

Australian/New Zealand Standard™

**Ultrasonic power measurement in  
liquids in the frequency range 0.5 MHz  
to 25 MHz**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee HE/3, Medical Electrical Equipment. It was approved on behalf of the Council of Standards Australia on 15 January 2000 and on behalf of the Council of Standards New Zealand on 25 February 2000. It was published on 20 April 2000.

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The following interests are represented on Committee HE/3:

Australasian College of Physical Scientists and Engineers in Medicine  
Australasian Society for Ultrasound in Medicine  
Australian Dental Association  
Australian Institute of Radiography  
Australian Radiation Laboratory  
Australian Society of Anaesthetists  
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# Australian/New Zealand Standard™

## **Ultrasonic power measurement in liquids in the frequency range 0.5 MHz to 25 MHz**

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## PREFACE

This Standard was prepared by the Joint Australian/New Zealand Standards Committee HE/3, Medical Electrical Equipment.

This Standard is issued as a necessary adjunct to the following to-be-published Joint Standards—  
Ultrasonics—Physiotherapy systems, Part 1: Guide for physiotherapists checking calibration; and  
Ultrasonics—Physiotherapy systems, Part 2: Guide for commercial testers checking calibration,  
and is an integral part of the calibration process.

This Standard is identical with and has been reproduced from IEC 61161:1992, *Ultrasonic power measurement in liquids in the frequency range 0.5 MHz to 25 MHz* and its first Amendment (1998). The amendment follows the text of the Standard and changes required are indicated in the IEC text by a marginal bar against the clause, table, figure or part thereof affected.

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The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the Annex to which they apply. A ‘normative’ Annex is an integral part of a Standard, whereas an ‘informative’ Annex is only for information and guidance.

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## INTRODUCTION

A number of measuring methods exist for the determination of the total radiated power of ultrasonic transducers ([1]\* to [3]\*, see also annex B). The purpose of this International Standard is to establish methods of measurement of ultrasonic power in liquids in the megahertz frequency range based on the measurement of the radiation force using a gravimetric balance. The great advantage of radiation force measurements is that a value for the total radiated power is obtained without the need to integrate field data over the cross-section of the radiated sound beam. In addition, the radiation force measuring devices are easy to handle and to calibrate.

This standard enumerates the sources of errors and describes a systematic step-by-step procedure needed to assess overall measurement uncertainties.

## AUSTRALIAN/NEW ZEALAND STANDARD

**Ultrasonic power measurement in liquids in the frequency range  
0.5 MHz to 25 MHz****1 Scope**

This International Standard

- specifies a method of determining the total radiated acoustic power of ultrasonic transducers based on the use of a radiation force balance;
- establishes general principles for the use of radiation force balances in which an obstacle (target) intercepts the sound field to be measured.

NOTE – The radiation force is equal to the change in the time-averaged momentum flow and is thus related to ultrasonic intensity and power.

- provides information on assessment of overall measurement uncertainties.

This International Standard is applicable to:

- the measurement of ultrasonic power based on the use of a radiation force balance in the frequency range from 0,5 MHz to 25 MHz;
- the measurement of total ultrasonic power of transducers with well-collimated beams;
- the use of radiation force balances of the gravimetric type.

NOTE – The titles of other publications referred to in this Standard are listed in annex C.

**2 Normative references**

The following normative documents 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 normative documents 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 normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(801):1984, *International Electrotechnical Vocabulary (IEV) – Chapter 801: Acoustics and electro-acoustics*

IEC 60150:1963, *Testing and calibration of ultrasonic therapeutic equipment*

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

**3 Definitions**

**3.1 acoustic streaming:** Steady-state fluid motion which develops under certain conditions in a sound field.

**3.2 far field:** Sound field at a distance from the source where the sound pressure decreases monotonically with increasing distance from the source. In general, this is the region of the sound field where the specific acoustic impedance, i.e. the complex ratio of sound pressure to particle velocity, is substantially equal to  $\rho c$ ,  $\rho$  being the density and  $c$  the velocity of sound in the sound-propagating medium.