International Standard 4871

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Acoustics — Noise labelling of machinery and equipment

Acoustique — Étiquetage du bruit des équipements et des machines

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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 developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4871 was developed by Technical Committee ISO/TC 43, *Acoustics*, and was circulated to the member bodies in June 1979.

It has been approved by the member bodies of the following countries:

Australia	Israel	South Africa, Rep. of
Austria	Italy	Spain
Belgium	Japan	Sweden
Czechoslovakia	Netherlands	Switzerland
Denmark	Norway	USA
France	New Zealand	USSR
Germany, F. R.	Poland	Yugoslavia
Greece	Portugal	
Hungary	Rumania	

The member bodies of the following countries expressed disapproval of the document on technical grounds:

Canada
United Kingdom

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Acoustics — Noise labelling of machinery and equipment

0 Introduction

In order to cope with the problems of noise from machines and its disturbance of people, useful information on noise emission of machines is needed by users, authorities, planners, etc.

Legal or voluntary codes for noise reduction purposes make use of three principally different approaches. The first is to specify maximum immission (exposure) limits at the work place and for residential, industrial and traffic areas; the second is to specify the maximum emission (output) limits from machines; the third is to give information on the noise emission of a machine through a labelled value. There exists a need to coordinate at least the general procedures on a world-wide basis in order to avoid the development of technical barriers to trade.

The following conclusions have been reached:

a) Consumers, purchasers, authorities and manufacturers need a uniform system for characterizing the noise emission and for labelling the machinery or equipment with the acoustical characteristics of a product giving the following:

— information on the noise output from a product for the purpose of noise regulations, acoustical planning and comparison of different noise sources of the same kind or different kinds;

— uniform ways of presenting noise performance to prevent barriers to trade resulting from differences in measurement methods, limit values and designations of noise, thus providing a clear, universal guideline for the choice between noise characteristics of a product.

NOTE — Information on the noise output from a product in relation to the noise output from other similar products having the same performance, output or function, that is, a relative classification, which may facilitate the choice of noise performance in relation to other characteristics is difficult to establish and implies a knowledge of the level of the noise of a whole family of machines at a given time. Those levels also change with technical progress. Therefore, a relative classification is not dealt with in this International Standard, although provisions are given in the annex, so that the information required is provided for by the relevant labelling code.

b) The purpose of this International Standard is to establish requirements for the use of measured noise emission values for the purposes of noise labelling machines or equipment.

In order to avoid confusion between values for sound pressure level (which are highly dependent on the distance of measurement and on the environment) and values for sound power level determined under specified mounting and operating conditions, levels in terms of the emitted sound power are basically used for labelling purposes in this International Standard, because sound power levels are independent of the measurement distance used.

Use of sound power for labelling purposes permits comparison of noise emissions between machines or equipment of different types. Information as to the absolute noise emissions of equipment or machines facilitates the preparation of noise regulations and legislation.

c) It is the responsibility

— of other appropriate authorities or committees to decide which noise limits they consider acceptable;

— of ISO and IEC, on the basis of this International Standard, to establish their specific labelling documents for specific families of machines or equipment under their responsibility

NOTES

1 Sound pressure levels at any specified position near the machine which depend essentially on the installation of the machine, its use, the environment, the directivity of noise radiation and the measurement distance, are excluded for the sake of a uniform method for labelling.

In special cases, for example where the operator's positions are well-defined, such measurements as decribed in documents related to the specific use of a machine (see ISO 6081) may also be of interest.

2 For assessment purposes, the value of the sound power level may be modified by corrective values for temporal or spectral characteristics. Since such corrections will generally be similar for a family of machines, corrections for assessment are not dealt with in this International Standard for the sake of simplicity.

1 Scope and field of application

This International Standard

— prescribes a manner in which the noise emission of machinery and equipment shall be expressed for labelling purposes;

— prescribes the minimum information to be given in a label attached to the machine or in commercial or technical documents supplied to consumers by the manufacturer.

