

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electroacoustics – Sound level meters –
Part 2: Pattern evaluation tests

IT'S A STANDARD PREVIEW
(standards.iteh.ai)

Electroacoustique – Sonomètres –
Partie 2: Essais d'évaluation d'un modèle

IEC 61672-2:2013
<https://standards.iteh.ai/catalog/standards/sist/6e13d41b-3e7f-4de4-b4fe-0c5fc3911ba7/iec-61672-2-2013>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2013 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester.

If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you to find IEC publications by a variety of criteria (reference number, text, technical committee,...).

It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available on-line and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,...).

Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.



IEC 61672-2

Edition 2.0 2013-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electroacoustics – Sound level meters –
Part 2: Pattern evaluation tests

Electroacoustique – Sonomètres –
Partie 2: Essais d'évaluation d'un modèle

STANDARD PREVIEW
(standards.iteh.ai)

IEC 61672-2:2013
<https://standards.iteh.ai/catalog/standards/sist/6e13d41b-3e7f-4de4-b4fe-0c5fc3911ba7/iec-61672-2-2013>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

W

ICS 17.140.50

ISBN 978-2-8322-1080-2

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	7
4 Submission for testing	7
5 Marking of the sound level meter and information in the Instruction Manual.....	8
6 Mandatory facilities and general requirements.....	8
7 Environmental, electrostatic, and radio-frequency tests	10
7.1 General.....	10
7.2 Uncertainties for measurements of environmental test conditions	11
7.3 Influence of static pressure	11
7.4 Limits on air temperature, relative humidity and static pressure.....	12
7.5 Acclimatization requirements for tests of the influence of air temperature and relative humidity.....	12
7.6 Abbreviated test of the combined influence of air temperature and relative humidity	12
7.7 Influence of air temperature.....	14
7.8 Influence of relative humidity.....	15
7.9 Influence of electrostatic discharges.....	16
7.10 Influence of a.c. power-frequency and radio-frequency fields.....	17
7.10.1 Sound signal	17
7.10.2 AC power-frequency tests.....	17
7.10.3 Radio-frequency tests.....	17
8 Radio-frequency emissions and public power supply disturbances.....	19
9 Electroacoustical performance tests	20
9.1 General.....	20
9.2 Indication at the calibration check frequency	21
9.3 Directional response.....	21
9.4 Tests of frequency weightings with acoustical signals.....	23
9.4.1 General.....	23
9.4.2 Windscreen corrections	24
9.4.3 Free-field tests	24
9.4.4 Comparison coupler tests	25
9.4.5 Conformance	26
9.4.6 Random incidence	26
9.5 Tests of frequency weightings with electrical signals	27
9.5.1 General	27
9.5.2 First alternative test procedure (variable input signal level).....	27
9.5.3 Second alternative test procedure (constant input signal level).....	27
9.5.4 Conformance.....	28
9.5.5 Frequency weightings C or Z at 1 kHz	28
9.6 Corrections for the effect of reflections from the case of a sound level meter and diffraction around a microphone.....	28
9.7 Corrections to obtain free-field or random-incidence sound levels	29
9.8 Level linearity.....	30
9.8.1 Tests at an air temperature near the reference air temperature	30
9.8.2 Tests at elevated air temperature	31

9.9	Under-range indication	31
9.10	Self-generated noise level	31
9.11	Decay time constants for time weightings F and S	32
9.12	Toneburst response for sound level meters that measure time-weighted sound level	32
9.13	Toneburst response for sound level meters that measure sound exposure level or time-averaged sound level	33
9.14	Response to sequences of repeated tonebursts for sound level meters that measure time-averaged sound level	34
9.15	Overload indication	34
9.16	C-weighted peak sound level	35
9.17	Reset	36
9.18	Electrical output	36
9.19	Timing facilities	36
9.20	Crosstalk in multi-channel sound level meter systems	36
9.21	Power supply	36
10	Pattern evaluation report	37
	Bibliography	38

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[IEC 61672-2:2013](https://standards.iteh.ai/catalog/standards/sist/6e13d41b-3e7f-4de4-b4fe-0c5fc3911ba7/iec-61672-2-2013)

<https://standards.iteh.ai/catalog/standards/sist/6e13d41b-3e7f-4de4-b4fe-0c5fc3911ba7/iec-61672-2-2013>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTROACOUSTICS –
SOUND LEVEL METERS –****Part 2: Pattern evaluation tests**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61672-2 has been prepared by IEC technical committee 29, Electroacoustics, in cooperation with the International Organization of Legal Metrology (OIML).

