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**Sound power rating of air-conditioning and  
air-source heat pump equipment —**

**Part 2:**  
Non-ducted indoor equipment

*Détermination du niveau de puissance acoustique des climatiseurs et  
pompes à chaleur sur l'air —*

*Partie 2: Appareils intérieurs non raccordés*

ISO 13261-2:1998

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International Organization for Standardization  
Case postale 56 • CH-1211 Genève 20 • Switzerland  
Internet central@iso.ch  
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 13261-2 was prepared by Technical Committee ISO/TC 86, *Refrigeration*, Subcommittee SC 6, *Factory-made air-conditioning and heat pump units*.

[ISO 13261-2:1998](https://standards.iso.org/iso/13261-2:1998)

<https://standards.iso.org/iso/13261-2:1998> Annex A forms an integral part of this part of ISO 13261. Annex B is for information only.

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# Sound power rating of air-conditioning and air-source heat pump equipment —

## Part 2: Non-ducted indoor equipment

### 1 Scope

This part of ISO 13261 specifies methods for the determination of sound power ratings of air-conditioning and air-source heat pump equipment to be used indoors.

It is applicable to the sound power rating of the indoor sections of non-ducted, factory-made, residential, commercial and industrial air-conditioning and air-source heat pump equipment, which are electrically driven with mechanical compression including free-delivery heat pumps, packaged-terminal air-conditioners and water-source heat pumps. This part of ISO 13261 includes both an octave-band sound power level rating and a single-number A-weighted overall sound power level rating.

This part of ISO 13261 does not apply to ducted indoor equipment or to chillers, room fan coil units, products with variable speed compressors, or industrial process equipment.

NOTE — The terms "air-conditioner" and "equipment" are used to mean "air-conditioners and air-source heat pumps" in this part of ISO 13261.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 13261. 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 13261 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3742:1988, *Acoustics — Determination of sound power levels of noise sources — Precision methods for discrete-frequency and narrow-band sources in reverberation rooms.*

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 3743-2:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering methods for small, movable sources in reverberant fields — Part 2: Methods for special reverberation 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 3745:1977, *Acoustics — Determination of sound power levels of noise sources — Precision methods for anechoic and semi-anechoic rooms.*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment.*

ISO 5151:1994, *Non-ducted air-conditioners and heat pumps — Testing and rating for performance.*

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

ISO 9614-2:1996, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning.*

ISO 12001:1996, *Acoustics — Noise emitted by machinery and equipment — Rules for the drafting and presentation of a noise test code.*

### 3 Definitions

For the purposes of this part of ISO 13261, the following definitions apply.

#### 3.1

##### **air-conditioner**

one or more factory-made assemblies which normally include an evaporator or cooling coil, a compressor and condenser combination, and may also include a heating function; where such equipment is provided in more than one assembly, the separated assemblies shall be designed to be used together

NOTE — The requirements for sound ratings specified in this part of ISO 13261 are based on the use of matched assemblies.

#### 3.2

##### **air-source heat pump**

one or more factory-made assemblies which normally include an indoor conditioning coil, a compressor and outdoor coil (including means to provide a heating function), and may optionally include a cooling function; when such equipment is provided in more than one assembly, the separated assemblies shall be designed to be used together

NOTE — The requirements for sound ratings specified in this part of ISO 13261 are based on the use of matched assemblies.

#### 3.3

##### **non-ducted indoor air-conditioning equipment**

air-conditioning and heat pump equipment with free delivery of air from, and returned to, the indoor portion of such equipment.

#### 3.4

##### **room fan-coil unit**

factory-made assembly which would usually include a water-to-air coil together with an electrically-driven air handling fan(s) enclosed in a casing or mounted on a chassis for built-in or framed-in application to form a complete unit intended to be connected as part of a chilled water cooling system

NOTE — The unit may include a heating function as well.

#### 3.5

##### **cassette unit**

split system air-conditioner or heat pump in which the indoor air-handling section has two or more integral diffusers and a recirculation grille and is normally designed to be hung in a ceiling with a minimum projection into the room.

