BS ISO 6798-2:2020

BSI Standards Publication

Reciprocating internal combustion engines — Measurement of sound power level using sound pressure

Part 2: Survey method

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National foreword

This British Standard is the UK implementation of ISO 6798-2:2020. Together with BS ISO 6798-1:2020, it supersedes BS ISO 6798:1995, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/14, RIC engines.

A list of organizations represented on this committee can be obtained on request to its secretary.

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INTERNATIONAL STANDARD

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Reciprocating internal combustion engines — Measurement of sound power level using sound pressure —

Part 2: Survey method

Moteurs alternatifs à combustion interne — Mesurage du niveau de puissance acoustique à partir de la pression acoustique —

Partie 2: Méthode de contrôle

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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 70, *Internal combustion engines*.

This first edition of ISO 6798-2, together with ISO 6798-1, cancels and replaces ISO 6798:1995, which has been technically revised. The main changes compared to the previous edition are as follows:

— the requirements of the test environment and the measurement uncertainty have been changed;

— the accuracy of measurement results has been changed from 1 dB to 0,1 dB;

— the calculation of background noise correction has been changed from table method to Formula method;

— the requirements of installation of engine and auxiliaries have been changed to be specified clearly;

— the specification for measurement units has been added;

— the criterion for position adequacy of microphone has been added;

— the criterion for acoustic adequacy of test environment has been improved.

A list of all parts in the ISO 6798 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

The ISO 6798 series can be used to calculate the sound power level by using the sound pressure level on a measurement surface enveloping a noise source.

The measurement result of sound power level has nothing to do with the test environment and the installation conditions of the noise source, which is one of the important reasons for using sound power level to characterize the noise radiation of all types of machinery and equipment.

Sound power level has the following applications:

— indication of noise radiated from machinery under the specified condition;

— validation of the indicated value of a noise;

— radiation noise comparison of all types and sizes of machinery;

— comparison of the noise limit value specified in the purchase contract or specification;

— making engineering measures to reduce radiation noise of machinery (generally, frequency band sound power level is also needed);

— prediction of the sound pressure level of noise in the specified position.

Table 1 gives the measurement methods for determining the sound power level of two types of accuracy grade; the measurement result of the sound power level is rounded to the nearest 0,1 dB. The method given in this document allows the determination of the A-weighted sound power level, the accuracy of the measurement result is grade 3.

Table 2 gives the measurement uncertainty of the sound power level (upper bound values of the standard deviation of reproducibility). The standard deviations listed in Table 2 are the comprehensive effect of the measurement uncertainty, but do not include variations of the sound power level caused by installation and operation conditions of the noise source.

In the noise control of a reciprocating internal combustion engine, the relevant members (the manufacturers, installers, and users) should conduct effective communication on acoustic information which is obtained by measurement. The measurement result is valid when in the specified measurement conditions from using the instrumentation and measurement method as specified in this document to obtain a clear acoustic value. The ISO 6798 series can be used according to the purpose of noise measurement and measurement conditions.

Table 1 — How ISO 6798 series determines the sound power level using sound pressure

Parameters	ISO 6798-1 Engineering method Accuracy grade 2	ISO 6798-2 Survey method Accuracy grade 3
International Standards referenced	ISO 3744	ISO 3746
Test environment	An essentially free field over a reflecting plane	An acoustic field over a reflecting plane
Noise source volume	Unlimited, depending on the test environment	
Criterion for background noise[a]	$\Delta L_p \geq 6{,}0$ dB $K_1 \leq 1{,}3$ dB	$\Delta L_{pA} \geq 3{,}0$ dB $K_{1A} \leq 3{,}0$ dB
Criterion for acoustic adequacy of test environment[b]	$K_2 \leq 4{,}0$ dB	$K_{2A} \leq 7{,}0$ dB
Criterion for position adequacy of microphone[c]	$s\left(L'_{pAm}\right) \leq 1$ dB	$s\left(L'_{pAm}\right) \leq \sqrt{2}$ dB

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Table 1 *(continued)*

Parameters	ISO 6798-1 Engineering method Accuracy grade 2	ISO 6798-2 Survey method Accuracy grade 3
International Standards referenced	ISO 3744	ISO 3746
Instrumentation[d] sound level meter/filter/sound calibrator	Class 1/class 1/class 1	Class 2/class 2/class 1
Sound power level acquired	A-weighted or frequency bands	A-weighted
Application	Acceptance test of sound power level; making engineering measures	Comparative test of sound power level

[a] The difference of sound pressure level, ΔL_{pA}, and the background noise correction, K_{1A}, see 8.3.2.

[b] The environmental correction, K_{2A}, see 8.3.3.

[c] The standard deviation, $s\left(L'_{pAm}\right)$, see 7.7.

[d] The requirements of instrumentation, see Clause 5.

Table 2 — Measurement uncertainty of the sound power level (upper bound values of the standard deviation of reproducibility)

Mid-band frequency Hz		ISO 6798-1 standard deviation of reproducibility dB	ISO 6798-2 standard deviation of reproducibility dB
Octave bands	One-third-octave bands		
63	50 to 80	5,0	—
125	100 to 160	3,0	
250	200 to 315	2,0	
500	400 to 630	1,5	
1 000 to 4 000	800 to 5 000	1,5	
8 000	6 300 to 10 000	2,5	
A-weighted		1,5	3,0

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Reciprocating internal combustion engines — Measurement of sound power level using sound pressure —

Part 2: Survey method

1 Scope

This document specifies the survey method, which is the measurement method of the sound power level for reciprocating internal combustion engines.

This document applies to all reciprocating internal combustion engines falling within the field of application of ISO 3046-1 and other internal combustion engines where no suitable International Standard exists.

NOTE In this document, reciprocating internal combustion engines are referred to as engines unless otherwise explained.

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, *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 3046-3, *Reciprocating internal combustion engines — Performance — Part 3: Test measurements*

ISO 6798-1, *Reciprocating internal combustion engines — Measurement of sound power level using sound pressure — Part 1: Engineering method*

ISO 6926, *Acoustics — Requirements for the performance and calibration of reference sound sources used for the determination of sound power levels*

IEC 60942, *Electroacoustics — Sound calibrators*

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

3 Terms, definitions and symbols

For the purposes of this document, the terms and definitions given in ISO 3046-1, ISO 6798-1 and IEC 61672-1 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/

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