This second edition cancels and replaces the first edition published in 2003. This second edition constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

In this second edition, conformance to specifications is demonstrated when:

- a) measured deviations from design goals do not exceed the applicable acceptance limits, and
- b) the uncertainty of measurement does not exceed the corresponding maximum permitted uncertainty, with both uncertainties determined for a coverage probability of 95 %.

The text of this second edition is based on that of the first edition and the following documents:

FDIS	Report on voting
29/813/FDIS	29/824/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 61672 series, published under the general title *Electroacoustics – Sound level meters*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 61672-2:2013](https://standards.iteh.ai/catalog/standards/sist/6e13d41b-3e7f-4de4-b4fe-0c5fc3911ba7/iec-61672-2-2013)

<https://standards.iteh.ai/catalog/standards/sist/6e13d41b-3e7f-4de4-b4fe-0c5fc3911ba7/iec-61672-2-2013>

ELECTROACOUSTICS – SOUND LEVEL METERS –

Part 2: Pattern-evaluation tests

1 Scope

This part of IEC 61672 provides details of the tests necessary to verify conformance to all mandatory specifications given in IEC 61672-1 for time-weighting sound level meters, integrating-averaging sound level meters, and integrating sound level meters. Pattern-evaluation tests apply for each channel of a multi-channel sound level meter, as necessary. Tests and test methods are applicable to class 1 and class 2 sound level meters. The aim is to ensure that all laboratories use consistent methods to perform pattern-evaluation tests.

NOTE 1 In this document, references to IEC 61672-1, IEC 61672-2, and IEC 61672-3 refer to the second editions unless stated otherwise.

NOTE 2 Procedures for the pattern-evaluation testing of sound level meters designed to conform to the specifications of IEC 61672-1:2002 were given in IEC 61672-2:2003.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60942, *Electroacoustics – Sound calibrators*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2010, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic-field immunity test*

IEC 61000-4-6:2008, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-6-2:2005, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*

IEC 61094-1, *Measurement microphones – Part 1: Specifications for laboratory standard microphones*

IEC 61094-5, *Measurement microphones – Part 5: Methods for pressure calibration of working standard microphones by comparison*

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

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

IEC 62585, *Electroacoustics – Methods to determine corrections to obtain the free-field response of a sound level meter*

CISPR 16-1-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*¹

CISPR 16-1-2:2006, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*

CISPR 16-2-1:2010 (Ed. 2.1), *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-2-3:2010 (Ed. 3.1), *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 22:2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

ISO/IEC Guide 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM: 1995)*

ISO/IEC Guide 99, *International vocabulary of metrology (VIM) – Basic and general concepts and associated terms (VIM)*

ISO 26101:2012, *Acoustics – Test methods for the qualification of free-field environments*

3 Terms and definitions

For the purposes of this document, in addition to the terms and definitions given in IEC 61672-1 and IEC 62585, the terms and definitions given in IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-6, ISO/IEC Guide 98-3, and ISO/IEC Guide 99 also apply.

4 Submission for testing

4.1 At least three specimens of the same pattern of sound level meter shall be submitted for pattern-evaluation testing. As a minimum, the laboratory shall select two of the specimens for testing. At least one of the two specimens shall then be tested fully according to the procedures of this Standard. The laboratory shall decide whether the full tests shall also be performed on the second specimen or whether additional limited testing is adequate to approve the pattern.

4.2 An Instruction Manual and all items or accessories that are identified in the Instruction Manual as integral components for the normal mode of operation shall be submitted along with the three sound level meters. Examples of additional items or accessories include a microphone extension device or cable and peripheral equipment.

4.3 If the manufacturer of the sound level meter supplies devices that are to be connected to the sound level meter by cables, then the devices and cables shall be submitted with the sound level meter.

¹ In English, CISPR stands for International Special Committee on Radio Interference.

