

Water quality —

Part 3: Radiological methods —

Section 3.1 Measurement of gross alpha activity in non-saline water: thick source method

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Environment and Pollution Standards Policy Committee (EPC/-) to Technical Committee EPC/44, upon which the following bodies were represented:

- Association of Consulting Scientists
- British Association for Chemical Specialities
- British Gas plc
- Chemical Industries Association
- Convention of Scottish Local Authorities
- Department of the Environment (Water Directorate)
- Department of the Environment for Northern Ireland
- Department of Trade and Industry (Laboratory of the Government Chemist)
- Electricity Association
- Industrial Water Society
- Institute of Gas Engineers
- Institution of Water and Environmental Management
- Institution of Water Officers
- National Rivers Authority
- Royal Institute of Public Health and Hygiene
- Royal Society of Chemistry
- Scottish Association of Directors of Water and Sewerage Services
- Soap and Detergent Industry Association
- Water Companies Association
- Water Research Centre
- Water Services Association of England and Wales

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- AEA Technology
- Ministry of Agriculture, Fisheries and Food
- Ministry of Defence
- National Radiological Protection Board
- University of Manchester

This British Standard, having been prepared under the direction of the Environment and Pollution Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 March 1993

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National foreword

This Section of BS 6068, which has been prepared under the direction of the Environment and Pollution Standards Policy Committee, is identical with ISO 9696:1992 *Water quality — Measurement of gross alpha activity in non-saline water — Thick source method*.

The International Standard was prepared by Technical Committee 147, Water quality, of the International Organization for Standardization (ISO) with the active participation and approval of the UK.

BS 6068 is being published in a series of Parts subdivided into Sections that will generally correspond to particular International Standards. Sections are being, or will be, published in Parts 1 to 7, which together with Part 0, are listed below.

- *Part 0: Introduction;*
- *Part 1: Glossary;*
- *Part 2: Physical, chemical and biochemical methods;*
- *Part 3: Radiological methods;*
- *Part 4: Microbiological methods;*
- *Part 5: Biological methods;*
- *Part 6: Sampling;*
- *Part 7: Precision and accuracy;*

Cross-references

International Standard	Corresponding British Standard
	BS 6068 <i>Water quality</i>
ISO 5667-1:1980	Section 6.1:1981 <i>Guidance on the design of sampling programmes</i> (Identical)
ISO 5667-2:1991	Section 6.2:1991 <i>Guidance on sampling techniques</i> (Identical)
ISO 5667-3:1985 ¹⁾	Section 6.3:1986 <i>Guidance on the preservation and handling of samples</i> (Identical)

¹⁾ A revision of ISO 5667-3 is in preparation. It is envisaged that this will be implemented in due course as a new edition of BS 6068-6.3.

Textual error. When adopting the text of the International Standard, the textual error given below was discovered. It has been marked in the text and has been reported to ISO in a proposal to amend the text of the International Standard.

In 5.1, line 5, “their” should be read as “thin”.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

WARNING — The manufacturer's instructions should be consulted with regard to the safe operating of high voltages used in counting equipment.

In all countries strict regulations are issued to cover the use of radioactive materials in laboratories. These regulations are enforceable and the regulatory body should be contacted by prospective users. Specific instructions for the preparation of alpha sources are given in clause 7.

1 Scope

1.1 Substance determined

This International Standard specifies a method for the determination of gross alpha activity in non-saline waters for alpha-emitting radionuclides which are not volatile at 350 °C. It is possible to determine supported volatile radionuclides measured to an extent determined by half-life, matrix retention (of the volatile species) and the duration of measurement (counting time).

1.2 Applicability

The method is applicable to raw and potable waters and can be extended to saline or mineralized waters, but with a reduced sensitivity.

1.3 Range of application

The range of application depends on the amount of inorganic material in the water and on the performance characteristics (background count rate and counting efficiency) of the counter.

2 Normative references

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

ISO 5667-1:1980, *Water quality — Sampling — Part 1: Guidance on the design of sampling programmes*.

ISO 5667-2:1991, *Water quality — Sampling — Part 2: Guidance on sampling techniques*.

ISO 5667-3, *Water quality — Sampling — Part 3: Guidance on the preservation and handling of samples*¹⁾.

¹⁾ To be published. (Revision of ISO 5667-3:1985)

3 Principle

The sample is acidified to stabilize it, evaporated almost to dryness, converted to the sulfate form and then ignited at 350 °C. A portion of the residue is transferred to a planchette and the alpha activity measured by counting in an alpha-particle detector or counting system previously calibrated against an alpha-emitting standard.

4 Reagents

All reagents shall be of recognized analytical grade and shall not contain any detectable alpha activity.

NOTE 1 A method for preparing reagent blanks to check for endemic radioactivity or contamination is given in 10.1.

4.1 Standard solution, which shall be ²⁴¹Am.

NOTE 2 ²⁴¹Am is preferred to ²³⁹Pu, because the latter frequently suffers from the presence of ²⁴¹Pu which leads to growth of ²⁴¹Am in prepared standard solutions of sources, which would therefore need to be continually purified. A uranium compound of known isotopic composition is difficult to obtain and has a sensitivity different from that of ²³⁹Pu (see 9.3).

NOTE 3 Certified reference materials are available from several sources in most countries. The International Atomic Energy Agency (IAEA) Vienna, Austria is an international supplier. The National Institute of Standards Technology (NIST), USA can also supply to most countries.

NOTE 4 The choice of alpha standard will depend on a knowledge of the type of radioactive contaminant likely to be present in the waters being tested. In general, this amounts to a choice between naturally occurring and man-made alpha emitters.

NOTE 5 A uranium compound of certified natural or known isotopic composition has one arguable advantage, in that its specific activity can be calculated from established physical constants and isotopic abundance data which are independent of the calibration procedures of a particular organization.

NOTE 6 Furthermore, since the energies of the alpha emissions from uranium isotopes are less than those from the artificial transuranic nuclides, the use of a uranium standard tends to give a high result for transuranics. Some authorities prefer to err on the high side in situations where the true composition is unknown.

4.2 Concentrated nitric acid, 50% (V/V).

Dilute 100 ml ± 5 ml of nitric acid ($\rho = 1,42$ g/ml) to 200 ml ± 10 ml with water (4.6).

4.3 Concentrated sulfuric acid, $\rho = 1,84$ g/ml.

4.4 Volatile organic solvents, methanol and acetone.

4.5 Calcium sulfate

Calcium salts may contain trace amounts of ²²⁶Ra and/or ²¹⁰Pb and checks for the presence of these nuclides shall be made (see 7.7 and 10.1).

4.6 Water

Distilled or deionized water shall be used for all applications.