

Acoustics —

Determination of sound insulation performances of enclosures

Part 2. Measurements in situ (for acceptance and verification purposes)

The European Standard EN ISO 11546-2 : 1995 has the status of a
British Standard

ICS 17.140.10

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee EH/1, Acoustics, upon which the following bodies were represented:

- Association of Consulting Engineers
- British Broadcasting Corporation
- British Occupational Hygiene Society
- British Telecommunications plc
- Department of the Environment (Building Research Establishment)
- Department of Health
- Department of Trade and Industry (National Physical Laboratory)
- Health and Safety Executive
- Institute of Acoustics
- Institute of Occupational Hygienists
- Institute of Sound and Vibration Research
- Institution of Electrical Engineers
- Royal Institute of British Architects
- Society of Environmental Engineers

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

- Advanced Manufacturing Technology Research Institute
- Agricultural Engineers Association
- British Cement Association
- British Compressed Air Society
- British Industrial Truck Association
- British Iron and Steel Producers Association
- Construction Industry Research and Information Association
- Department of Trade and Industry (National Engineering Laboratory)
- Engineering Industries Association
- Fan Manufacturers Association
- Federation of the Electronics Industry
- Federation of Manufacturers of Construction Equipment and Cranes
- Federation of Piling Specialists
- Hevac Association
- Institution of Engineering Designers
- Institution of Mechanical Engineers
- National Specialist Contractors Council
- Rotating Electrical Machines Association
- University of Liverpool
- University of Manchester

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National foreword

This British Standard has been prepared by Technical Committee EH/1 and is the English language version of EN ISO 11546-2 : 1995 *Acoustics - Determination of sound insulation performances of enclosures - Part 2: Measurements in situ (for acceptance and verification purposes)*, published by the European Committee for Standardization (CEN). It is identical with ISO 11546-2 : 1995 published by the International Organization for Standardization (ISO).

Cross-references

Publication referred to	Corresponding British Standard
ISO 140-6 : 1978	BS 2750 <i>Measurement of sound insulation in buildings and of building elements</i> Part 6: 1980 <i>Laboratory measurements of impact sound insulation of floors</i>
ISO 3743-1 : 1994	BS EN ISO 3743 <i>Acoustics. Determination of sound power levels of noise sources. Engineering methods for small, movable sources in reverberant fields</i> Part 1 : 1995 <i>Comparison for hard-walled test rooms</i>
ISO 3744 : 1994	BS EN ISO 3744: 1995 <i>Acoustics. Determination of sound power levels of noise sources using sound pressure. Engineering method in an essentially free field over a reflecting plane</i>
ISO 3746 : 1995	BS EN ISO 3746 : 1996 <i>Acoustics — Determination of sound power levels of noise source using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane</i>
ISO 3747 : 1987	BS 4196 <i>Sound power levels of noise sources</i> Part 7 : 1988 <i>Survey method for determination of sound power levels of noise sources using a reference sound source</i>
ISO 9614-1 : 1993	BS EN ISO 9614-1 : 1995 <i>Acoustics. Determination of sound power levels of noise sources using sound intensity Measurement at discrete points</i>
ISO 11201 : 1995	BS EN ISO 11201 : 1996 <i>Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane</i>
ISO 11202 : 1995	BS EN ISO 11202 : 1996 <i>Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Survey method in situ</i>
ISO 11204 : 1995	BS EN ISO 11204 : 1996 <i>Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections</i>
IEC 651 : 1979	BS EN 60651 : 1994 <i>Specification for sound level meters</i>
IEC 804 : 1985	BS EN 60804 : 1994 <i>Specification for integrating-averaging sound level meters</i>
IEC 942 : 1988	BS 7189 : 1989 <i>Specification for sound calibrators</i>

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

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Descriptors: Acoustics, machinery, noise (sound), engine noise, noise reduction, enclosures, acoustic insulation, tests, acoustic tests, performance tests, field tests, acoustic measurements

English version

Acoustics - Determination of sound insulation performances of enclosures - Part 2: Measurements in situ (for acceptance and verification purposes) (ISO 11546-2: 1995)

Acoustique - Détermination de l'isolement
acoustique des encoffrements - Partie 2:
Mesurages sur site (aux fins d'acceptation et de
vérification) (ISO 11546-2: 1995)

Akustik - Bestimmung der Schalldämmung von
Schallschutzkapseln - Teil 2: Messungen im
Einsatzfall (zum Zweck der Abnahme und
Nachprüfung) (ISO 11546-2: 1995)

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Foreword

The text of the International Standard ISO 11546-2: 1995 has been prepared by the Technical Committee ISO/TC 43, Acoustics, in collaboration with the Technical Committee CEN/TC 211, Acoustics.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 1996, and conflicting national standards shall be withdrawn at the latest by June 1996.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Acoustics — Determination of sound insulation performances of enclosures —

Part 2:

Measurements *in situ* (for acceptance and verification purposes)

1 Scope

This part of ISO 11546 specifies *in situ* methods for the determination of the sound insulation performance (insertion loss) of machine enclosures.