4.4 A calibrated sound calibrator of a model specified in the Instruction Manual for the sound level meter shall be supplied with the sound level meter. An Instruction Manual for the sound calibrator shall also be provided. As required by IEC 61672-1, the model of the calibrator shall conform to the relevant specifications of IEC 60942 for the class of sound calibrator.

5 Marking of the sound level meter and information in the Instruction Manual

5.1 It shall be verified that the sound level meter is marked according to the requirements of IEC 61672-1.

5.2 It shall be verified that the Instruction Manual contains all the information that is required by IEC 61672-1, as relevant to the facilities provided by the sound level meter.

5.3 If the sound level meter does not conform to the requirements of 5.1 and 5.2, no pattern-evaluation tests shall be performed.

5.4 After completion of all tests, the information shall be reviewed to ensure that it is correct and that no applicable acceptance limits are exceeded.

6 Mandatory facilities and general requirements

6.1 No test specified in this part of IEC 61672 shall be omitted unless the sound level meter does not possess the facility described for the test. When the design of a sound level meter, which has been pattern approved, is changed and a new pattern approval is requested, then, at the discretion of the laboratory, it is not necessary to repeat those tests for electroacoustical performance characteristics that are not affected by the design change.

6.2 A time-weighting sound level meter shall be verified to be able to display A-frequency-weighted, F-time-weighted sound level and to be able to indicate overload and under-range conditions.

6.3 An integrating-averaging sound level meter shall be verified to be able to display A-frequency-weighted, time-averaged sound level and to be able to indicate overload and under-range conditions.

6.4 An integrating sound level meter shall be verified to be able to display A-frequency-weighted sound exposure level and to be able to indicate overload and under-range conditions.

6.5 All display devices for the sound level meter shall be verified to be able to display sound levels or sound exposure levels with the resolution required by IEC 61672-1. The range of the display shall be at least the minimum specified in IEC 61672-1.

6.6 If a sound level meter is capable of measuring maximum or peak sound levels, or both, it shall be verified that a "hold" feature is provided.

6.7 A class 1 sound level meter shall be verified to have frequency-weighting C.

6.8 If the sound level meter is capable of indicating C-weighted peak sound levels, it shall be verified that the capability to display C-weighted, time-weighted sound level or C-weighted, time-averaged sound level is also provided.

6.9 For sound level meters with multiple level ranges, it shall be verified that overlap of the level ranges conforms to the specifications of IEC 61672-1.

6.10 For sound level meters that can display more than one measurement quantity, it shall be verified that there is a means to ascertain the quantity that is being displayed.

6.11 If the sound level meter does not possess the mandatory facilities listed in 6.2 through 6.10, as applicable, the sound level meter does not conform to the specifications of IEC 61672-1 and no pattern-evaluation tests shall be performed.

6.12 For all pattern-evaluation tests, the configuration of the sound level meter, or the multi-channel sound level meter system, shall be as specified in the Instruction Manual for one of the normal modes of operation, including all required accessories. The configuration shall include a windscreen if a windscreen is an integral component for the normal mode of operation, or if the Instruction Manual states that the sound level meter conforms to the specifications of IEC 61672-1 with a windscreen installed around the microphone. The model of the windscreen shall be as stated in the Instruction Manual for use with the sound level meter. All configurations of the sound level meter that are stated in the Instruction Manual as conforming to the requirements of IEC 61672-1 shall be tested.

6.13 If the Instruction Manual states that the sound level meter conforms to the specifications of IEC 61672-1 with optional facilities installed, the configuration with the optional facilities installed shall also be tested to verify conformance to the relevant specifications.

6.14 If an electrical output is provided on the sound level meter and the laboratory intends to utilize the electrical output instead of the display device, the laboratory shall verify that changes in the levels of applied acoustical or electrical input signals produce changes in the signal levels indicated on the display device and at the electrical output that are in accordance with the specifications of IEC 61672-1. This requirement applies to each channel of a multi-channel system. Where multiple outputs are present, if an output is specified in the Instruction Manual for testing, that output should be used for pattern-evaluation tests.

6.15 For all tests, the sound level meter shall be powered from its preferred supply.

6.16 The sound level meter shall be allowed to reach equilibrium with the prevailing environmental conditions before switching on the power to perform a test.

6.17 Tests for conformance to the specifications for the effects of changes in environmental conditions preferably should be conducted before tests for conformance to the specifications for electroacoustical performance.

