## **INTERNATIONAL STANDARD**

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# Water quality — Determination of carbon 14 activity — Liquid scintillation counting method

té di Jone 14 Qualité de l'eau — Détermination de l'activité volumique du carbone 14 — Méthode par comptage des scintillations en milieu liquide



Reference number ISO 13162:2011(E)



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#### Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13162 was prepared by Technical Committee ISO/TC 147, Water quality.

#### Introduction

The carbon 14 (<sup>14</sup>C) present in the environment is of natural origin and man made. As a result of atmospheric nuclear weapon testing, emissions from nuclear engineering installations, and the application and processing ly in the source of the second of isotopes, relatively large amounts of <sup>14</sup>C have been released into the environment. Due to the substantial proportion of <sup>14</sup>C in the human internal dose contribution, monitoring of <sup>14</sup>C activity concentrations in the environment is necessary in order to follow its circulation in the hydrosphere and biosphere. <sup>14</sup>C is the second radionuclide (~3 500 Bg) to contribute to the human body natural radioactivity, behind <sup>40</sup>K (~6 000 Bg).

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## Water quality — Determination of carbon 14 activity — Liquid scintillation counting method

WARNING — Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

IMPORTANT — It is absolutely essential that tests conducted according to this International Standard be carried out by suitably trained staff.

#### 1 Scope

This International Standard specifies the conditions for the determination of <sup>14</sup>C activity concentration in samples of environmental water or of <sup>14</sup>C-containing water using liquid scintillation counting.

The method is applicable to the analysis of any organic molecule soluble in water that is well mixed with the scintillation cocktail. It does not apply to micelles or "large" particles (lipids, fulvic acid, humic acid, etc.) that are inadequately mixed with the scintillation cocktail and the water. Some beta energy is lost without any excitation of the scintillation cocktail and the results are underestimated. The method is not applicable to the analysis of organically bound <sup>14</sup>C, whose determination requires additional chemical processing (such as chemical oxidation, combustion).

It is possible to determine <sup>14</sup>C activity concentrations below 10<sup>6</sup> Bq I<sup>-1</sup> without any sample dilution.

#### 2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 5667-1, Water quality — Sampling — Part 1: Guidance on the design of sampling programmes and sampling techniques

ISO 5667-3, Water quality — Sampling — Part 3: Preservation and handling of water samples

ISO 11929, Determination of the characteristic limits (decision threshold, detection limit and limits of the confidence interval) for measurements of ionizing radiation — Fundamentals and application

ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories

ISO 80000-10, Quantities and units — Part 10: Atomic and nuclear physics

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