#### 3.6

##### **sound power level, $L_W$**

ten times the logarithm to the base 10 of the ratio of the sound power radiated by the sound source under test to a reference sound power, expressed in decibels (dB)

NOTE — The reference sound power used in this part of ISO 13261 is 1 pW (picowatt).

**3.7****sound pressure level,  $L_p$** 

ten times the logarithm to the base 10 of the ratio of a given sound pressure squared to a reference sound pressure squared, expressed in decibels (dB)

NOTE — The reference sound pressure used in this part of ISO 13261 is 20  $\mu$ Pa (micropascals).

**3.8****octave band**

band of sound covering a range of frequencies such that the highest is twice the lowest

NOTE — The octave bands used in this part of ISO 13261 are those shown in table 1.

**3.9****one-third-octave band**

band of sound covering a range of frequencies such that the highest is the cube root of two (approximately 1,26) times the lowest

NOTE — The one-third-octave bands used in this part of ISO 13261 are those shown in table 1.

**Table 1 — Standard frequency bands**

Values in hertz

Octave band			One-third-octave band		
Lower frequency limit	Centre* frequency	Upper frequency limit	Lower frequency limit	Centre* frequency	Upper frequency limit
44	63**	90	44 56 71	50** 63** 80**	56 71 90
90	125 180	250 355	90 112 140 180	100 125 160	112 140 180
180	250 355	500 710	180 224 280 355	200 250 315	224 280 355
355	500 710	1 000 1 400	355 450 560 710	400 500 630	450 560 710
710	1 000 1 400	2 000 2 800	710 900 1 120	800 1 000 1 250	900 1 120 1 400
1 400	2 000 2 800	4 000 5 600	1 400 1 800 2 240	1 600 2 000 2 500	1 800 2 240 2 800
2 800	4 000 5 600	8 000 11 200	2 800 3 550 4 500	3 150 4 000 5 000	3 550 4 500 5 600
5 600	8 000 11 200		5 600 7 100 9 000	6 300 8 000 10 000	7 100 9 000 11 200

\* The centre frequency is the geometric mean of the frequency limits.  
 \*\* These bands are considered to be optional.  
 NOTE — The frequencies in this table have been rounded off slightly for ordinary use.

**3.10****hertz (Hz)**

unit of frequency in cycles per second

**3.11****published rating**

statement of the assigned values of those performance characteristics, under stated rating conditions, by which air-conditioning equipment may be chosen to fit its application

NOTE — These values apply to all equipment of identical size and type (model) and nominal capacity produced by the same manufacturer for the specific temperature conditions for which the equipment is rated for cooling and/or heating capacities.

**3.11.1****standard rating**

rating based on tests performed at standard rating conditions

**3.11.2****application rating**

rating based on tests performed at other than standard rating conditions

**4 Requirements for conducting sound tests****4.1 Testing requirements for equipment**

**4.1.1** Sound tests shall be conducted in accordance with the test methods (Grade 1 or Grade 2 as identified in ISO 12001) specified in ISO 3742:1988, ISO 3743-1, ISO 3743-2, ISO 3744, ISO 3745, ISO 9614-1 and ISO 9614-2. (See table 2.)

**Table 2 — Sound power ratings — Methods and information**

International Standard	Octave-band sound power level data			Overall A-weighted sound power level data	
	63 Hz Optional data	125 Hz to 4 kHz Rating data	8 kHz Rating data	Normal procedure	Special procedure
ISO 3742:1988	See 4.3	.	.	.	.
ISO 3743-1*	See 4.3	.	.	.	.
ISO 3743-2*	See 4.3	.	.	.	.
ISO 3744	See 4.3	.	.	.	.
ISO 3745	See 4.3	.	.	.	.
ISO 9614-1	See 4.3	.	See 4.2	.	See 5.4.1.2
ISO 9614-2	See 4.3	.	See 4.2	.	See 5.4.1.2

\* ISO 3743-1 and ISO 3743-2 are only to be used for testing small, portable equipment.

**4.1.2** High air speeds and adverse air streams causing turbulence may affect the sound measured by a microphone. These effects will tend to result in an overestimation of the sound power of the product. Thus, it is recommended that the air speed at the microphone should not exceed 2 m/s. The error due to air streams may be checked by repeating the measurement at a larger distance from the product. If the resulting sound power levels at both measurement distances are within  $\pm 1,0$  dB, the air-stream effects are negligible.