This International Standard applies to machinery and equipment which is essentially stationary in nature. Traffic vehicles are excluded.

It applies only to families of machines or equipment for which measurement test codes for the determination of the sound power level exist.

2 References

ISO 3740, *Acoustics — Determination of sound power levels of noise sources — Guidelines for the use of basic standards and for the preparation of noise test codes.*

ISO 3741, *Acoustics — Determination of sound power levels of noise sources — Precision methods for broad-band sources in reverberation rooms.*

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

ISO 3743, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for special reverberation test rooms.*

ISO 3744, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for free-field conditions over a reflecting plane.*

ISO 3745, *Acoustics — Determination of sound power levels of noise sources — Precision methods for anechoic and semi-anechoic rooms.*

ISO 3746, *Acoustics — Determination of sound power levels of noise sources — Survey method.*

ISO 6081, *Acoustics — Noise emitted by machinery and equipment — Guidelines for the preparation of test codes of engineering grade requiring noise measurements at the operator's position.*[1)]

ISO 7574/1, *Acoustics — Statistical methods for determining and verifying stated noise emission values of machinery and equipment — Part 1: Definitions.*[1)]

ISO 7574/2, *Acoustics — Statistical methods for determining and verifying stated noise emission values of machinery and equipment — Part 2: Method for determining and verifying labelled values for machines labelled individually.*[1)]

ISO 7574/3, *Acoustics — Statistical methods for determining and verifying stated noise emission values of machinery and equipment — Part 3: Simple (transition) method for determining and verifying labelled values for batches of machines.*[1)]

ISO 7574/4, *Acoustics — Statistical methods for determining and verifying stated noise emission values of machinery and equipment — Part 4: Determining and verifying labelled values for batches of machines.*[1)]

3 Definitions

For the purpose of this International Standard, the following definitions apply.

3.1 family of machines or equipment: Machines or equipment of similar design or kind, or meeting the same performance requirements.

NOTES

1 A family could include

— different designs which meet the same performance requirements;

— different production batches of a given design from one manufacturer;

— comparable products from different manufacturers in various countries designed to fulfil the same purpose;

— machines of different sizes but of similar design.

2 Examples of families of machines:

— a group of rotating electrical machines of a given range of power and speed;

— a group of concrete mixers with a certain range of volumetric capacities.

3 The family shall be fully described for each case of application.

3.2 lot of machines: Population of machines of the same family, produced in large quantities, usually manufactured to the same technical specifications and characterized by the same labelled value (see 3.4).

3.3 A-weighted sound power level, L_{WA}, in decibels: The sound power level of the noise source determined in accordance with the appropriate noise measurement standard and using A-weighting. The reference sound power is 1 pW ($= 10^{-12}$ W).

3.4 labelled value: The numerical value which indicates, as an integer, the limit below which the A-weighted sound power level of the single machine and/or of a large proportion of the lot shall lie when the machine is new.

NOTE — In some cases, the labelled value may be expressed as the numerical value of this sound power level, divided by ten, given with one digit after the decimal sign.

4 Determination of the labelled value

4.1 Determination of the A-weighted sound power level

For the purpose of this International Standard, the A-weighted sound power level of a machine or a piece of equipment is determined in accordance with the applicable measurement test code(s) based on ISO 3741, ISO 3742, ISO 3743, ISO 3744, ISO 3745 and ISO 3746.

If the measurement test code requires the observation of more than one A-weighted sound power level, corresponding to several modes of operation, the mode usually resulting in the highest value shall be used for labelling purposes, otherwise the specific labelling code for the specific family of machines shall give detailed information.

1) At present at the stage of draft.

4.2 Information to be considered when determining the labelled value

Depending on the average size of lots of the family of machines under consideration and depending on the presence of machines on the market, it shall be decided whether lots of machines of the family under consideration shall be labelled with one value for all machines or whether (especially for small average lot sizes or for tailor-made machines) individual labelling is appropriate.

