IEC 62127-1

Edition 2.0 2022-03
REDLINE VERSION

Corrected version
2026-08

INTERNATIONAL STANDARD

Ultrasonics – Hydrophones –
Part 1: Measurement and characterization of medical ultrasonic fields ~~up to 40 MHz~~

IEC 62127-1:2022-03 RLV(en)

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INTERNATIONAL
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ICS 17.140.50 ISBN 978-2-8322-5195-9

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Edition 2.0 2022-03

Ultrasonics - Hydrophones -
Part 1: Measurement and characterization of medical ultrasonic fields

INTERPRETATION SHEET 1

This interpretation sheet has been prepared by IEC technical committee 87: Ultrasonics.

The text of this interpretation sheet is based on the following documents:

DISH	Report on voting
87/941/DISH	87/946/RVDISH

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

Subclause 5.1.7.1, last paragraph

This is clarified by the following:

Medical ultrasound devices often require additional acoustic field measurements during version upgrades to incorporate newly developed probes, modes, or transmission technologies into the system. In such cases, even within the same device, 5.1.7.1 permits data from a second edition conforming measurement system and data from earlier measurement systems to coexist depending on the testing period.

IEC 62127-1:2022-03/ISH1:2026-08(en)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ULTRASONICS – HYDROPHONES –

Part 1: Measurement and characterization of medical ultrasonic fields ~~up to 40 MHz~~

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.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 62127-1:2007+AMD1:2013 CSV. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 62127-1 has been prepared by IEC technical committee 87: Ultrasonics. It is an International Standard.

This second edition cancels and replaces the first edition published in 2007 and Amendment 1:2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition.

a) The upper frequency limit of 40 MHz has been removed.
b) Hydrophone sensitivity definitions have been changed to recognize sensitivities as complex-valued quantities.
c) Procedures and requirements for narrow-band approximation and broadband measurements have been modified; details on waveform deconvolution have been added.
d) Procedures for spatial averaging correction have been amended.
e) Annex D, Annex E and bibliography have been updated to support the changes of the normative parts.

The text of this International Standard is based on the following documents:

Draft	Report on voting
87/783/FDIS	87/788/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts of IEC 62127 series, published under the general title *Ultrasonics – Hydrophones*, can be found on the IEC website.

NOTE Words in **bold** in the text are terms defined in Clause 3.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

The contents of the Interpretation sheet 1 (2026-08) have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The main purpose of this document is to define various acoustic parameters that can be used to specify and characterize ultrasonic fields propagating in liquids, and, in particular, water, using hydrophones. Measurement procedures are outlined that may be used to determine these parameters. Specific device related measurement standards, for example IEC 61689, IEC 61157, IEC 61847 or IEC 62359, can refer to this document for appropriate acoustic parameters. In IEC 62359, some additional measurement methods for attenuated parameters and indices are described addressing the specific needs of acoustic output characterization of ultrasonic diagnostic equipment in accordance with IEC 60601-2-37.

The philosophy behind this document is the specification of the acoustic field in terms of acoustic pressure parameters, acoustic pressure being the primary measurement quantity when hydrophones are used to characterize the field.

Intensity parameters are specified in this document, but these are regarded as derived quantities that are meaningful only under certain assumptions related to the ultrasonic field being measured.

ULTRASONICS – HYDROPHONES –

Part 1: Measurement and characterization of medical ultrasonic fields ~~up to 40 MHz~~

1 Scope ~~and object~~

This part of IEC 62127 specifies methods of use of calibrated **hydrophones** for the measurement in liquids of acoustic fields generated by ultrasonic medical equipment ~~operating in the frequency range up to 40 MHz~~ including **bandwidth** criteria and calibration frequency range requirements in dependence on the spectral content of the fields to be characterized.

This document:

– defines a group of acoustic parameters that can be measured on a physically sound basis;

– defines a second group of parameters that can be derived under certain assumptions from these measurements, and called derived intensity parameters;

– defines a measurement procedure that ~~may~~ can be used for the determination of acoustic pressure parameters;

– defines the conditions under which the measurements of acoustic parameters can be made ~~in the frequency range up to 40 MHz~~ using calibrated **hydrophones**;

– defines procedures for correcting for limitations caused by the use of **hydrophones** with finite **bandwidth** and finite active element size, and for estimating the corresponding **uncertainties**.

NOTE 1 Throughout this document, SI units are used. In the specification of certain parameters, such as **beam areas** and intensities, it ~~may~~ can be convenient to use decimal multiples or submultiples. For example, **beam area** ~~may~~ is likely to be specified in cm^2 and intensities in W/cm^2 or mW/cm^2.

