SLOVENSKI STANDARD
SIST EN ISO 17201-3:2010

01-maj-2010

Akustika - Hrup strelskih poligonov - 3. del: Smernice za izračun širjenja zvoka (ISO 17201-3:2010)

Acoustics - Noise from shooting ranges - Part 3: Guidelines for sound propagation calculations (ISO 17201-3:2010)

Akustik - Geräusche von Schießplätzen - Teil 3: Anleitung für die Berechnung der Schallausbreitung (ISO 17201-3:2010)

Acoustique - Bruit des stands de tir - Partie 3: Lignes directrices pour le calcul de la propagation du son (ISO 17201-3:2010)

Ta slovenski standard je istoveten z: **EN ISO 17201-3:2010**

ICS:

17.140.20	Emisija hrupa naprav in opreme	Noise emitted by machines and equipment
95.020	Vojaška tehnika. Vojaške zadeve. Orožje	Military engineering. Military affairs. Weapons
97.220.10	Športni objekti	Sports facilities

SIST EN ISO 17201-3:2010 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 17201-3

February 2010

ICS 97.220.10; 17.140.20; 95.020

English Version

Acoustics - Noise from shooting ranges - Part 3: Guidelines for sound propagation calculations (ISO 17201-3:2010)

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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN ISO 17201-3:2010) 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of an identical text or by endorsement, at the latest by August 2010, and conflicting national standards shall be withdrawn at the latest by August 2010.

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The text of ISO 17201-3:2010 has been approved by CEN as a EN ISO 17201-3:2010 without any modification.

INTERNATIONAL STANDARD

ISO 17201-3

First edition
2010-02-01

Acoustics — Noise from shooting ranges —

Part 3: Guidelines for sound propagation calculations

Acoustique — Bruit des stands de tir —

Partie 3: Lignes directrices pour le calcul de la propagation du son

Reference number
ISO 17201-3:2010(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.

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ISO 17201-3 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

ISO 17201 consists of the following parts, under the general title *Acoustics — Noise from shooting ranges*:

— *Part 1: Determination of muzzle blast by measurement*

— *Part 2: Estimation of muzzle blast and projectile sound by calculation*

— *Part 3: Guidelines for sound propagation calculations*

— *Part 4: Prediction of projectile sound*

— *Part 5: Noise management*

Introduction

The initiative to prepare a standard on impulse noise from shooting ranges was taken by the Association of European Manufacturers of Sporting Ammunition (AFEMS), in April 1996 by the submission of a formal proposal to CEN (see doc. CEN N 1085). After consultation in CEN in 1998, CEN/TC 211, *Acoustics*, asked ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise* to prepare ISO 17201 (all parts).

This part of ISO 17201 provides guidance for sound propagation calculation of shooting sound from shooting ranges. If calculation procedures are not implied or specified by local or national guidelines, rules and regulations, and if a more sophisticated propagation model is not available, then ISO 9613-2 may be applied, provided that the recommendations in this part of ISO 17201 are observed.

The source energy of muzzle blast is typically measured or calculated for free-field conditions and often exhibits strong directivity. In many cases firearms are fired within a shooting range which has structures such as firing sheds, walls or safety barriers. Guns, particularly shotguns, are sometimes fired in many directions, e.g. in trap and skeet where the shooting direction is dictated by the flight path of the clay target. This part of ISO 17201 recommends ways in which source data can be adapted for use with ISO 9613-2 to obtain a general survey for the sound exposure levels to be expected in the neighbourhood of shooting ranges.

Acoustics — Noise from shooting ranges —

Part 3:
Guidelines for sound propagation calculations

1 Scope

This part of ISO 17201 specifies methods of predicting sound exposure levels of shooting sound for a single shot at a given reception point. Guidelines are given to calculate other acoustic indices from the sound exposure level. The prediction is based on the angular source energy distribution of the muzzle blast as defined in ISO 17201-1 or calculated using values from ISO 17201-2.

This part of ISO 17201 applies to weapons with calibres of less than 20 mm or explosive charges of less than 50 g TNT equivalent, at distances where peak pressures, including the contribution from projectile sound, are less than 1 kPa (154 dB).

NOTE National or other regulations, which could be more stringent, can apply.

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 9613-1, *Acoustics — Attenuation of sound during propagation outdoors — Part 1: Calculation of the absorption of sound by the atmosphere*

ISO 9613-2:1996, *Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation*

ISO 17201-1:2005, *Acoustics — Noise from shooting ranges — Part 1: Determination of muzzle blast by measurement*

ISO 17201-2, *Acoustics — Noise from shooting ranges — Part 2: Estimation of muzzle blast and projectile sound by calculation*

ISO 17201-4, *Acoustics — Noise from shooting ranges — Part 4: Prediction of projectile sound*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9613-2, ISO 17201-1 and the following apply.

