
**Acoustics — Measurement of airborne
sound emitted by vessels on inland
waterways and harbours**

*Acoustique — Mesurage du bruit aérien émis par les bateaux de
navigation intérieure et portuaire*

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

This third edition cancels and replaces the second edition (ISO 2922:2000), which has been technically revised. It also incorporates the amendment ISO 2922:2000/Amd 1:2013.

The main changes compared to the previous edition are as follows:

- clarification in the Scope that the document is applicable to vessels of all speeds and lengths;
- specification of: sound pressure level measurement response (slow), in [4.1](#); integration time for background noise (5 min), in [6.4](#); and the surf/weather limitation (sea state 1), in [6.3.2](#), during the survey period;
- addition of a formula to compute the sound pressure level at 25 m in [10.1.4](#).

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.

Acoustics — Measurement of airborne sound emitted by vessels on inland waterways and harbours

1 Scope

This document specifies the conditions for obtaining reproducible and comparable measurement results of the airborne sound emitted by vessels of all kinds, on inland waterways and in ports and harbours, except powered recreational craft as specified in the ISO 14509 series. This document is applicable to sea-going vessels, harbour vessels, dredgers, and all watercraft, including non-displacement craft, used or capable of being used as a means of transport on water. There are no limitations to the application of this document with regard to speed, length and height of vessels, as long as the ship is determined to act like a point source at the reference distance of 25 m.

All noise data obtained in accordance with this document are referred to a reference distance of 25 m.

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 1996-2:2017, *Acoustics — Description, measurement and assessment of environmental noise — Part 2: Determination of sound pressure levels*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

IEC 60942:2017, *Electroacoustics — Sound calibrators*

IEC 61183, *Electroacoustics — Random-incidence and diffuse-field calibration of sound level meters*

IEC 61260-1, *Electroacoustics — Octave-band and fractional-octave-band filters — Part 1: Specifications*

IEC 61260-3, *Electroacoustics — Octave-band and fractional-octave-band filters — Part 3: Periodic tests*

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

IEC 61672-3, *Electroacoustics — Sound level meters — Part 3: Periodic tests*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 <http://www.electropedia.org/>

3.1

acceptance test for vessels

acceptance test

measurement performed to prove that the sound emitted by the vessel, stationary or in motion, as delivered by the manufacturer, complies with noise specifications or specified limits

3.2

monitoring test for vessels

monitoring test

measurement performed to check that the sound emitted by the vessel, stationary or in motion, is still within specified limits and that no noticeable changes have occurred since the acceptance on initial delivery or after modification, as applicable

3.3

maximum AS-weighted sound pressure level for vessels

maximum AS-weighted sound pressure level

L_{pASmax}

maximum sound pressure level achieved from measurement during the passage of the vessel under specified operating conditions, measured with frequency weighting A and with time weighting slow (S)

Note 1 to entry: Sound pressure level is expressed in decibels (dB).

Note 2 to entry: Other weightings such as C or unweighted can be needed.

3.4

A-weighted sound exposure

$E_{A,T}$

integral of the square of the sound pressure, p , over a stated time interval or event of duration T (starting at t_1 and ending at t_2), measured with frequency weighting A

$$E_{A,T} = \int_{t_1}^{t_2} p_A^2(t) dt$$

Note 1 to entry: Sound exposure is expressed in pascal-squared seconds ($\text{Pa}^2 \cdot \text{s}$).

[SOURCE: ISO/TR 25417:2007, 2.6, modified – Former Notes 2 to 4 deleted.]

3.5

A-weighted sound exposure level

$L_{E,A,T}$

ten times the logarithm to the base 10 of the ratio of the A-weighted sound exposure, $E_{A,T}$, to a reference value, E_0 , which is given by the product of the square of the reference sound pressure of $p_0 = 20 \mu\text{Pa}$ and the sound exposure reference duration of $T_0 = 1 \text{ s}$, ($E_0 = p_0^2 \times T_0 = 4 \times 10^{-10} \text{ Pa}^2 \text{ s}$)

Note 1 to entry: Sound exposure level is expressed in decibels (dB).

Note 2 to entry: In symbols, the A-weighted sound exposure level, $L_{E,A,T}$, of a specified event (e.g. the passage of a vessel) with the duration $T = t_2 - t_1$, is related to a corresponding measurement of the time-averaged A-weighted sound pressure level, $L_{pAeq,T}$, by

$$L_{E,A,T} = 10 \lg \left\{ \frac{\int_{t_1}^{t_2} p_A^2(t) dt}{p_0^2 T_0} \right\} \text{dB} = 10 \lg \left(\frac{E_{A,T}}{E_0} \right) \text{dB} = L_{pAeq,T} + 10 \lg \left(\frac{T}{T_0} \right) \text{dB}$$

where $p_A^2(t)$ is the squared, instantaneous, A-weighted sound pressure as a function of running time t .

Note 3 to entry: The A-weighted sound exposure level $L_{E,A,T}$ is arithmetically identical to the A-weighted single-event sound pressure level $L_{pA,1s}$ (reference duration $T_0 = 1 \text{ s}$) as, for example, defined in ISO 3744.

Note 4 to entry: The abbreviation "SEL" is sometimes used for the single-event sound pressure level, $L_{p,1s}$.

Note 5 to entry: In this document, the sound exposure level characterizes the emission of the source and not the noise impact on people exposed to the sound.