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INTERNATIONAL STANDARD

Radiation protection instrumentation - Equipment for continuous monitoring of radioactivity in gaseous effluents -
Part 2: Specific requirements for radioactive aerosol monitors including transuranic aerosols

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Radiation protection instrumentation - Equipment for continuous monitoring of radioactivity in gaseous effluents - Part 2: Specific requirements for radioactive aerosol monitors including transuranic aerosols

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IEC 60761-2 has been prepared by subcommittee 45B: Radiation protection instrumentation, of IEC technical committee 45: Nuclear instrumentation. It is an International Standard.

This International Standard is to be used in conjunction with IEC 60761-1:2002.

This third edition cancels and replaces the second edition published in 2002. This edition constitutes a technical revision.

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This edition includes the following significant technical changes with respect to the previous edition:

a) more precise tests for air-flow were added:
   1) sampled volume correctness;
   2) flow-rate robustness;
b) uncertainties have been taken into account for the reference response test;
c) addition of tests against aerosol granulometry variation;
d) creating a uniform functionality test for all environmental, electromagnetic and mechanical tests and a requirement for the coefficient of variation of each nominal mean reading.

The text of this International Standard is based on the following documents:

Draft	Report on voting
45B/1109/FDIS	45B/1114/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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A list of all parts in the IEC 60761 series, published under the general title *Radiation protection instrumentation - Equipment for continuous monitoring of radioactivity in gaseous effluents*, can be found on the IEC website.

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Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

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INTRODUCTION

IEC 60761 consists of the following parts, under the general title: *Radiation protection instrumentation - Equipment for continuous monitoring of radioactivity in gaseous effluents.*

Part 1: General requirements

Part 2: Specific requirements for radioactive aerosol monitors including transuranic aerosols

Part 3: Specific requirements for radioactive noble gas monitors

Part 4: Specific requirements for radioactive iodine monitors

Part 5: Specific requirements for tritium monitors

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1 Scope

This part of IEC 60761 is applicable to equipment intended for simultaneous, delayed or discrete sequential measurement of aerosols in gaseous effluents discharged into the environment.

It is applicable to equipment designed to fulfil the following functions:

– the measurement of the volumetric activity (Bq/m^3) of the aerosols in either gaseous effluents or the released total activity of aerosols (Bq), or both;
– the actuation of an alarm signal when either a predetermined volumetric activity or a predetermined total released activity of aerosols is exceeded.

This equipment is intended for measurement over a wide range of activity, including very small quantities in the presence of a much larger natural background. The daughters of ^{222}Rn (radon) and ^{220}Rn (thoron) are naturally occurring aerosols contributing to the natural background. The discrimination against natural activity can be an important problem in monitoring low level activity. In order to provide more and better information, complementary or retrospective laboratory analysis of the filters after collection can be performed.

The objective of this document is to establish specific standard requirements, including technical characteristics and general test conditions, and to give examples of acceptable methods for aerosol effluent monitors.

The general requirements, technical characteristics, test procedures, radiation characteristics, electrical, mechanical, safety and environmental characteristics are given in IEC 60761-1. Unless otherwise stated, these requirements apply to this document.

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2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60050-395, *International Electrotechnical Vocabulary - Part 395: Nuclear instrumentation: Physical phenomena, basic concepts, instruments, systems, equipment and detectors*

IEC 60761-1:2002, *Equipment for continuous monitoring of radioactivity in gaseous effluents - Part 1: General requirements*

IEC 61578:1997, *Radiation protection instrumentation - Calibration and verification of the effectiveness of radon compensation for alpha and/or beta aerosol measuring instruments - Test methods*

3 Terms and definitions, abbreviated terms, quantities and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-395 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

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3.1.1
aerosol
suspension of fine solid particles or liquid droplets in air or another gas

3.1.2
aerodynamic equivalent diameter
diameter of a unit-density sphere having the same gravitational-settling velocity as the particle in question

3.1.3
activity median aerodynamic diameter
AMAD
aerodynamic particle diameter for which 50 % of the aerosol activity is associated with sizes smaller than (or larger than) that particular size

3.1.4
aerosol monitor
equipment designed for the continuous, delayed or sequential measurement of an aerosol activity in gaseous effluents discharged into the environment

3.1.5
total equivalent thickness
equivalent window thickness (or density thickness), generally expressed in mass per unit area (mg/cm^2), that a particle emitted normally from the surface of the aerosol collection medium traverses to reach the sensitive volume of the detector

Note 1 to entry: This thickness includes the distance covered in air plus the thickness of the entry window of the detector, thickness which can include any coating over the detector for protection against radioactive contamination, noxious chemicals or water vapour.

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3.1.6
source efficiency
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largest of the two quotients, of the surface emission rate by the number of particles of the same type created or released per unit time, either within the source thickness or within the source saturation layer

3.1.7
alarm
audible, visual, or other signal activated when the instrument reading exceeds a pre-set value or falls outside of a pre-set range, or when the instrument detects the presence of the source of radiation according to a pre-set condition

3.1.8
background level
radiation field in which the instrument is intended to operate which includes background produced by naturally occurring radioactive material

3.2 Abbreviated terms

AMAD activity median aerodynamic diameter

3.3 Quantities and units

In the present document, units of the International System (SI) are used[1]. The definitions of radiation quantities are given in IEC 60050-395.

[1] International Bureau of Weights and Measures: The International System of Units, 9th edition, 2019.

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