6.18 If the sound level meter has more than one signal-processing channel, pattern-evaluation tests shall be performed for each channel that utilizes unique signal processing techniques. For multi-channel systems with the same functional equivalence in all channels, the number of channels to be tested may be less than the number of available channels, at the discretion of the laboratory. For a multi-channel system, the number of channels to be tested should be determined from consideration of a scenario for which there is an array of microphones supplying signals to each input with each channel processing the signals in an identical manner. Selection of how many and which channels to test should consider differences, as described in the Instruction Manual, in the implementation of signal-processing techniques in the various channels. If any special procedure for testing the channels for identical functionality is described in the Instruction Manual, that procedure should be followed.

NOTE If the sound level meter is a multi-channel device (for example, a sound level meter with two or more separate signal inputs with non-parallel processing of digitized data by time-sharing, but quasi-parallel display for the displayed signals), it is usually possible to test the channels for identical functionality either by setting the functions of the channels for identical processing and reading the display(s) or by allowing the channel functionality to rotate by a special test setting procedure thereby allowing comparison of display(s).

6.19 Conformance to a performance specification is demonstrated when the following criteria are both satisfied: (a) a measured deviation from a design goal does not exceed the

applicable acceptance limit and (b) the corresponding uncertainty of measurement does not exceed the corresponding maximum-permitted uncertainty of measurement given in IEC 61672-1 for the same coverage probability of 95%. IEC 61672-1 gives example assessments of conformance using these criteria.

6.20 The laboratory shall use instruments with current calibrations for the appropriate quantities. The calibrations shall be traceable to national standards, as required.

6.21 Laboratories performing pattern evaluation tests shall calculate all uncertainties of measurements in accordance with the guidelines given in the ISO/IEC Guide 98-3. Actual measurement uncertainties shall be calculated for a coverage probability of 95 %. Calculation of the actual measurement uncertainty for a particular test should consider at least the following components, as applicable.

- The uncertainty attributed to calibration of the individual instruments and equipment used to perform the test, including the sound calibrator, where applicable;
- The uncertainty resulting from environmental effects or corrections;
- The uncertainty resulting from small errors that may be present in the applied signals;
- The uncertainty attributed to effects associated with the repeatability of the results of the measurements. When a laboratory is only required to perform a single measurement, it is necessary for the laboratory to make an estimate of the random contribution to the total measurement uncertainty. The estimate should be determined from an earlier evaluation of several measurements of the performance of similar sound level meters;
- The uncertainty associated with the resolution of the display device of the sound level meter under test. For digital display devices that indicate signal levels with a resolution of 0,1 dB, the uncertainty component should be taken as a rectangular distribution with semi-range of 0,05 dB;
- The uncertainty associated with the device used to mount the sound level meter in the free-field test facility;
- The uncertainty resulting from the deviation of the sound field in the free-field test facility from an ideal free sound field; and
- The uncertainty associated with each correction applied to the measurement data.

6.22 If the uncertainty of measurement exceeds the maximum-permitted uncertainty of measurement, the result of the test shall not be used to demonstrate conformance to a specification and pattern approval shall not be granted.

6.23 As appropriate, the laboratory shall utilize the recommendations given in the Instruction Manual for performing the pattern-evaluation tests.

7 Environmental, electrostatic, and radio-frequency tests

7.1 General

7.1.1 Before conducting, but not during, the tests described in the Clause 7, the indication of A-weighted sound level at the calibration check frequency shall be checked by application of the sound calibrator specified in 4.4. If necessary, the sound level meter shall be adjusted to indicate the required sound level under reference environmental conditions. For multi-channel devices, the corresponding indications shall be checked for all channels selected for testing.

7.1.2 Environmental conditions at the time of checking the indication shall be recorded.

7.1.3 The effect of environmental conditions on the sound pressure level produced by the sound calibrator shall be accounted for in accordance with the procedure in the Instruction

Manual for the sound calibrator and data from its calibration. The effects shall be evaluated relative to the sound pressure level produced under reference conditions.