In order to obtain the labelled value, the manufacturer shall take into account:

— the uncertainty of the measurement with respect to the precision of the measurement method, that means with respect to the reproducibility (including repeatability) of the measurement method,

— the total standard deviation, σ_t, for values of A-weighted sound power levels as a combination of the standard deviation of reproducibility and the standard deviation of production, when labelling lots of a series production where only a sample of the whole lot is measured,

— the possibility that the labelled value might be verified by methods in accordance with ISO 7574; in the case of lot labelling, ISO 7574 assumes that the typical total standard deviation of A-weighted sound power level values, the reference standard deviation, σ_M, is known and that the sample size n for the sampling inspection is known (see labelling code for the specific family of machines),

— the risk (of a lot or an individually labelled machine being rejected) he is willing to bear.

NOTE — It might be expected that the labelled value lies approximately 1,5 σ_M above the mean value of the A-weighted sound power levels for the lot when accepting a rejection risk of 5 %. Detailed consideration of ISO 7574 is, however, necessary when labelling lots of series machines or when labelling machines individually.

The labelled value, in decibels, shall be given as an integer.

NOTE — When this value, divided by ten, is used for labelling purposes, this method should be used for the whole family of machines within one country.

5 Labelling

The labelling shall contain at least the following information:

— the wording "Noise output (L_{WA})", followed by the labelled value, as defined in 3.4 and determined in accordance with clause 4;

— the reference to the appropriate labelling code or, in the absence of a labelling code, the appropriate measurement test code;

— identification of the labelled product (lot), for example, by the serial number or date of manufacture/delivery;

— information whether lot labelling ["(L)"] or whether individual labelling ["(I)"] was prescribed.

NOTES

1 Whenever required or necessary the following additional information may be given when labelling:

— data provided by the measurement test code such as noise spectra in octave or one-third octave bands for different operating conditions and cycles, assessment information (for example, existence of tonal components), sound pressure level at the operator's position (if included in the special measurement test code),

— the typical range of labelled values for lots of different manufacture for the specific family of machines.

2 As an example, the labelling for a stationary compressor of a given power could be as follows:

Labelling	Interpretation
Noise output (L_{WA}) 97	The labelled value in accordance with clause 4 is 97; the expected A-weighted sound power level will not exceed 97 dB with a high probability.
ISO ...	Specific labelling code.
19400919 (L)	Serial number. The serial number identifies the lot. "(L)" indicates that all machines of the lot are labelled by the same value: 97.

3 Labelling does not necessarily mean that the required information shall be put on a label stuck on the machine. For example, it might be the responsibility of an authority to decide whether a standardized label shall be attached to a machine or equipment or whether the labelling information shall be given in the technical data sheet supplied by the manufacturer to the consumer.

Annex

Guidelines for the preparation of noise labelling codes for a specific family of machines

(This annex does not form part of the standard.)

The labelling code for a specific family of machines shall contain at least

- a statement that it is based on this International Standard, ISO 4871;
- a definition of the family of machines to which the code applies;
- a reference to the measurement test code or ISO or IEC standards in accordance with which the noise measurements were made;
- the mounting, loading and operating conditions used during noise measurements if the noise measurement test code specifies several options;
- the decision whether lot labelling or individual labelling shall be prescribed;
- when testing lots of series machines (in accordance with ISO 7574), the sampling procedure, sample size, reference standard deviation and operating characteristic curve (see ISO 7574);
- an example of a label, a reference to the relevant labelling code, the date of manufacture of the product or serial number.

If appropriate, the code shall also contain

- additional data as provided by the measurement test code (see clause 5, note 1);
- information on the sound power emission of the family of machines under consideration by giving:
  - the origin of measurement data, including the number of different types of machines investigated, design characteristics (including noise reduction measures), the date and size of the data collection;
  - a table (or graph) showing the range covered by the sound power levels determined as a function of a significant machine parameter.

NOTE — The figure shows the relationship between the existing test codes and the steps to be followed in establishing a specific labelling code.