SLOVENSKI STANDARD

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Ultrasonics - Fields - Guidance for the measurement and characterization of ultrasonic fields generated by medical ultrasonic equipment using hydrophones in the frequency range 0,5 MHz to 15 MHz (IEC 61220:1993)

ICS 17.140.50; 11.040.50

Referenčna številka
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EN 61220

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Descriptors: Ultrasound, ultrasonic field, medical electrical equipment, measurement, characterization

English version

Ultrasonics - Fields
Guidance for the measurement and characterization of ultrasonic fields generated by medical ultrasonic equipment using hydrophones in the frequency range 0,5 MHz to 15 MHz
(IEC 1220:1993)

Ultrasons - Champs
Guide pour les mesures et caractéristiques des champs ultrasonores produits par des appareils médicaux à ultrasons utilisant des hydrophones dans la gamme de fréquences de 0,5 MHz à 15 MHz
(CEI 1220:1993)

Ultraschall - Felder
Anleitung für die Messung und Kennzeichnung der durch medizinische Ultraschallgeräte erzeugten Ultraschallfelder mittels Hydrophonen im Frequenzbereich 0,5 MHz bis 15 MHz
(IEC 1220:1993)

This European Standard was approved by CENELEC on 1994-12-06. 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.

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 text of the International Standard IEC 1220:1993, prepared by IEC TC 87, Ultrasonics, was submitted to the formal vote and was approved by CENELEC as EN 61220 on 1994-12-06 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1995-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 1995-12-01

Annexes designated "normative" are part of the body of the standard.
Annexes designated "informative" are given for information only.
In this standard, annexes A and ZA are normative and annex B is informative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 1220:1993 was approved by CENELEC as a European Standard without any modification.

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
1101	1991	The absolute calibration of hydrophones using the planar scanning technique in the frequency range 0,5 MHz to 15 MHz	EN 61101	1993
1102	1991	Measurement and characterization of ultrasonic fields using hydrophones in the frequency range 0,5 MHz to 15 MHz	EN 61102	1993
A1	1993		A1	1994
1161	1992	Ultrasonic power measurement in liquids in the frequency range 0,5 MHz to 25 MHz	EN 61161	1994

RAPPORT TECHNIQUE

TECHNICAL REPORT

CEI
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Première édition
First edition
1993-05

Ultrasons – Champs –

Guide pour les mesures et caractéristiques des champs ultrasonores produits par des appareils médicaux à ultrasons utilisant des hydrophones dans la gamme de fréquences de 0,5 MHz à 15 MHz

Ultrasonics – Fields –

Guidance for the measurement and characterization of ultrasonic fields generated by medical ultrasonic equipment using hydrophones in the frequency range 0,5 MHz to 15 MHz

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ULTRASONICS – FIELDS –

GUIDANCE FOR THE MEASUREMENT AND CHARACTERIZATION OF ULTRASONIC FIELDS GENERATED BY MEDICAL ULTRASONIC EQUIPMENT USING HYDROPHONES IN THE FREQUENCY RANGE 0,5 MHz TO 15 MHz

FOREWORD

1) The IEC (International Electrotechnical Commission) is a world wide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. 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. The 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 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.
3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

- type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

Technical Reports of types 1 and 2 are subject to review within three years of publication to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

IEC 1220, which is a technical report of type 2, has been prepared by IEC technical committee 87: Ultrasonics.

The text of this technical report is based on the following documents:

Committee Draft	Report on Voting
87(SEC)33	87(SEC)50

Full information on the voting for the approval of this technical report can be found in the report(s) on voting indicated in the above table.

This document is issued in the type 2 technical report series of publications (according to G.4.2.2 of part 1 of the IEC/ISO Directives) as a "prospective standard for provisional application" in the field of ultrasonics because there is an urgent requirement for guidance on how standards in this field should be used to meet an identified need.

This document is not to be regarded as an "International Standard". It is proposed for provisional application so that information and experience of its use in practice may be gathered. Comments on the content of this document should be sent to the IEC Central Office.

A review of this type 2 technical report will be carried out not later than three years after its publication, with the options of either extension for a further three years or conversion to an International Standard or withdrawal.

Annex A forms an integral part of this technical report.

Annex B is for information only.

INTRODUCTION

IEC 1102 deals with ultrasonic fields in general. For medical ultrasound, there is a need to provide guidance for the choice of the most appropriate and scientifically meaningful group of acoustic parameters for the characterization of the various types of ultrasonic fields. This requirement arises from the fact that pulse-echo diagnostic, Doppler and therapeutic transducers emit ultrasound at different acoustic pressures and with different spatial and temporal characteristics. Consequently, some of the parameters referred to in IEC 1102 are appropriate to all equipment whilst others are appropriate to only certain types of equipment. This technical report provides general information on the measurement of ultrasonic fields generated by medical ultrasonic equipment. It also provides guidance for the choice of the most appropriate hydrophone to use and the most appropriate acoustical parameters to be measured.

Measurement procedures described in clauses 5 and 6 of IEC 1102 are believed to provide the most accurate results, but are particularly demanding on precision and degrees of freedom required for the hydrophone or transducer positioning systems. For certain measurements these requirements may be relaxed, thereby enabling simpler characterization systems to be used. This technical report provides guidance for these various aspects.

Finally, it is often necessary to use hydrophones which may have limited bandwidth or ones with active elements which are too large. This technical report gives guidance for estimating bandwidth and spatial-averaging corrections.

ULTRASONICS – FIELDS –

GUIDANCE FOR THE MEASUREMENT AND CHARACTERIZATION OF ULTRASONIC FIELDS GENERATED BY MEDICAL ULTRASONIC EQUIPMENT USING HYDROPHONES IN THE FREQUENCY RANGE 0,5 MHz TO 15 MHz

1 Scope

This technical report provides guidance on the practical measurement of the acoustic output of various types of medical ultrasonic equipment in the frequency range 0,5 MHz to 15 MHz based on the use of hydrophones.

It gives simplified procedures and guidelines for the measurement of the acoustic output of medical ultrasonic equipment.

Procedures for correcting for limitations caused by the use of hydrophones with finite bandwidth and finite active element size are also given.

2 Normative references

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

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

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

Amendment 1, Definitions of additional terms and specific requirements for the characterization of fields from ultrasonic transducers having cylindrical or spherical active elements (under consideration)

IEC 1161: 1992, *Ultrasonic power measurement in liquids in the frequency range 0,5 MHz to 25 MHz*

3 List of symbols

a_{max}	Maximum effective radius of a hydrophone active element
a_1	Effective radius of an ultrasonic transducer
C	Spatial-averaging correction factor