It applies to a total enclosure only and not to the individual panels from which the enclosure is made.

NOTES

1 Sound insulation for enclosure panels such as wall elements, doors, windows, silencers, etc. should be measured in accordance with other relevant standards.

2 Related standards concern noise-attenuation measurements of enclosures under laboratory conditions (ISO 11546-1) and cabins (ISO 11957).

The measurement methods specified in this part of ISO 11546 are based on International Standards in the series ISO 3740, ISO 9614 and ISO 11200 (see table 1). Depending on the method chosen, the sound insulation performance (insertion loss) of the enclosure is determined in terms of the reduction of sound power level or sound pressure level. Methods are given for measurements where the enclosure surrounds the actual sound source (machine). When these methods are not practicable, alternative measurements can be performed with an artificial sound source. Such methods are also described in this part of ISO 11546.

1) To be published. (Revision of ISO 717-1:1982 and ISO 717-3:1982)

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11546. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11546 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 140-6:1978, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 6: Laboratory measurements of impact sound insulation of floors*.

ISO 717-1:—¹⁾, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation*.

ISO 3743-1:1994, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for small, movable sources in reverberant fields — Part 1: Comparison method for hard-walled test rooms*.

ISO 3744:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane*.

ISO 3746:1995, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane.*

ISO 3747:1987, *Acoustics — Determination of sound power levels of noise sources — Survey method using a reference sound source.*

ISO 4871:—²⁾, *Acoustics — Declaration and verification of noise emission values of machinery and equipment.*

ISO 9614-1:1993, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points.*

ISO 9614-2:—³⁾, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning.*

ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane.*

ISO 11202:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Survey method in situ.*

ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections.*

IEC 651:1979, *Sound level meters.*

IEC 804:1985, *Integrating-averaging sound level meters.*

IEC 942:1988, *Sound calibrators.*

IEC 1260:—⁴⁾, *Electroacoustics — Octave-band and fractional-octave-band filters.*

3 Definitions

For the purposes of this part of ISO 11546, the following definitions apply.

2) To be published. (Revision of ISO 4871:1984)

3) To be published.

4) To be published. (Revision of IEC 225:1966)

3.1 A-weighting: Frequency weighting as defined in IEC 651.

3.2 enclosure: A structure enveloping a noise source (machine), designed to protect the environment from this noise source (machine).

NOTE 3 An enclosure can be, for example, a freestanding structure terminated on the floor or a structure more or less fixed to the machine. (Concerning enclosures fixed to the machine, see clause 4.)

3.3 sound pressure level, L_p : Ten times the logarithm to the base 10 of the ratio of the square of the sound pressure of a sound to the square of the reference sound pressure. Sound pressure levels are expressed in decibels. The reference sound pressure is 20 μ Pa (2×10^{-5} Pa).

3.4 average sound pressure level, $\bar{L}_p$: Mean-square of the sound pressure levels:

$$\bar{L}_p = 10 \lg \left(\frac{10^{0,1L_{p1}} + 10^{0,1L_{p2}} + \dots + 10^{0,1L_{pn}}}{n} \right) \text{ dB}$$

where L_{p1} , L_{p2} , ..., L_{pn} are the sound pressure levels, in decibels, to be averaged.

3.5 sound power level, L_W : Ten times the logarithm to the base 10 of the ratio of a given sound power to the reference sound power. It is expressed in decibels. The reference sound power is 1 pW (10^{-12} W).

3.6 average sound power level, $\bar{L}_W$: Mean-square of the sound power levels:

$$\bar{L}_W = 10 \lg \left(\frac{10^{0,1L_{W1}} + 10^{0,1L_{W2}} + \dots + 10^{0,1L_{Wn}}}{n} \right) \text{ dB}$$

where L_{W1} , L_{W2} , ..., L_{Wn} are the sound power levels, in decibels, to be averaged.

3.7 sound power insulation, D_W : Reduction in sound power level obtained due to the enclosure (octave bands or one-third-octave bands). It is expressed in decibels.

3.8 A-weighted sound power insulation, D_{WA} : Reduction in the A-weighted sound power level obtained due to the enclosure for the actual sound source spectrum. It is expressed in decibels.

3.9 sound pressure insulation, D_p : Reduction in the sound pressure level at a specified position due to the