

INTERNATIONAL STANDARD

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Ultrasonics – Flow measurement systems – Flow test object

*Ultrasons –
Systèmes de mesure de débit –
Montage pour essai de débit*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ULTRASONICS – FLOW MEASUREMENT SYSTEMS – FLOW TEST OBJECT

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, 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.
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International Standard IEC 61685 has been prepared by IEC Technical Committee 87: Ultrasonics.

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

FDIS	Report on voting
87/202/FDIS	87/208/RVD

Full information on the voting for the approval of this standard 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 3.

Annexes A, C, D, E and F are for information only.

Annex B forms an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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- withdrawn;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

INTRODUCTION

The purpose of this International Standard is to establish a **flow Doppler test object** for the acceptance testing, quality assurance testing and clinical calibration of Doppler systems, working at a frequency between 2 MHz and 10 MHz. As the response of Doppler systems depends on the signal level and on the spectral contents of the signal, it is desirable to test some aspects of a Doppler system with a test object that mimics the *in vivo* situation. A **flow Doppler test object** is particularly useful for

- testing the influence of the size and the depth of the blood vessel on the signal recorded by a Doppler system;
- testing the response of a Doppler system with a spectrum of blood velocities typical of the *in vivo* situation.

This **flow test object** is not intended as a phantom mimicking clinical conditions.

The basis of this International Standard is given by IEC Technical Report 61206:1993 *Ultrasonics – Continuous Wave Doppler systems – Test procedures*. In annex A the position of this standard in relation to IEC 61206 and IEC 61895 is described. This standard only declares parameters that can be measured with the test object. Measurement methods are given in IEC 61206 and IEC 61895.

This International Standard deals only with the **flow Doppler test object** in a restricted sense, i.e. the section in which the ultrasonic measurements are performed. Where the whole of the set-up is meant, the phrase 'flow rig' is used. The prescriptions of this International Standard define the ultrasonic properties and the flow pattern in the measurement section of the flow test object. For other aspects of the flow rig (i.e. generating and measuring flows) standard engineering practice has to be followed.

The flow conditions are simplified as much as possible: a steady flow through a straight **tube** with a circular cross-section. Generalisation of the flow conditions to other geometries and time dependent flows is required in order to test some instrument functions. This generalisation is not undertaken in this International Standard.

In annex D, an example **flow Doppler test object** is described which complies with the requirements of this International Standard. Compliance with this International Standard can also be fulfilled by measuring the properties of the materials to be used, and complying with the values given in this International Standard.

In literature [1], [2] the nomenclature about the primary measurand of Doppler systems is confused. 'Doppler frequency' and 'velocity' occur on equal footing. In 'velocity' often a correction for **Doppler angle** has been included. To avoid this ambiguity, in this International Standard the term 'Doppler frequency' is preferred. In case a Doppler system is declared to measure velocity, it is intended that measured values are converted to Doppler frequency, using **acoustic working frequency** and, if applicable, **Doppler angle**.

ULTRASONICS – FLOW MEASUREMENT SYSTEMS – FLOW TEST OBJECT

1 Scope

This International Standard specifies parameters for a **flow Doppler test object** representing a blood vessel of known diameter at a certain depth in human tissue, carrying a steady flow.

This International Standard establishes a **flow Doppler test object** which can be used to assess various aspects of the performance of Doppler diagnostic equipment.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, 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. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 61206:1993, *Ultrasonics – Continuous-wave Doppler systems – Test procedures*

IEC 61102:1991, *Measurement and characterisation of ultrasonic fields using hydrophones in the frequency range 0,5 MHz to 15 MHz*

IEC 61895:1999, *Ultrasonics – Pulsed Doppler diagnostic systems – Test procedures to determine performance*