NOTE 2 The **hydrophone** as defined ~~may~~ can be of a piezoelectric or an optic type.

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.

~~IEC 60050-801:1994, *International Electrotechnical Vocabulary – Chapter 801: Acoustics and electroacoustics*~~

~~IEC 60565, *Underwater acoustics – Hydrophones – Calibration in the frequency range 0,01 Hz to 1 MHz*~~

IEC 60565-1, *Underwater acoustics – Hydrophones – Calibration of hydrophones – Part 1: Procedures for free-field calibration of hydrophones*

~~IEC/TR 60854:1986, *Methods of measuring the performance of ultrasonic pulse-echo diagnostic equipment*~~

IEC 61689, *Ultrasonics – Physiotherapy systems –* ~~*Performance requirements*~~ *Field specifications and methods of measurement in the frequency range 0,5 MHz to 5 MHz*

~~IEC 61828, *Ultrasonics – Focusing transducers – Definitions and measurement methods for the transmitted fields*~~

~~IEC 61846, *Ultrasonics – Pressure pulse lithotripters – Characteristics of fields*~~

~~IEC 61847, *Ultrasonics – Surgical systems – Measurement and declaration of the basic output characteristics*~~

IEC 62127-2, *Ultrasonics – Hydrophones – Part 2: Calibration for ultrasonic fields up to 40 MHz*

IEC 62127-3, *Ultrasonics – Hydrophones – Part 3: Properties of hydrophones for ultrasonic fields up to 40 MHz*

IEC 63009, *Ultrasonics – Physiotherapy systems – Field specifications and methods of measurement in the frequency range 20 kHz to 500 kHz*

ISO 16269-6~~:2005~~, *Statistical interpretation of data – Part 6: Determination of statistical tolerance intervals*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

~~NOTE The following standards rely on the proper use of this document.~~

~~IEC 61157, *Standard means for the reporting of the acoustic output of medical diagnostic ultrasonic equipment*~~

~~IEC 62359, *Ultrasonics – Field characterization – Test methods for the determination of thermal and mechanical indices related to medical diagnostic ultrasonic fields*~~

~~IEC 61847, *Ultrasonics – Surgical systems – Measurement and declaration of the basic output characteristics.*~~

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IEC 60050-801, *International Electrotechnical Vocabulary – Part 801: Acoustics and electroacoustics*

IEC 60050-802, *International Electrotechnical Vocabulary – Part 802: Ultrasonics*

IEC 60500, *Underwater acoustics – Hydrophones – Properties of hydrophones in the frequency range 1 Hz to 500 kHz*

IEC 60601-2-5 *Medical electrical equipment – Part 2-5: Particular requirements for the basic safety and essential performance of ultrasonic physiotherapy equipment*

IEC 60601-2-37, *Medical electrical equipment – Part 2-37: Particular requirements for the basic safety and essential performance of ultrasonic medical diagnostic and monitoring equipment*

IEC 60601-2-62, *Medical electrical equipment – Part 2-62: Particular requirements for the basic safety and essential performance of high intensity therapeutic ultrasound (HITU) equipment*

IEC TR 60854, *Methods of measuring the performance of ultrasonic pulse-echo diagnostic equipment*

IEC 61157, *Standard means for the reporting of the acoustic output of medical diagnostic ultrasonic equipment*

IEC 61161, *Ultrasonics – Power measurement – Radiation force balances and performance requirements*

IEC 61828, *Ultrasonics – Transducers – Definitions and measurement methods regarding focusing for the transmitted fields*

IEC 61846, *Ultrasonics – Pressure pulse lithotripters – Characteristics of fields*

IEC 61847, *Ultrasonics – Surgical systems – Measurement and declaration of the basic output characteristics*

IEC TS 61949, *Ultrasonics – Field characterization – In situ exposure estimation in finite-amplitude ultrasonic beams*

IEC 62359, *Ultrasonics – Field characterization – Test methods for the determination of thermal and mechanical indices related to medical diagnostic ultrasonic fields*

IEC TS 62556, *Ultrasonics – Field characterization – Specification and measurement of field parameters for high intensity therapeutic ultrasound (HITU) transducers and systems*

IEC TR 62781, *Ultrasonics – Conditioning of water for ultrasonic measurements*

IEC 63045, *Ultrasonics – Non-focusing short pressure pulse sources including ballistic pressure pulse sources – Characteristics of fields*

IEC TS 63081, *Ultrasonics – Methods for the characterization of the ultrasonic properties of materials*

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