



Standard Practice for Set-up, Calibration, and Quality Control of Instruments Used for Radioactivity Measurements¹

This standard is issued under the fixed designation D7282; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers consensus criteria for the calibration and quality control of nuclear instruments. This practice is provided for establishing appropriate quality control parameters at instrument startup, calibration of nuclear counting instruments and the continuing monitoring of quality control parameters. Calibrations are usually performed to establish the operating parameters of the instrument. This practice addresses the typically used nuclear counting instruments: alpha spectrometer, gamma spectrometer, gas proportional counter and liquid scintillation counter.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

[D1129 Terminology Relating to Water](#)

[D3648 Practices for the Measurement of Radioactivity](#)

[D4375 Practice for Basic Statistics in Committee D19 on Water](#)

2.2 Other Standards:

[ANSI N42.22 Traceability of Radioactive Sources to the National Institute of Standards and Technology \(NIST\)](#)

[and Associated Instrument Quality Control³](#)

[ANSI N42.23 Measurement and Associated Instrumentation Quality Assurance for Radioassay Laboratories³](#)

[ANSI/HPS N13.30 Performance Criteria for Radiobioassay³](#)
[ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories⁴](#)

[JCGM 100:2008 Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement⁵](#)

3. Terminology

3.1 Definitions:

3.1.1 For definition of other terms used in this practice, refer to Terminology [D1129](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *acceptable verification ratio (AVR)*, n —ratio of the difference between measured value of the verification sample and the known value added to the verification sample to the square root of the sum of the squares of their associated combined standard uncertainties.

3.2.1.1 *Discussion*—See [Eq 10](#) in [16.2.13](#).

3.2.2 *background subtraction count (BSC)*, n —a source count used to determine the background to be subtracted from the sample test source count.

3.2.3 *calibration*, n —determining the instrument response to a known amount of radioactive material.

3.2.4 *calibration source (CS)*, n —a known quantity of radioactive material, traceable to a national standards body, prepared for the purpose of calibrating nuclear instruments.

3.2.5 *continuing instrument quality control*, n —measurements taken to ensure that an instrument responds in the same manner subsequent to its calibration.

3.2.6 *instrument check source (ICS)*, n —a radioactive source, not necessarily traceable to a national standards body, that is used to confirm the continuing satisfactory operation of an instrument.

¹ This practice is under the jurisdiction of ASTM Committee [D19](#) on Water and is the direct responsibility of Subcommittee [D19.04](#) on Methods of Radiochemical Analysis.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from International Organization for Standardization (ISO), 1 rue de Varembe, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.

⁵ Available from Bureau International des Poids et Mesures (BIPM), Pavillon de Breteuil F-92312 Sèvres Cedex France, <http://www.bipm.org/en/publications/guides/gum.html>.