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**Sestavi tokovnih generatorjev, ki jih poganja batni stroj z notranjim zgorevanjem -  
10. del: Meritev hrupa v zraku (ISO 8528-10:2022)**

Reciprocating internal combustion engine driven alternating current generating sets -  
Part 10: Measurement of airborne noise (ISO 8528-10:2022)

Stromerzeugungsaggregate mit Hubkolben-Verbrennungsmotor - Teil 10: Messung von  
Luftschall mit der Hüllflächenmethode (ISO 8528-10:2022)

Groupes électrogènes à courant alternatif entraînés par moteurs alternatifs à combustion  
interne - Partie 10: Mesurage du bruit aérien (ISO 8528-10:2022)

**Ta slovenski standard je istoveten z: EN ISO 8528-10:2022**

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## Reciprocating internal combustion engine driven alternating current generating sets - Part 10: Measurement of airborne noise (ISO 8528-10:2022)

Groupes électrogènes à courant alternatif entraînés par  
moteurs alternatifs à combustion interne - Partie 10:  
Mesurage du bruit aérien (ISO 8528-10:2022)

Stromerzeugungsaggregate mit Hubkolben-  
Verbrennungsmotor - Teil 10: Messung von Luftschall  
mit der Hüllflächenmethode (ISO 8528-10:2022)

This European Standard was approved by CEN on 1 October 2022.

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## European foreword

This document (EN ISO 8528-10:2022) has been prepared by Technical Committee ISO/TC 70 "Internal combustion engines" in collaboration with Technical Committee CEN/TC 270 "Internal combustion engines" the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by June 2023, and conflicting national standards shall be withdrawn at the latest by June 2023.

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

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

For the relationship with EU Directive(s) / Regulation(s), see informative Annex ZA, which is an integral part of this document.

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## Endorsement notice

The text of ISO 8528-10:2022 has been approved by CEN as EN ISO 8528-10:2022 without any modification.

## Annex ZA (informative)

### Relationship between this document and the essential requirements of Directive 2006/42/EC aimed to be covered

This document has been prepared under a Commission's standardization request "M/396 Mandate to CEN and CENELEC for Standardisation in the field of machinery" to provide one voluntary means of conforming to essential requirements of Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).

Once this document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this document given in Table ZA.1 confers, within the limits of the scope of this document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

**Table ZA.1 — Correspondence between this document and Annex I of Directive 2006/42/EC**

The relevant Essential Requirements of Directive 2006/42/EC	Clause(s)/subclause(s) of this document	Remarks/Notes
1.7.4.2. (u)	6, 7, 8, 9, 10, 11, 12, 13, 14, 15.	

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**WARNING 2** — Other Union legislation may be applicable to the product(s) falling within the scope of this document.

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**Reciprocating internal combustion  
engine driven alternating current  
generating sets —**

**Part 10:  
Measurement of airborne noise**

*Groupes électrogènes à courant alternatif entraînés par moteurs  
alternatifs à combustion interne —  
Partie 10: Mesurage du bruit aérien*

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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](http://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](http://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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 270, *Internal combustion engines*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 8528-10:1998), which has been technically revised.

The main changes are as follows:

- the normative references have been updated;
- the latest requirements of ISO 3744:2010 and ISO 3746:2010 have been included, respecting ISO 12001:1996 requirements;
- the measurement surfaces have been updated;
- the definition of the reference box in special cases has been added;
- the guaranteed sound power level has been added;
- requirements concerning variable speed engine gensets, fans and lighting towers have been added;
- the requirements for welding generators have been updated;
- the determination of the emission sound pressure level at workstation has been updated.

A list of all parts in the ISO 8528 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](http://www.iso.org/members.html).

## Introduction

This document specifies noise test codes for determining the basic noise emission descriptors.

For many manufacturers of generating sets, the control of noise is a major issue that requires effective exchange of acoustical information, in particular on noise emission. The basic noise emission descriptors are the sound power level of the generating set itself and the emission sound pressure level at the workstation.

In this context, the main flow of information goes from the manufacturer to the purchaser. However, installers and users of the generating sets also desire comprehensive information about the generating sets' ability to generate airborne sound.

Thus, measuring the basic noise emission descriptors allows the generating set manufacturer to determine, declare and verify the noise emission values.

Therefore, the sound power level, as the major parameter to characterize machines as sound sources, is determined by measurements. The sound power level is a major parameter because it represents an intrinsic characteristic of generating sets as noise sources. It is useful, for example, in noise-abatement programmes or when designing a building where the generating set is intended to be used.

The emission sound pressure level at the workstation is also measured. This enables an assessment of the risk of exposure to the airborne sound of the operators. This assessment is essential for health and safety reasons.

In this document, the generating sets are considered as steady noise sources as per ISO 12001:1996. The generating sets concerned and the extent to which noise is covered are indicated in this document. This document allows measurements to be made in many different test environments. [Clause 5](#) can be used as a general guideline to assist in the selection of the right noise test code. The selection mainly depends on the test environment and the desired grade of accuracy.

This document contains two methodologies for determining the measurement uncertainty. In [Clause 12](#), the uncertainty U is determined by considering measurements on a single generating set. In [Clause 13](#), the uncertainty K is determined by considering a batch of generating sets, which can be useful for control of production purpose.

This document is a C-type standard as stated in ISO 12001:1996. When provisions of this C-type standard are different from those stated in A or B standards, the provisions of this C-type standard take precedence.