7.1.4 For environmental tests, a sound calibrator shall be used to provide a known sound pressure level at the microphone of the sound level meter. For class 1 sound level meters, the calibrator shall conform to either the class LS or class 1 specifications of IEC 60942. For class 2 sound level meters, the calibrator shall conform to either class LS, class 1, or class 2 specifications of IEC 60942. If the sound calibrator conforms to the requirements of the applicable performance class for a nominal frequency of 1 kHz, the environmental tests shall be performed at the nominal frequency of 1 kHz. The effects of static pressure, air temperature, and relative humidity on the sound pressure level produced in the coupler of the sound calibrator, over the range of environmental conditions specified for the tests, shall be known.

NOTE The range of environmental conditions specified for pattern-evaluation tests exceeds the range specified in IEC 60942 for class LS sound calibrators.

7.1.5 The sound level meter shall be set to perform a typical measurement of time-weighted sound level, time-averaged sound level, or sound exposure level on the reference level range. The frequency weighting shall be set to A weighting.

7.1.6 Time-weighted sound levels, time-averaged sound levels, or sound exposure levels indicated by the sound level meter in response to the signal from the sound calibrator shall be recorded for each test condition. When necessary, time-averaged sound levels shall be calculated from the indications of sound exposure level and elapsed time in accordance with IEC 61672-1. Averaging times for time-averaged sound levels or integration times for sound exposure levels shall be recorded.

7.2 Uncertainties for measurements of environmental test conditions

IEC 61672-2:2013

The actual uncertainty of measurement shall not exceed 0,2 kPa for measurements of static pressure. The actual uncertainty of measurement shall not exceed 0,3 °C and 4 % relative humidity for measurements of air temperature and relative humidity, respectively. These measurement uncertainties shall be determined for a coverage probability of 95 %,

7.3 Influence of static pressure

7.3.1 During the measurements of the influence of static pressure, the measured air temperature shall be within $\pm 2,0$ °C of the reference air temperature. Measured relative humidity at the reference static pressure shall be maintained within +20 % relative humidity to –10 % relative humidity from the reference relative humidity.

7.3.2 For practical reasons, relative humidity is specified for the reference static pressure. Evacuating or pressurizing an enclosure around a sound level meter will change the relative humidity within the enclosure. No corrections for this effect shall be applied.

7.3.3 The influence of static pressure shall be tested at the reference static pressure and at seven other static pressures. At each static pressure, the sound calibrator of 7.1.4 and the sound level meter (or its relevant components) shall be permitted to acclimatize for at least 10 minutes before recording the indicated sound level. For tests of the influence of static pressure, the sound calibrator shall remain coupled to the microphone of the sound level meter during the acclimatization periods. The electrical power applied to the sound level meter may be on continuously, or may be switched off and on by remote means.

7.3.4 Sound levels shall be measured twice at nominal static pressures spaced at approximately equal intervals between the minimum and the maximum static pressure specified in IEC 61672-1. For each nominal static pressure condition, the two measured static pressures shall not differ by more than 1 kPa. One measurement sequence shall start from the minimum static pressure and increase to each selected nominal pressure until the maximum is reached. The other sequence shall follow a decrease in pressure from the

maximum via each of the selected nominal pressures until the minimum is reached. At the maximum static pressure, only one indication of sound level shall be recorded.

7.3.5 The indicated sound levels shall be corrected for any difference between the sound pressure level generated by the sound calibrator under a test condition and the sound pressure level generated under reference environmental conditions.

7.3.6 At each static pressure test condition, the measured deviation of the indicated sound level from the sound level first indicated at the reference static pressure shall not exceed the applicable acceptance limits specified in IEC 61672-1.

7.4 Limits on air temperature, relative humidity and static pressure

Unless specified otherwise, for each test of the influence of air temperature and relative humidity, including the acclimatization requirements given in 7.5, the measured air temperature shall not exceed $\pm 1,0$ °C of a specified air temperature, the measured relative humidity shall not exceed ± 5 % relative humidity of a specified relative humidity, and the measured difference between the maximum and minimum prevailing static pressures shall not exceed 6,0 kPa.

7.5 Acclimatization requirements for tests of the influence of air temperature and relative humidity

7.5.1 The sound calibrator of 7.1.4 and the sound level meter (or relevant components) shall be placed in an environmental chamber to test the influence of air temperature and relative humidity on the sound level meter.

