



BSI Standards Publication

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

Part 3: Survey method for use in situ

National foreword

This British Standard is the UK implementation of ISO 6798-3:2022.

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 committee manager.

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© The British Standards Institution 2022
Published by BSI Standards Limited 2022

ISBN 978 0 539 14626 4

ICS 17.140.20; 27.020

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2022.

Amendments/corrigenda issued since publication

Date	Text affected
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INTERNATIONAL STANDARD

ISO
6798-3

First edition
2022-02-11

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

Part 3: Survey method for use in situ

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

Partie 3: Méthode de contrôle pour utilisation in situ



Reference number
ISO 6798-3:2022(E)
Documents
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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.

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This document was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*.

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.

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 different types of machinery and equipment.

Sound power level has the following applications:

- indication of noise radiated from machinery under the specified condition;
- validation of indicated value of a noise;
- radiation noise comparison of different 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 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 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 grade of the measurement result is grade 3.

Table 1 — Determination of the sound power level using sound pressure by the ISO 6798 series

Parameters	ISO 6798-1 Engineering method Accuracy grade 2	ISO 6798-2 Survey method Accuracy grade 3	ISO 6798-3 Survey method for use in situ Accuracy grade 3
Basic standards referenced	ISO 3744	ISO 3746	ISO 3747
Test environment	An essentially free field over a reflecting plane	An acoustic field over a reflecting plane	An acoustic field over multiple reflecting planes
Noise source volume	Unlimited, depending on the test environment		
Criterion for background noise ^a	$\Delta L_{pA} \geq 6,0$ dB $K_{1A} \leq 1,3$ dB	$\Delta L_{pA} \geq 3,0$ dB $K_{1A} \leq 3,0$ dB	$\Delta L_{pA} \geq 3,0$ dB $K_{1A} \leq 3,0$ dB
Criterion for acoustic adequacy of test environment	$K_{2A} \leq 4,0$ dB	$K_{2A} \leq 7,0$ dB	Special requirement
Criterion for position adequacy of microphone ^b	$s(L'_{pAm}) \leq 1,0$ dB	$s(L'_{pAm}) \leq \sqrt{2}$ dB	$s(L'_{pAm}) \leq 2,0$ dB
Key K_{1A} : background noise correction K_{2A} : environmental correction ΔL_{pA} : difference between the measured surface time-averaged sound pressure level and the measured surface time-averaged sound pressure level of the background noise from the array of microphone positions over the measurement surface $s(L'_{pAm})$: standard deviation of the mean sound pressure level ^a For the corrections of background noise, see 8.3.2 . ^b For the criterion for the position adequacy of microphones, see 7.7 . ^c For the requirements, calibration and application of instrumentation, see Clause 5 .			

Parameters	ISO 6798-1 Engineering method Accuracy grade 2	ISO 6798-2 Survey method Accuracy grade 3	ISO 6798-3 Survey method for use in situ Accuracy grade 3
Instrumentation ^c sound level meter/filter/sound calibrator	class 1/class 1/class 1	class 2/class 2/class 1	class 2/class 2/class 1
Sound power level ac- quired	A-weighted or frequency bands	A-weighted	A-weighted
Application	Acceptance test of sound power level; making engi- neering measures	Comparative test of sound power level	Comparative test of sound power level
Key K_{1A} : background noise correction K_{2A} : environmental correction ΔL_{pA} : difference between the measured surface time-averaged sound pressure level and the measured surface time-averaged sound pressure level of the background noise from the array of microphone positions over the measurement surface $s(L'_{pAm})$: standard deviation of the mean sound pressure level a For the corrections of background noise, see 8.3.2 . b For the criterion for the position adequacy of microphones, see 7.7 . c For the requirements, calibration and application of instrumentation, see Clause 5 .			

[Table 2](#) gives the measurement uncertainty of 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.

Table 2 — Measurement uncertainty of 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	ISO 6798-3 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	4,0

In the noise control of reciprocating internal combustion engine, the relevant members (manufacturer, installers and the users) should conduct effective communication of acoustic information which is obtained by measurement. These measurements are useful only if they are carried out under specified conditions to obtain defined acoustical quantities using the instrumentation and measurement method as specified in this document. The ISO 6798 series can be used according to the purpose of noise measurement and measurement conditions.