**4.2 Data to be taken**

**4.2.1** Sound power levels shall be determined in decibels (ref. 1 pW) for the one-third-octave bands from 100 Hz to 10 000 Hz, or the full-octave bands from 125 Hz to 8 000 Hz, as listed in table 1. Sound power levels shall be determined in accordance with the specific International Standard on acoustics, listed in clause 2, which was used to conduct the test.

**4.2.2** If testing is conducted in accordance with ISO 9614, data are to be reported only for frequencies up to and including 6 300 Hz. Data above 6 300 Hz can only be provided for information purposes when using ISO 9614 because the uncertainties are not defined above 6 300 Hz. In addition, special consideration must be given to the determination of the overall A-weighted sound power level rating (see 5.4) using the procedures established in annex A.

**NOTE —** If additional information on sound power levels at 50 Hz, 63 Hz and 80 Hz one-third-octave bands or the 63 Hz octave band is to be optionally provided, it is recommended that the standard rating temperature conditions and the measurement methods in the applicable standards be respected.



### 4.3 Special testing considerations for the optional 63 Hz octave band

**4.3.1** When extending the testing procedures in ISO 3742, ISO 3743-1, ISO 3743-2 and annex A below 100 Hz, the standard deviation shall not exceed 5 dB.

**4.3.2** When testing in accordance with ISO 3744, the acoustical environment shall have an acoustical environmental correction  $K_2$  of less than or equal to 2 dB.

**4.3.3** When testing in accordance with ISO 3745, the acoustical environment shall have an acoustical environmental correction  $K_2$  of less than or equal to 0,5 dB.

**4.3.4** When testing in accordance with ISO 9614, a larger microphone spacer will allow measurements at lower frequencies but the field indicators of this part of ISO 13261 shall be satisfied.

### 4.4 Use of windscreen

The use of a foam windscreen on the microphone is required in these tests. The effect of the windscreen on the microphone response shall not be more than  $\pm 1$  dB for frequencies of 50 Hz to 4 000 Hz or  $\pm 1,5$  dB for frequencies of 4 000 Hz to 10 000 Hz. Sound measurements shall not be made with air velocities over the microphone exceeding 2 m/s.

### 4.5 Equipment mounting

**4.5.1** All equipment shall be mounted according to the manufacturer's installation instructions. If any deviations from these instructions are necessary, they shall be made in a manner that will not affect the acoustic performance of the equipment, and such mounting deviations shall be reported.

**4.5.2** In the case of wall-mounted equipment, the mounting wall should be of heavy masonry or equivalent construction (normal incidence absorption coefficient of less than 0,06 over the frequency range of interest), or an auxiliary mounting platform shall be provided to minimize wall vibration effects. Where a single packaged air-conditioner can be installed partly outdoors and partly indoors (such as a window air-conditioner), it shall be mounted in accordance with the manufacturer's installation instructions into a partition which is impervious to sound and shall include any wall sleeves, mounting frames or mounting brackets normally supplied with the equipment.

**4.5.3** Typical mounting configurations are illustrated in figure 1 and described below.

- a) Position A (figure 1): equipment mounted away from a wall.
- b) Position B (figure 1): equipment mounted against or through-the-wall with the bottom of the equipment on or near the floor or with the top of the equipment on or near the ceiling. The equipment shall be mounted at the manufacturer's minimum recommended projection into the room (see "Y" in figure 1).
- c) Position C (figure 1): equipment mounted against or through-the-wall but the bottom of the equipment is not on or near the floor. The equipment shall be mounted at the manufacturer's minimum recommended projection into the room and the manufacturer's recommended wall location (see "X" and "Y" in figure 1).
- d) Position D (figure 1): ceiling-mounted equipment may be suspended from the sound room ceiling, or through the ceiling, or from a frame device of suitable construction.

**4.5.4** Auxiliary mounting surfaces shall be non-absorbent (diffuse field absorption coefficient less than 0,06).

**4.5.5** Cassette units and packaged-terminal air-conditioners designed for surface mounting, framed-in or built-in applications shall be installed and operated at free-delivery conditions without enclosures or duct work.