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Ultrasonics – Conditioning of water for ultrasonic measurements

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ULTRASONICS – CONDITIONING OF WATER FOR ULTRASONIC MEASUREMENTS

FOREWORD

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IEC 62781, which is a technical report, has been prepared by IEC technical committee 87: Ultrasonics.

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

Enquiry draft	Report on voting
87/494A/DTR	87/507/RVC

Full information on the voting for the approval of this technical report 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.

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- withdrawn,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.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Many ultrasonic measurements are conducted in water, as it provides an inexpensive and readily available medium with characteristic acoustic impedance comparable to biological tissue. However, basic tap water is far from optimum for ultrasonic measurement as it contains many dissolved, absorbed and suspended contaminants. Measurements can be affected in many ways by these impurities. For example:

- dissolved gases readily dissociate from the water in the presence of high rarefactional pressures or heat giving rise to bubble formation. These bubbles not only are unwanted point reflectors but also increase the likelihood of cavitation.
- dissolved ionic components result in a raised conductivity of the water, which in turn can affect the measured output from some unshielded hydrophones. Furthermore experimental equipment left in an ionic solution for any period of time will gradually develop a layer of deposit (e.g. calcium carbonate) on its surface.
- biological activity within an untreated water tank will result in the creation of an unpleasant film on all available surfaces. If left long enough this biological activity will result in an undesirable environment for the operator and may also be a health hazard.

To minimize these effects it is necessary to undertake a water treatment process.

These problems are well known and many IEC standards have sought to address these issues, often by means of an informative annex. This technical report aims to provide a unified resource for operators wishing to establish a water treatment process for ultrasonic measurements. This technical report discusses each of the stages within a water treatment process and provides examples of suitable treatment methods.

ULTRASONICS – CONDITIONING OF WATER FOR ULTRASONIC MEASUREMENTS

1 Scope

This Technical Report describes methods:

- for degassing water to be used in ultrasonic measurements,
- to decrease the ionic content of water to be used in ultrasonic measurements,
- to decrease the biological content of water to be used in ultrasonic measurements,
- to reduce the suspended particulate content of water to be used in ultrasonic measurements.

This technical report is applicable to all measurements of ultrasonic fields where water is the transmission medium. The quality and treatment methods for water used within a radiation force balance (RFB) may be different from that required for hydrophone based acoustic measurements. Chemical based methods of water treatment (e.g. algaecides) may be appropriate for these applications. However, in this document, chemical means are noted but appropriately discouraged for acoustic pressure/intensity measurements.

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 62127-1, *Ultrasonics – Hydrophones – Part 1: Measurement and characterization of medical ultrasonic fields up to 40 MHz*