SLOVENSKI STANDARD
SIST EN ISO 7235:2004

01-januar-2004

Nadomešča:
SIST EN ISO 7235:1997

Akustika – Laboratorijski merilni postopki za dušilnike v kanalih in elementih za dovod in odvod zraka - Dodano dušenje, hrup zaradi pretoka in padec celotnega tlaka (ISO 7235:2003)

Acoustics - Laboratory measurement procedures for ducted silencers and air-terminal units - Insertion loss, flow noise and total pressure loss (ISO 7235:2003)

Akustik - Labormessungen an Schalldämpfern in Kanälen - Einfügungsdämpfung, Strömungsgeräusch und Gesamtdruckverlust (ISO 7235:2003)

Acoustique - Modes opératoires de mesure en laboratoire pour silencieux en conduit et unités terminales - Perte d'insertion, bruit d'écoulement et perte de pression totale (ISO 7235:2003)

Ta slovenski standard je istoveten z: **EN ISO 7235:2003**

ICS:

17.140.01	Akustična merjenja in blaženje hrupa na splošno	Acoustic measurements and noise abatement in general
91.120.20	Akustika v stavbah. Zvočna izolacija	Acoustics in building. Sound insulation
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning

SIST EN ISO 7235:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 7235

August 2003

ICS 91.120.20

Supersedes EN ISO 7235:1995

English version

Acoustics - Laboratory measurement procedures for ducted silencers and air-terminal units - Insertion loss, flow noise and total pressure loss (ISO 7235:2003)

Acoustique - Modes opératoires de mesure en laboratoire pour silencieux en conduit et unités terminales - Perte d'insertion, bruit d'écoulement et perte de pression totale (ISO 7235:2003)

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This European Standard was approved by CEN on 20 June 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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CORRECTED 2003-09-24

Foreword

This document (EN ISO 7235:2003) has been prepared by Technical Committee ISO/TC 43 "Acoustics" in collaboration with Technical Committee CEN/TC 211 "Acoustics", the secretariat of which is held by DS.

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 February 2004, and conflicting national standards shall be withdrawn at the latest by February 2004.

This document supersedes EN ISO 7235:1995.

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

For relationship with EU Directive(s), see informative annex ZB, which is an integral part of this document.

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

Endorsement notice

The text of ISO 7235:2003 has been approved by CEN as EN ISO 7235:2003 without any modifications.

NOTE Normative references to International Standards are listed in Annex ZA (normative).

Annex ZA
(normative)

Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

Publication	Year	Title	EN	Year
ISO 3741	1999	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms	EN ISO 3741	1999
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	EN ISO 3746	1995
ISO 9614-3	2002	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 3: Precision method for measurement by scanning	EN ISO 9614-3	2002

Annex ZB
(informative)

Relationship of this document with EC Directives

This document 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) :

Machinery Directive 98/37/EC, amended by Directive 98/79/EC.

Compliance with this document provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

WARNING: Other requirements and other EC Directives may be applicable to the product(s) falling within the scope of this document.

INTERNATIONAL STANDARD

ISO 7235

Second edition
2003-08-01

Acoustics — Laboratory measurement procedures for ducted silencers and air-terminal units — Insertion loss, flow noise and total pressure loss

Acoustique — Modes opératoires de mesure en laboratoire pour silencieux en conduit et unités terminales — Perte d'insertion, bruit d'écoulement et perte de pression totale

Reference number
ISO 7235:2003(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 7235 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

This second edition cancels and replaces the first edition (ISO 7235:1991), which has been technically revised.

Introduction

This International Standard specifies the substitution method for determining the insertion loss of ducted silencers and a method for determining the transmission loss of air-terminal units.

In the substitution method, the sound pressure level of the transmitted wave is first determined for the test object and then when the test object has been replaced by the substitution duct. The sound pressure level of the transmitted wave can be measured

— in a reverberation room,

— in a test duct after the silencer, or

— in an essentially free field.

The methods are listed in order of preference.

The acoustic performance of silencers depends on the modal composition of the sound field at the inlet and on reflections at the outlet side, on flanking transmission and on level differences between signals and flow noise (or regenerated sound).

This International Standard describes configurations at the inlet side providing for a predominant fundamental mode that suffers the least attenuation. For the outlet side, it describes anechoic terminations and measurement procedures which are not sensitive to reflections or which allow for specified corrections. Furthermore, this International Standard gives guidance on the suppression of flanking transmission and noise signals.

The transmission loss of an air-terminal unit is determined from the results of measurements in a reverberation room and theoretical reflection coefficients of a substitution duct.

The insertion loss of a silencer is generally affected by the airflow. The insertion loss is therefore preferably measured with superimposed airflow if the silencer is to be used in ducts with high flow velocity.

For absorptive silencers where the maximum internal flow velocity falls short of 20 m/s, the flow will hardly have an effect on the insertion loss. In practice, non-uniform flow distributions will occur. Therefore, the limit velocity of 20 m/s may correspond to a design velocity of 10 m/s to 15 m/s.

