INTERNATIONAL STANDARD

ISO 7235

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Acoustics — Measurement procedures for ducted silencers — Insertion loss, flow noise and total pressure loss

Acoustique — Méthodes de mesurage pour silencieux en conduit — Perte d'insertion, bruit d'écoulement et perte de pression totale

Reference number
ISO 7235:1991(E)

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 7235 was prepared by Technical Committee ISO/TC 43, *Acoustics*.

Annexes A, B and C form an integral part of this International Standard. Annexes D, E and F are for information only.

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Introduction

This International Standard specifies the substitution method for determining the insertion loss of ducted silencers. Another measurement method, the direct method, was also considered when preparing this International Standard, but this method is not specified here. It may form the subject of a future International Standard.

The test arrangement is designed to allow the application of either the substitution method or the direct method (method not covered by this International Standard). It is such that the measured data arise only from the silencer under test and not from elements to which the silencer is connected.

In the substitution method the sound pressure level of the transmitted wave is first determined with the silencer installed between the test ducts and then when the silencer is replaced by the substitution duct (a hard-duct element). The sound pressure level of the transmitted wave can be measured either in the test duct after the silencer or in a reverberation room connected to this test duct via a transmission element. A reverberation room is used when the flow noise of the microphone in the test duct cannot be sufficiently suppressed. In the substitution method, the determination of the sound power level of the incident wave is not necessary. The method does, however, create the problem of maintaining an unchanged sound power and pressure distribution in the incident wave when replacing the silencer by the substitution duct.

The insertion loss of a silencer is generally affected by the air flow. The insertion loss is therefore measured with superimposed air flow if the silencer is to be used in flow ducts. This measurement requires the provision of an additional air-moving device with its own silencer. The same arrangement is necessary for measuring the flow noise and pressure loss of the silencer under test.

An air flow through a silencer produces noise. This flow noise establishes the lowest sound pressure level which can be achieved after the silencer. It is, therefore, necessary to know the sound power level of the flow noise behind the silencer. This is preferably determined in a reverberation room connected to the test duct via a transmission element.

In accordance with this International Standard, the total pressure loss of a silencer to be used with flow is to be determined. It is, therefore, useful to equip the test facility with the instruments and devices necessary for the determination of the total pressure loss.

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1 Scope

This International Standard specifies the substitution method for determining the insertion loss of ducted silencers. It sets out requirements for determining

— the insertion loss, in frequency bands, of silencers with and without air flow;

— the sound power level, in frequency bands, of the flow noise generated by silencers;

— the total pressure loss of silencers with air flow.

The measurement procedures are intended for laboratory measurements on silencers but may also be used for *in situ* measurements on silencers if the requirements of this International Standard can be met.

This International Standard applies to silencers for ventilating and air-conditioning systems which are usually connected to ducts or splitter absorbers mounted in ducts. Other duct elements, such as bends or T-connectors, may also be tested using this International Standard.

This International Standard does not apply to reactive silencers used for motor vehicles.

NOTE 1 Exact information on the precision of the method cannot be given at this time. Interlaboratory tests are necessary for the determination of the reproducibility standard deviation σ_R of the method (relevant terms and methods are given in ISO 5725). The following estimates of the reproducibility standard deviation, σ_R, were determined from tests made on splitter-type silencers.

Centre frequencies of the one-third octave hand Hz	Reproducibility standard deviation, σ_R dB
50 to 1 250	3
1 600 to 10 000	2

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 266:1975, *Acoustics — Preferred frequencies for measurements.*

ISO 3741:1988, *Acoustics — Determination of sound power levels of noise sources — Precision methods for broad-band sources in reverberation rooms.*

ISO 5136:1990, *Acoustics — Determination of sound power radiated into a duct by fans — In-duct method.*

ISO 5221:1984, *Air distribution and air diffusion — Rules to methods of measuring air flow rate in an air handling duct.*

IEC 225:1966, *Octave, half-octave and third-octave band filters intended for the analysis of sounds and vibrations.*

IEC 651:1979, *Sound level meters.*

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

3 Definitions

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