, because a new sound calibrator is being used with the sound level meter), the sound level meter shall be adjusted so that its reading corresponds to the output level of the sound calibrator specified on the most recent calibration certificate for the calibrator. The reading of the sound level meter shall be recorded.

NOTE 1 The sound level calibrator should conform to BS 7189:1989 or to BS EN 60942:1998, depending on the standard to which the calibrator was originally manufactured.

b) The electrical tests specified in **3.3**, **3.4**, **3.5** and **3.6** shall be carried out with an equivalent electrical impedance substituted for the microphone.

c) The acoustic calibration specified in **3.7** shall be carried out.

d) The sound calibrator shall again be applied to the sound level meter, and the reading of the meter recorded.

The tolerances given in this standard and in BS EN 60651:1994, BS 7189:1989 and BS EN 60942:1998 (which supersedes BS 7189:1989) do not take into account any measurement uncertainty of the laboratory performing the verification. The measured values obtained during a verification shall not be extended by any measurement uncertainty when assessing whether an instrument conforms to this standard. Conformity is demonstrated when all measured values are within the specified tolerances.

NOTE 2 It is recommended that the calibration certificate states, if appropriate, that verification does not accommodate measurement uncertainty.

3.2 For all tests of the sound level meter the configuration used for measuring vehicle noise, for example with an extension cable, shall be used. All tests shall be carried out with the frequency weighting A and time weighting F settings of the sound level meter.

3.3 The A-weighting response shall be checked electrically at frequencies of 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 000 Hz, 2 000 Hz, 4 000 Hz and 8 000 Hz. The signal level at 1 000 Hz shall give an indication of 94 dB. Where the A-weighted signal level is different at the other test frequencies any necessary correction for level range control or scale linearity shall be made.

Any corrections for the frequency response of the microphone and, where appropriate, of the effect of the instrument case and windshield, shall be made to the indications. The data shall be provided with the equipment.

The response shall meet the frequency response and tolerances for the A-weighting characteristic specified in Tables IV and Table V of BS EN 60651:1994, with the reference frequency defined as 1 000 Hz, as follows:

Frequency	Relative response	Tolerances
Hz	dB	dB
63	– 26.2	± 1.5
125	– 16.1	± 1
250	– 8.6	± 1
500	– 3.2	± 1
1 000	0	0
2 000	+ 1.2	± 1
4 000	+ 1.0	± 1
8 000	– 1.1	+ 1.5, – 3

3.4 The linearity of the system consisting of the detector-indicator and any manual or automatic range controls shall be tested at 1 000 Hz at integral decibel scale intervals over the range from 70 to 110 dB (A). The accuracy relative to a reference level of 94 dB shall be as specified in Table XII of BS EN 60651:1994 as follows:

Readings	Tolerances
	dB
Inside primary indicator range	± 0.7
Outside primary indicator range	± 1.0

3.5 The time weighting F shall be tested with a single sinusoidal burst of duration 200 ms at a frequency in the range 1 000 Hz to 2 000 Hz and an amplitude which produces an indication of 106 dB when the signal is continuous. The lowest setting of the level range control which includes 106 dB shall be used. The maximum response to the test tone burst relative to the response to a continuous signal shall be – 1.0 ± 1 dB as specified in Table VIII of BS EN 60651:1994. Where the "maximum r.m.s. hold F" characteristic is provided this shall be tested under the same conditions and to the same tolerance.

NOTE The value of 106 dB is chosen for consistency with BS 5969 for an upper limit of 110 dB.

3.6 The r.m.s accuracy of the detector indicator system shall be tested by comparing the indication for a sequence of tone bursts with that for a continuous sinusoidal signal. The frequency of the signals shall be 2 000 Hz, at an amplitude which produces an indication of 108 dB when the signal is continuous. The lowest setting of the level range control which includes 108 dB shall be used. The tone burst shall consist of 11 cycles of a sine wave of frequency 2 000 Hz, starting and ending at zero crossing, with a repetition frequency of 40 Hz and having an r.m.s. value which is identical to that of the continuous sine wave signal. The indication for the tone burst shall be within ± 0.5 dB of that of the continuous signal as specified in Table VII of BS EN 60651:1994

NOTE The value of 108 dB is chosen to allow for the tolerance at the upper limit of 110 dB.

3.7 The acoustic calibration of the complete sound level meter shall be performed at 125 Hz and 1 000 Hz. The tests shall be carried out either in a plane progressive sound field or using an acoustic coupler.

If an acoustic coupler is used, a correction shall be made for any effect of the instrument case and, where relevant, the windshield on the calibration.

The ambient conditions of static pressure, temperature and relative humidity shall be recorded.

Where the 125 Hz acoustic calibration is not carried out at the same A-weighted sound level as the 1 000 Hz calibration, any necessary correction for the level range control or scale linearity shall be made.

The sound level meter shall meet the frequency response and tolerances for the A-weighting characteristic at the two test frequencies, and the sensitivity of the sound level meter shall be reset if necessary to read correctly at 1 000 Hz.

NOTE The 1 000 Hz test should preferably be carried out at a sound pressure level of 94 dB.

4 Information to be provided

A calibration certificate shall be issued giving the following information.

a) The name of the manufacturer, the model number and the serial number of the sound level meter.

b) Identification of the microphone fitted to the sound level meter together with any connecting cables and/or other accessories.

c) The name of the manufacturer, the model number and the serial number or other unique identifying mark of the sound calibrator used for routine field calibration together with identification of any adaptors or other accessories used in the field calibration.

d) The readings obtained in **3.1** a) and **3.1** d) of this standard.

NOTE The reading obtained in **3.1** d) is to be used for setting up the sound level meter for field use and for the next periodic recalibration of the sound level meter.

e) A statement that the sound level meter has been calibrated as specified in this standard.

f) A statement that the sound level meter complies with the tolerances specified in this standard.

g) The date of calibration.

blank

Publications referred to

BS 3425, *Method for the measurement of noise emitted by motor vehicles*[1)].
BS EN 60651:1994, *Specification for sound level meters.*

[1)] Referred to in the foreword only.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL