



SLOVENSKI STANDARD
SIST EN 61101:2002
01-september-2002

The absolute calibration of hydrophones using the planar scanning technique in the frequency range 0,5 MHz to 15 MHz (IEC 61101:1991)

The absolute calibration of hydrophones using the planar scanning technique in the frequency range 0,5 MHz to 15 MHz

Die absolute Kalibrierung von Hydrophonen nach dem Planar-Scanning-Verfahren im Frequenzbereich von 0,5 MHz bis 15 MHz

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L'talonnage absolu des hydrophones par la technique du balayage planaire dans la gamme de frquences de 0,5 MHz 15 MHz

[SIST EN 61101:2002](https://standards.iteh.ai/catalog/standards/sist/3626b324-d6fb-400b-a00c-1d22ca92ace2/sist-en-61101-2002)

Ta slovenski standard je istoveten z: EN 61101:1993

ICS:

17.140.50 Elektroakustika Electroacoustics

SIST EN 61101:2002 **en**

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ENGLISH VERSION

The absolute calibration of hydrophones using the planar scanning technique in the frequency range 0,5 MHz to 15 MHz
(IEC 1101:1991)

L'étalonnage absolu des hydrophones par la technique du balayage planaire dans la gamme de fréquences de 0,5 MHz à 15 MHz
(CEI 1101:1991)

Die absolute Kalibrierung von Hydrophonen nach dem Planar-Scanning-Verfahren im Frequenzbereich von 0,5 MHz bis 15 MHz
(IEC 1101:1991)

This European Standard was approved by CENELEC on 1993-09-22. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

FOREWORD

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 1101:1991 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 61101 on 22 September 1993.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1994-10-01
- latest date of withdrawal of conflicting national standards (dow) 1994-10-01

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given only for information. In this standard, annexes A, B and C are informative and annex ZA is normative.

ENDORSEMENT NOTICE

The text of the International Standard IEC 1101:1991 was approved by CENELEC as a European Standard without any modification.

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ANNEX ZA (normative)

OTHER INTERNATIONAL PUBLICATIONS QUOTED IN THIS STANDARD
WITH THE REFERENCES OF THE RELEVANT EUROPEAN PUBLICATIONS

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

NOTE : When the international publication has been modified by CENELEC common modifications, indicated by (mod), the relevant EN/HD applies.

IEC Publication	Date	Title	EN/HD	Date
50(801)	1984	International Electrotechnical Vocabulary (IEV) Chapter 801: Acoustics and electro-acoustics	-	-
866	1987	Characteristics and calibration of hydrophones for operation in the frequency range 0,5 MHz to 15 MHz	-	-
1102	1991	Measurement and characterisation of ultrasonic fields using hydrophones in the frequency range 0,5 MHz to 15 MHz	EN 61102	1993
1103	-	Ultrasonic power measurement in liquids in the frequency range 0,5 MHz to 25 MHz (being prepared)	-	-

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**L'étalonnage absolu des hydrophones
par la technique du balayage planaire
dans la gamme de fréquences
de 0,5 MHz à 15 MHz**

**The absolute calibration of hydrophones
using the planar scanning technique
in the frequency range 0,5 MHz to 15 MHz**

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International Electrotechnical Commission
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CONTENTS

	Page
FOREWORD	5
INTRODUCTION	7
Clause	
1 Scope	9
2 Normative references	9
3 Definitions	9
4 List of symbols	13
5 Determination of hydrophone sensitivity	15
6 Measurement procedure	21
6.1 Power measurement	21
6.2 Transducer mounting	21
6.3 Measurement conditions	21
6.4 Measurements	23
7 Corrections and sources of uncertainty	23
7.1 Total power	23
7.2 Received hydrophone signal	25
7.3 Integration	25
7.4 Directional response	27
7.5 Finite size of the hydrophone	27
7.6 Noise	27
7.7 Nonlinear propagation	29
7.8 Planar scanning	31
7.9 Intensity proportional to pressure squared	31
SIST EN 61101:2002 https://standards.iteh.ai/catalog/standards/sist/3626b324-d6fb-400b-a00c-f5d2ca02ace2/sist-en-61101-2002	
ANNEXES	
A (informative)	35
B (informative)	39
C (informative)	43
Bibliography	46

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**THE ABSOLUTE CALIBRATION OF HYDROPHONES
USING THE PLANAR SCANNING TECHNIQUE
IN THE FREQUENCY RANGE 0,5 MHz TO 15 MHz**

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

This International Standard has been prepared by IEC Technical Committee No. 87: Ultrasonics.

The text of this standard is based on the following documents:

Six Months' Rule	Report on Voting
87(CO)4	87(CO)7

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

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All annexes are informative. **(standards.iteh.ai)**

NOTE - The following print types are used:

- Requirements: in roman type [SIST EN 61101:2002](https://standards.iteh.ai/catalog/standards/sist/3626b324-d6fb-400b-a00c-f5d2ca02ace2/sist-en-61101-2002)
- Test specifications: in italic type
- Notes: in small roman type
- Words in bold in the text are defined in clause 3.

