INTERNATIONAL STANDARD

ISO 17201-6

First edition
2021-07

Acoustics — Noise from shooting ranges —

Part 6: Sound pressure measurements close to the source for determining exposure to sound

Acoustique — Bruit des stands de tir —

Partie 6: Mesurages de la pression sonore près de la source pour déterminer l'exposition au son

Reference number
ISO 17201-6:2021(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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 17201 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

ISO 17201-1 to ISO 17201-5 (see Clause 2 and References [2] to [5]) relate to the determination or prediction of environmentally relevant sound immission at receiving locations outside shooting ranges.

There are countries, where the need exists also for knowledge about exposure to sound within a shooting range at short distances from the sound source, for instance for prediction, evaluation, assessment, control or comparison purposes.

Various methods and metrics are in use for the determination of exposure to impulsive sounds, and these can be derived from the measurement and analysis of the time history of sound pressure at the locations of interest.

Close to the muzzle blast or blast of an explosion, the measurement of sound pressure has particular features to be considered. This document can be applied to both indoor and outdoor shooting ranges that can contain different elements or usage situations. The method is applicable for locations where persons may be present at the shooting range, including the shooter and other persons (such as an instructor, supervisor, bystander or observer). The locations of interest include the position of the shooter (and posture and orientation) and the position of other persons within the shooting range.

This document defines how the time history of the sound pressure at locations of interest within a shooting range, regarding the exposure to impulsive sound of a person, can be reliably obtained.

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Acoustics — Noise from shooting ranges —

Part 6: Sound pressure measurements close to the source for determining exposure to sound

1 Scope

This document specifies methods for recording the time history of the sound pressure produced either by shooting with calibres of less than 20 mm, or by detonation of explosive charges of less than 50 g TNT equivalent, within the shooting range at locations of interest, regarding the exposure to sound of the shooter, or any other person within the shooting range. The time history of the sound pressure can be the basis for further analyses of this type of sound at the locations of interest.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 17201-1:2018, *Acoustics — Noise from shooting ranges — Part 1: Determination of muzzle blast by measurement*

ISO 80000-8, *Quantities and units — Part 8: Acoustics*

IEC 60942, *Electroacoustics — Sound calibrators*

IEC 61094-4, *Measurement microphones — Part 4: Specifications for working standard microphones*

IEC 61094-6:2004, *Measurement microphones — Part 6: Electrostatic actuators for determination of frequency response*

IEC 61672-1:2013, *Electroacoustics — Sound level meters — Part 1: Specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 80000-8 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.or

3.1
discrete-time sound pressure signal series
sound pressure history with values given for discrete times

Note 1 to entry: In general, this time-series is the result of sampling the recorded sound pressure time-history.

Note 2 to entry: In all applications in this document, equal time spacing is assumed.

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3.2
sampling
reduction of a continuous-time signal series to a discrete-time signal series

3.3
sample
value at a point in time within a discrete-time signal series

Note 1 to entry: Samples can be in various number formats, typically integer or real.

Note 2 to entry: Scaling and offset information is needed if samples are not stored as sound pressure values.

3.4
sampling interval
T_s
time between two adjacent values in a discrete-time signal series

Note 1 to entry: The sampling interval T_s is expressed in seconds.

3.5
sampling rate
f_s
number of *samples* (3.3) per second

Note 1 to entry: The sampling rate f_s is expressed in hertz.

Note 2 to entry: $f_s = \frac{1}{T_s}$.

4 Measurement system requirements

4.1 General

This clause specifies instrumentation for measuring impulsive sounds from the sources specified in the scope. The purpose is to enable the reliable and accurate measurement of sound pressure histories which can be used as input to various methods for describing impulsive sound characteristics such as sound exposure level, peak sound pressure level, A-duration, etc. as for example defined in ISO 10843[1].

As this clause specifies the frequency range and other system requirements, data obtained within the given specifications can be compared to other measurement results obtained using this method.

4.2 Ranges of sound pressure levels

The peak sound pressure level depends, among other things, on the source energy of the blast and the distance to it. At close distances to the source, the peak sound pressure can be above 1 kPa, corresponding to a level above 154 dB. The other parts of ISO 17201 series can only be used for sound pressure levels below 154 dB, since these parts are concerned with sound propagation. This document is focused on the measurement of the time history of the sound pressure; therefore no limit on the peak sound pressure level is set.

4.3 Overall system description

The measurement system shall consist of at least a microphone with a preamplifier and a digital data acquisition system capable of storing digital signals for later retrieval and processing.

The measurement system including the digital data acquisition system shall meet the requirements for the limits on frequency response for Class 1 according to IEC 61672-1:2013, 5.5 using Z-weighting.

NOTE For the calculation of quantities specified in IEC 61672-1, also see Annex B.

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