7.5.2 For tests of the influence of air temperature and relative humidity, the sound calibrator and the microphone on the sound level meter shall be uncoupled and the power to both instruments switched off during an acclimatization period.

7.5.3 The sound calibrator and sound level meter shall be permitted to acclimatize at the reference environmental conditions for at least 12 h.

7.5.4 For all test conditions other than reference environmental conditions, the sound calibrator and sound level meter shall be permitted to acclimatize for at least an additional 7 h after completion of the initial 12 h acclimatization period, unless the laboratory has applicable evidence that a shorter acclimatization period is sufficient.

7.5.5 After completion of an acclimatization period, the sound calibrator shall be coupled to the microphone of the sound level meter and the power switched on to both instruments.

7.5.6 The laboratory may have the facility to couple the sound calibrator to the microphone of the sound level meter without affecting the temperature and relative humidity in the environmental test chamber. If this facility is available, sound levels may be recorded following the time specified in the Instruction Manual for pressure equalization of the microphone. If this facility is not available, at least a further 3 h acclimatization time shall be allowed before commencing a test.

7.6 Abbreviated test of the combined influence of air temperature and relative humidity

7.6.1 To reduce the time and cost of verifying the influence of air temperature and relative humidity on the performance of a sound level meter, a set of abbreviated tests shall first be performed for certain combinations of air temperature and relative humidity.

7.6.2 For the abbreviated tests of the combined influence of air temperature and relative humidity, the acceptance limits are smaller than those specified in IEC 61672-1. If the sound

level meter conforms to the reduced acceptance limits at all specified test conditions, then the sound level meter shall be considered to fully conform to the temperature and humidity specifications of IEC 61672-1. No additional tests are required. If the sound level meter fails to conform to the reduced acceptance limits for any specified test condition, then additional temperature and humidity tests shall be performed to determine conformance to the specifications of IEC 61672-1. The additional tests are described in 7.7 and 7.8.

7.6.3 Following the acclimatization procedures described in 7.5, the sound level indicated in response to application of the sound calibrator of 7.1.4 shall be recorded for certain combinations of air temperature and relative humidity. When setting the test conditions, rapid changes of air temperature in the test chamber should be avoided. Care should be taken to avoid condensation while the temperature is being changed in the environmental test chamber. It is important to monitor the relative humidity in the environmental test chamber each time the air temperature is changed to ensure that the relative humidity does not exceed the specified range.

NOTE The combinations of temperature and relative humidity in 7.6.4 and 7.6.5 were chosen in consideration of the dewpoints that were obtainable within available environmental test facilities. The combinations also reflect the range of environmental conditions for general applications of class 1 and class 2 sound level meters.

7.6.4 For sound level meters where all components can be operated over the wide range of temperature and relative humidity covered by the specifications in IEC 61672-1, the target test conditions are given below. The reference air temperature and the reference relative humidity are given in IEC 61672-1.

- for class 1 sound level meters:
 - reference air temperature and reference relative humidity,
 - air temperature of -10 °C and relative humidity of 65 %,
 - air temperature of +5 °C and relative humidity of 25 %,
 - air temperature of +40 °C and relative humidity of 90 %, and
 - air temperature of +50 °C and relative humidity of 50 %.
- for class 2 sound level meters:
 - reference air temperature and reference relative humidity,
 - air temperature of 0 °C and relative humidity of 30 %, and
 - air temperature of +40 °C and relative humidity of 90 %.

7.6.5 For those components of a sound level meter that are designated in the Instruction Manual as intended only for operation in an environmentally controlled enclosure, the target test conditions are:

- reference air temperature and reference relative humidity,
- air temperature of +5 °C and relative humidity of 25 %, and
- air temperature of +35 °C and relative humidity of 80 %.

7.6.6 For sound level meters that consist of combinations of components, the abbreviated environmental tests shall be performed in three steps.

- In step 1, the components that can operate over a wide range of environmental conditions (for example, a microphone and preamplifier) and the components that operate only in the controlled environment (for example, a computer) shall be exposed to the reference environmental conditions.
- In step 2, the wide-range components shall be exposed to the combinations of environmental conditions of 7.6.4 (four conditions for class 1 or two conditions for class 2 sound level meters) while the controlled-environment components are maintained at reference environmental conditions.