3.1
substitute source
substitute for a sound source and its firing shed by a model source without a firing shed positioned in the centre of the opening of the firing shed to represent the emission in the direction of a reception point

3.2
safety barrier
⟨shooting ranges⟩ barrier that is intended to stop projectiles leaving the range

3.3
safety baffle
⟨shooting ranges⟩ overhead barrier that is intended to stop projectiles leaving the range

3.4
firing shed
structure constructed to protect the shooters and their equipment from precipitation and wind, having an opening that allows shooting at a target located on open ground

3.5
shooting range
enclosed arrangement of firing positions and matching targets which, depending on the design, may include such features as a firing shed, safety barriers, safety baffles, and unsafe areas

3.6
shooting facility
organizational entity consisting of one or more shooting ranges, and associated buildings and infrastructure

3.7
firing position
position of the shooter within a shooting range

3.8
matching target direction
direction of the shooter to the position of a moving target accounting for the time delay of the shot hitting the target

3.9
maximum A-weighted and S-weighted sound pressure level
$L_{p,\mathrm{AS,max}}$
greatest A-weighted and S-weighted sound pressure level within a stated time interval

NOTE 1 Maximum A-weighted and S-weighted sound pressure level is expressed in decibels.

NOTE 2 A designates the frequency weighting and S the time weighting as specified in IEC 61672-1.

NOTE 3 This definition is technically in accordance with ISO 1996-1:2003 [1], 3.1.2.

3.10
maximum A-weighted and F-weighted sound pressure level
$L_{p,\mathrm{AF,max}}$
greatest A-weighted and F-weighted sound pressure level within a stated time interval

NOTE 1 Maximum A-weighted and F-weighted sound pressure level is expressed in decibels.

NOTE 2 A designates the frequency weighting and F the time weighting as specified in IEC 61672-1.

NOTE 3 This definition is technically in accordance with ISO 1996-1:2003 [1], 3.1.2.

3.11
maximum A-weighted and I-weighted sound pressure level
$L_{p,\mathrm{AI,max}}$
greatest A-weighted and I-weighted sound pressure level within a stated time interval

NOTE 1 Maximum A-weighted and I-weighted sound pressure level is expressed in decibels.

NOTE 2 A designates the frequency weighting and I the time weighting as specified in IEC 61672-1.

3.12
impact sound
sound produced by the projectile hitting the target

3.13
diffraction point
point on top of a barrier which provides the shortest pathlength for the sound travelling over the barrier to the reception point

4 Source modelling

4.1 Introduction

The basic quantities to be used are the angular source energy distribution, $S_q(\alpha)$, and the angular source energy distribution level, $L_q(\alpha)$, as defined in ISO 17201-1. The angle between the line of fire and the line from the muzzle to the reception point is designated by α. If the gun is fired in an open air situation, $S_q(\alpha)$ can be used to describe the muzzle blast. For rifle shots, projectile sound has to be included (see 4.3). Substitute sources can be used for shed situations and for the incorporation of reflection and diffraction to calculate the reception levels as if it was an open field situation. Impact sound caused by the projectile hitting the target can usually be neglected. This part of ISO 17201 does not apply to projectiles containing a charge which is detonated at the target.

4.2 Muzzle blast

4.2.1 Background

For the non-free-field situation (such as a shed with one opening), the propagation model of ISO 9613-2 is insufficient, and more complex propagation models and calculation procedures are needed. Annex A provides a benchmark case and a demonstration of how sophisticated sound propagation approximations (see Annex B) may be used to describe the sound emitted from such a range, based on the free-field data of the angular source energy distribution levels. The sound emission is then expressed by the angular source energy level distribution of a substitute source positioned at a representative position in front of or above the firing shed. All further calculations of the sound pressure level are carried out as specified in Clause 5 by a point source with directivity independent of the range, which may be formed by a shed, baffles and side walls, etc.

4.2.2 Open field situation

If the weapon under consideration is used outside a firing shed or similar structure, use the angular source energy distribution level $L_q(\alpha)$ of the specific weapon/ammunition combination directly. If a shot is fired with a reflecting surface near the shooter, take the reflection into account. The directivity has to be adjusted accordingly. If the gun can be fired in varying horizontal and vertical directions, account for these directions separately. Examples of open field situations are described in Annex C.