An airflow through a silencer regenerates noise. This flow noise (or regenerated sound) establishes the lowest sound pressure level that can be achieved after the silencer. It is, therefore, necessary to know the sound power level of the flow noise (or regenerated sound) behind the silencer. This is preferably determined in a reverberation room connected to the object 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.

Acoustics — Laboratory measurement procedures for ducted silencers and air-terminal units — Insertion loss, flow noise and total pressure loss

1 Scope

This International Standard specifies methods for determining

— the insertion loss, in frequency bands, of ducted silencers with and without airflow,

— the sound power level, in frequency bands, of the flow noise (or regenerated sound) generated by ducted silencers,

— the total pressure loss of silencers with airflow, and

— the transmission loss, in frequency bands, of air-terminal units.

The measurement procedures are intended for laboratory measurements at ambient temperature. Measurements on silencers *in situ* are specified in ISO 11820.

It is to be noted that the results determined in a laboratory according to this International Standard will not necessarily be the same as those obtained *in situ* (installation), as different sound and flow fields will yield different results. For example, the pressure loss will be lower under laboratory conditions than *in situ*, but will be comparable between different laboratories.

This International Standard is applicable to all types of silencer including silencers for ventilating and air-conditioning systems, air intake and exhaust of flue gases, and similar applications. Other passive air-handling devices, such as bends, air-terminal units or T-connectors, can also be tested using this International Standard.

This International Standard is not applicable to reactive silencers used for motor vehicles.

NOTE 1 Annex A specifies the sound field excitation equipment. Annex B gives requirements for the transition element. Annex C gives details of duct walls and limiting insertion loss. Annex D specifies how to convert one-third-octave band attentuation values to octave band values. Annex E gives requirements for measurements on large parallel-baffle silencers. Annex F specifies a test of longitudinal attenuation. Annex G gives guidelines on anechoic terminations and Annex H shows examples of measurement arrangements.

NOTE 2 Acoustic testing of air-terminal devices and fan-coil units is to be carried out as described for air-terminal units.

NOTE 3 Sound power measurements on air-terminal units are specified in ISO 5135. Measurements of the pressure loss of air-terminal units are described in EN 12238, EN 12239 and EN 12589.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3741:1999, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for reverberation rooms*

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

ISO 5167-1, *Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full — Part 1: General principles and requirements*

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

ISO 9614-3, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 3: Precision method for measurement by scanning*

IEC 60651:2001, *Sound level meters*

IEC 60804:2000, *Integrating-averaging sound level meters*

IEC 60942:1997, *Electroacoustics — Sound calibrators*

IEC 61260, *Electroacoustics — Octave-band and fractional-octave-band filters*

3 Terms and definitions

For the purposes of this document, the following definitions apply.

3.1
insertion loss
D_i

⟨of the test object⟩ reduction in the level of the sound power in the duct behind the test object due to the insertion of the test object into the duct in place of a substitution duct, given by the equation

$$D_i = L_{WII} - L_{WI} \quad (1)$$

where

L_{WI} is the level of the sound power in the frequency band considered, propagating along the test duct or radiating into the connected reverberation room when the test object is installed;

L_{WII} is the level of the sound power in the frequency band considered, propagating along the test duct or radiating into the connected reverberation room when the substitution duct replaces the test object.

NOTE 1 The insertion loss is expressed in decibels (dB).

NOTE 2 For measurements according to this International Standard, the insertion loss of a silencer equals its transmission loss.

3.2
transmission loss
D_t

⟨of an air-terminal unit⟩ difference between the levels of the sound powers incident on and transmitted through the test object

NOTE 1 The transmission loss is expressed in decibels (dB).

NOTE 2 Adapted from ISO 11820:1996.

3.3
face velocity
v_f
velocity in front of the test object

$$v_f = \frac{q_V}{S_1} \tag{2}$$

where

q_V is the volume flow rate, in cubic metres per second (m^3/s);

S_1 is the inlet (or face) cross-sectional area of the test object, in square metres (m^2)

NOTE The face velocity is expressed in metres per second (m/s).

3.4
total pressure loss
Δp_t
⟨of the test object⟩ difference between the total pressures upstream and downstream of the test object

NOTE The total pressure loss is expressed in pascals (Pa).

3.5
total pressure loss coefficient
ζ
total pressure loss divided by the face velocity pressure upstream of the test object, given by the formula

$$\zeta = \frac{\Delta p_t}{\frac{1}{2}\rho_1 v_f^2} \tag{3}$$

where

Δp_t is the total pressure loss, in pascals (Pa);

ρ_1 is the air density upstream of the silencer, in kilograms per cubic metre (kg/m^3);

v_f is the face velocity, in metres per second (m/s) (see 3.3)

3.6
front
position relative to the direction of the sound propagation of the sound signal to be measured, corresponding to the “source side”

3.7
behind
position relative to the direction of the sound propagation of the sound signal to be measured, corresponding to the “receiving side”

3.8
test duct
straight, rigid duct of constant cross section in front of and behind the test object