# Reciprocating internal combustion engine driven alternating current generating sets —

## Part 10: Measurement of airborne noise

### 1 Scope

This document specifies noise test codes for determining the sound power level and the emission sound pressure level at the workstation of reciprocating internal combustion engine driven electrical power generating sets.

This document applies to constant and variable-speed reciprocating internal combustion (RIC) engine driven alternating current (AC) and direct current (DC) generating sets for fixed and mobile applications with rigid or flexible mountings. It is applicable for land and marine use, excluding generating sets used on aircraft or to propel land vehicles and locomotives.

NOTE 1 For some specific applications (e.g. essential hospital supplies, high-rise buildings) supplementary requirements can be necessary. The provisions of this document can be regarded as a basis.

NOTE 2 This document is referenced with regard to noise in ISO 8528-13:2016, which contains requirements concerning the design of generating sets, verification of noise levels and information related to noise in the operating and maintenance instructions.

### 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 3046-1:2002, *Reciprocating internal combustion engines — Performance — Part 1: Declarations of power, fuel and lubricating oil consumptions, and test methods — Additional requirements for engines for general use*

ISO 3744:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*

ISO 3746:2010, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*

ISO 8528-1:2018, *Reciprocating internal combustion engine driven alternating current generating sets — Part 1: Application, ratings and performance*

ISO 8528-2:2018, *Reciprocating internal combustion engine driven alternating current generating sets — Part 2: Engines*

ISO 15619:2013, *Reciprocating internal combustion engines — Measurement method for exhaust silencers — Sound power level of exhaust noise and insertion loss using sound pressure and power loss ratio*

IEC 60942:2017, *Electroacoustics - Sound calibrators*

IEC 60974-1:2021, *Arc welding equipment - Part 1: Welding power sources*

IEC 61260-1:2014, *Electroacoustics - Octave-band and fractional-octave-band filters - Part 1: Specifications*

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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 3046-1:2002, ISO 8528-1:2018 and ISO 8528-2:2018 and the following apply.

ISO and IEC maintain terminology 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.org/>

#### 3.1 emission

<acoustics> airborne sound radiated by the generating set under test

#### 3.2 emission sound pressure

$p_e$   
sound pressure, at a workstation or another specified position near a noise source, when the source is in operation under specified operating and mounting conditions on a reflecting plane surface, excluding the effects of background noise

Note 1 to entry: Emission sound pressure is expressed in pascals.

#### 3.3 emission sound pressure level

$L_{pe}$   
ten times the logarithm to the base 10 of the ratio of the square of the emission sound pressure,  $p_e$ , to the square of a reference value,  $p_0$ , expressed in decibels by [Formula \(1\)](#):

$$L_{pe} = 10 \lg \frac{p_e^2}{p_0^2} \quad (1)$$

where the reference value,  $p_0$ , is 20  $\mu$ Pa

#### 3.4 time-averaged emission sound pressure level

$L_{pe,T}$   
ten times the logarithm to the base 10 of the ratio of the time average of the square of the emission sound pressure,  $p_e$ , during a stated time interval of duration,  $T$  (starting at  $t_1$  and ending at  $t_2$ ), to the square of a reference value,  $p_0$ , expressed in decibels by [Formula \(2\)](#):

$$L_{pe,T} = 10 \lg \left[ \frac{\frac{1}{T} \int_{t_1}^{t_2} p_e^2(t) dt}{p_0^2} \right] \quad (2)$$

where the reference value,  $p_0$ , is 20  $\mu$ Pa

Note 1 to entry: In general, the subscript “T” is omitted, since time-averaged sound pressure levels are necessarily determined over a certain measurement time interval.

Note 2 to entry:  $L_{peA}$  denotes the A-weighted emission sound pressure level.

### 3.5 workstation operator's position

position in the vicinity of the generating set under test which is intended for the operator

Note 1 to entry: This position is defined as the location in the vicinity of the device(s) mounted to the generating set for work tasks.

Note 2 to entry: Such devices can be a control panel, an emergency stop button or the most likely device on the equipment that an operator would interact with.

Note 3 to entry: A generating set can have more than one workstation.

### 3.6 operator

individual whose workstation is in the vicinity of a machine and who is performing a work task associated with that machine

## 4 Symbols

$\cos \varphi$	power factor
$d$	measurement distance, in metres
$D_{li}^*$	apparent directivity index, in decibels
$i$	subscript denoting a particular measuring point
$K$	expanded measurement uncertainty of the sound power level, or of the emission sound pressure level at the workstation, for a batch of generating sets, in decibels
$K_{1A}$	A-weighted background noise correction, in decibels
$K_{2A}$	A-weighted environmental correction, in decibels
$L_p$	sound pressure level, in decibels
$\overline{L_p}$	surface time-averaged sound pressure level, in decibels
$L_{pe}$	emission sound pressure level, in decibels
$L_{peA}$	A-weighted emission sound pressure level, in decibels
$L_{pe,T}$	time-averaged emission sound pressure level, in decibels
$L_{pi,T}$	time-averaged sound pressure level, for the $i$ th microphone position on the measurement surface, in decibels
$L_{p,T}$	time-averaged sound pressure level, in decibels
$L_W$	sound power level, in decibels
$L_{WA}$	A-weighted sound power level, in decibels
$\Delta L_p$	difference between the time-averaged sound pressure level of the background noise measured and averaged over the microphone positions, and corresponding time-averaged sound pressure level of the noise source under test when measured in the presence of this background noise, in decibels
$p$	sound pressure, in pascals