INTRODUCTION

The spatial and temporal distribution of acoustic pressure within an ultrasonic field is commonly determined by using miniature piezoelectric hydrophones (see IEC 1102). These hydrophones are not absolute devices and the relation between the acoustic pressure in the ultrasonic field and the voltage produced by the hydrophone must be determined by calibration. Two techniques for hydrophone calibration are in common use. One of these, two-transducer reciprocity (see [1]), is described in IEC 866, and the other technique, commonly referred to as planar scanning ([2] and [3]), is described in this International Standard. Planar scanning involves the use of a hydrophone to determine the beam profile of a transducer of known output power. The accuracy of the technique can be comparable with that of reciprocity (see IEC 866, [4] and [5]).

Planar scanning provides a technique for the calibration of a hydrophone by means of a transducer of known output power. The transducer may be a standard device of known and reproducible output power, or it may be calibrated using, for example, a radiation pressure balance (see IEC 1103 and [3]-[7]). Whilst the concept of the technique of planar scanning can be applied at any frequency, the particular techniques described in this International Standard are most applicable to the frequency range 0,5 MHz to 15 MHz.

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THE ABSOLUTE CALIBRATION OF HYDROPHONES USING THE PLANAR SCANNING TECHNIQUE IN THE FREQUENCY RANGE 0,5 MHz TO 15 MHz

1 Scope

This International Standard specifies a method of absolute calibration of hydrophones based on the planar scanning technique in the frequency range 0,5 MHz to 15 MHz.

NOTES

- 1 The titles of other publications referred to in this standard are listed on page 46.
- 2 Throughout this standard SI units are used. In the specification of certain parameters, such as instantaneous intensities, it may be convenient to use other units. For example, instantaneous intensity may be specified in W/cm^2 or mW/cm^2 .

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(801): 1984, *International Electrotechnical Vocabulary (IEV), Chapter 801: Acoustics and electro-acoustics*.

IEC 866: 1987, *Characteristics and calibration of hydrophones for operation in the frequency range 0,5 MHz to 15 MHz*.

IEC 1102: 1991, *Measurement and characterization of ultrasonic fields using hydrophones in the frequency range 0,5 MHz to 15 MHz*.

IEC 1103: xxxx, *Ultrasonic power measurement in liquids in the frequency range 0,5 MHz to 25 MHz* (being prepared).

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3 Definitions

For the purpose of this International Standard, the following definitions apply. Definitions of certain relevant parameters, given in IEC 1102, have been repeated in 3.4 to 3.6 and 3.8 to 3.9.

3.1 **beam centre:** Point in a plane in the far field, usually perpendicular to the beam alignment axis, at which the spatial-peak temporal-peak acoustic pressure occurs. See IEC 1102 for the definition of spatial-peak temporal-peak acoustic pressure.

3.2 diametrical beam scan: Set of measurements of the hydrophone output voltage made in a straight line passing through the beam centre and normal to the beam alignment axis. The diametrical beam scan may extend to different distances on either side of the beam centre.

3.3 effective radius of an ultrasonic transducer: Radius of a perfect disc piston-like ultrasonic transducer which has a predicted axial acoustic pressure distribution approximately equivalent to the observed axial acoustic pressure distribution over a limited axial distance.

Symbol: a
Unit: metre, m

3.4 effective radius of a hydrophone active element: Radius of a stiff disc receiver hydrophone which has a predicted directional response function with an angular width equal to the observed angular width. The angular width is determined at a specified level below the peak of the directional response function. For the specified levels of 3 dB and 6 dB the radii are denoted by a_3 and a_6 respectively (see IEC 1102).

Symbols: a, a_3, a_6
Unit: metre, m

3.5 end-of-cable loaded sensitivity of a hydrophone: Ratio of the instantaneous voltage at the end of any integral cable or connector of a hydrophone, when connected to a specified electrical input impedance, to the instantaneous acoustic pressure in the undisturbed free field of a plane wave in the position of the acoustic centre of the hydrophone (i.e. if the hydrophone were removed). See IEC 1102.

Symbol: M_L
Unit: volt per pascal, V/Pa.

3.6 far field: Acoustic (sound) field at distances from an ultrasonic transducer where the values of the instantaneous acoustic pressure and particle velocity are substantially in phase. See IEC 1102.

3.7 hydrophone reference point: Point to which electroacoustic characteristics of a hydrophone are referred. See IEC 50(801).

3.8 Instantaneous acoustic pressure: Pressure minus the ambient pressure at a particular instant in time and at a particular point in an acoustic field. See IEC 1102.

Symbol: p
Unit: pascal, Pa

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3.9 Instantaneous Intensity: Acoustic energy transmitted per unit time in the direction of acoustic wave propagation per unit area normal to this direction at a particular instant in time and at a particular point in an acoustic field. See IEC 1102.

Symbol: I
Unit: watt per metre squared, W/m^2

3.10 transducer reference point: Point to which electroacoustic characteristics of the ultrasonic transducer are referred. See IEC 50(801).