
Akustika – Hrup strelskih poligonov - 4. del: Napoved zvoka izstrelka (ISO 17201-4:2006)

Acoustics - Noise from shooting ranges - Part 4: Prediction of projectile sound (ISO 17201-4:2006)

Akustik - Geräusche von Schießplätzen - Teil 4: Abschätzung des Geschossgeräusches (ISO 17201-4:2006)

Acoustique - Bruit des stands de tir - Partie 4: Estimation du bruit du projectile (ISO 17201-4:2006)

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English Version

Acoustics - Noise from shooting ranges - Part 4: Prediction of
projectile sound (ISO 17201-4:2006)

Acoustique - Bruit des stands de tir - Partie 4: Estimation
du bruit du projectile (ISO 17201-4:2006)

Akustik - Geräusche von Schießplätzen - Teil 4:
Bestimmung des Mündungsknalls und
Geschossgeräusches durch Berechnung (ISO 17201-
4:2006)

This European Standard was approved by CEN on 23 March 2006.

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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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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

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Foreword

This document (EN ISO 17201-4:2006) 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of an identical text or by endorsement, at the latest by October 2006, and conflicting national standards shall be withdrawn at the latest by October 2006.

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

Endorsement notice

The text of ISO 17201-4:2006 has been approved by CEN as EN ISO 17201-4:2006 without any modifications.

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**Acoustics — Noise from shooting
ranges —**

**Part 4:
Prediction of projectile sound**

*Acoustique — Bruit des stands de tir —
Partie 4: Estimation du bruit du projectile*
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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 17201-4 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 4: Prediction of projectile sound*

The following parts are under preparation:

- *Part 3: Guidelines for sound propagation calculation*
- *Part 5: Noise management*

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

Introduction

Shooting sound consists in general of three components: muzzle sound, impact sound and projectile sound. This part of ISO 17201 deals solely with projectile sound, which only occurs if the projectile moves with supersonic speed.

It specifies a method for calculating the source sound exposure level of projectile sound. It also gives guidelines for calculating the propagation of projectile sound as far as it deviates from the propagation of sound from other sources.

Projectile sound is described as originating from a certain point on the projectile trajectory, the “source point”. The sound source exposure level is calculated from the geometric properties and the speed of the projectile along the trajectory. As a result of non-linear effects, the frequency content of the projectile sound exposure depends on the distance from the source point. This is taken into account. Guidance is given on how the sound exposure level can be calculated from the sound exposure level at the receiver location, taking into account geometrical attenuation, attenuation due to the non-linear effects, and atmospheric absorption. In addition, the effects on the sound exposure level of the decrease of the projectile speed and of atmospheric turbulence are taken into account.

Projectile sound exposure levels are significant compared to the muzzle sound exposure level in a restricted region, the Mach region (region II — see Clause 4). Outside this region only diffracted or scattered projectile sound is received, with considerably lower levels than in the Mach region. Projectile sound behind the Mach region (region I) is negligible compared to muzzle sound. In this part of ISO 17201, a computational scheme for the levels in regions II and III is provided. In the bibliographical reference [2], measurements and calculations were compared for a set of calibres and distances, i.e. from the source point to the receiver location. For this set, there is a slight tendency of an overestimation of the projectile sound: on average 1,8 dB, A-weighted.

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Acoustics — Noise from shooting ranges —

Part 4: Prediction of projectile sound

1 Scope

This part of ISO 17201 provides a computational model for determining the acoustical source level of projectile sound and its one-third-octave-band spectrum, expressed as the sound exposure level for nominal mid-band frequencies from 12,5 Hz to 10 kHz. It also gives guidance on how to use this source level to calculate the sound exposure level at a receiver position.

This part of ISO 17201 is intended for calibres of less than 20 mm, but can also be applied for large calibres. Additionally, the data can be used to compare sound emission from different types of ammunition used with the same weapon. This part of ISO 17201 is meant for weapons used in civil shooting ranges, but is also applicable to military weapons.

The computational method can be used as a basis for environmental noise assessment studies. The prediction method applies to outdoor conditions, straight projectile trajectories, and streamlined projectile shapes. Because of the latter, it cannot be applied to pellets. Default values of parameters used in this part of ISO 17201 are given for a temperature of 10 °C, 80 % relative humidity, and a pressure of 1 013 hPa. Annex A can be used for calculations in other atmospheric conditions. Particularly for calibres < 20 mm, the spectrum is dominated by high frequency components. As air absorption is rather high for these frequency components, calculations are performed in one-third-octave-bands, in order to allow a more accurate result for air absorption to be obtained.

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

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

Guide to the expression of uncertainty in measurement (GUM). BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, first edition, 1993, corrected and reprinted in 1995.