

Nuclear instrumentation — Density gauges utilizing ionizing radiation — Definitions and test methods

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Summary of pages

This document comprises a front cover, an inside front cover, the IEC title page, pages 2 to 18, an inside back cover and a back cover.

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Densimètres à rayonnements ionisants –
Définitions et méthodes d'essai**

**Nuclear instrumentation –
Density gauges utilizing ionizing radiation –
Definitions and test methods**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

NUCLEAR INSTRUMENTATION –

Density gauges utilizing ionizing radiation –
Definitions and test methods

FOREWORD

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International Standard IEC 60692 has been prepared by IEC technical committee 45: Nuclear instrumentation.

This second edition cancels and replaces the first edition, published in 1980. This second edition constitutes a technical revision.

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

FDIS	Report on voting
45/464/FDIS	45/466/RVD

Full information on the voting for 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.

Annex A forms an integral part of this standard.

The committee has decided that this publication remains valid until 2004. At this date, in accordance with the committee's decision, the publication will be

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- withdrawn;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

NUCLEAR INSTRUMENTATION –

Density gauges utilizing ionizing radiation – Definitions and test methods

1 Scope and object

This International Standard relates to definitions, test methods and procedures for density gauges utilizing ionizing radiation, designed for measuring the density of liquids, gas vapours, slurries, or fluidized solids. The output signals from density gauges may be either analogue or digital. The measurement system may also include multiple input signals with various means of compensation and signal conditioning prior to the output signals. Reference to compliance with this standard shall identify any deviations and the reasons for such deviations.

Safety aspects are covered in other IEC and ISO standards (for example IEC 60405, ISO 2919, ISO 7205, ISO 9978). Consideration should also be given to compliance with all applicable national and local regulations and codes of practice.

NOTE 1 Many density measuring systems in use today have multiple sensors (i.e. temperature and pressure) and employ various means of compensating the basic sensor signals to minimize the effects of extraneous influence quantities that introduce measurement errors, or to correct the density reading to a standard reference temperature or pressure. Dedicated microprocessors have further enhanced multiple input signal processing and error compensation techniques.

NOTE 2 In this standard, the term “density” means the density of the irradiated material being measured. It is used interchangeably to mean mass per volume or per cent solids. Radiometric sensors in density applications generally measure mass attenuation of a photon beam.

The object of this standard is to establish definitions, specifications and test methods for nuclear density gauges.

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 60050(394):1995, *International Electrotechnical Vocabulary (IEV) – Chapter 394: Nuclear instrumentation – Instruments*

IEC 60359:1987, *Expression of the performance of electrical and electronic measuring equipment*

Amendment 1: 1991

IEC 60405:1972, *Nuclear instruments – Constructional requirements to afford personal protection against ionizing radiation*

IEC 60476:1993, *Nuclear instrumentation – Electrical measuring systems and instruments utilizing ionizing radiation sources – General aspects*

IEC 61336:1996, *Nuclear instrumentation – Thickness measurement systems utilizing ionizing radiation – Definitions and test methods*

ISO 2919:1999, *Radiation protection – Sealed radioactive sources – General requirements and classification*

ISO 7205:1986, *Radionuclide gauges – Gauges designed for permanent installation*

ISO 9978:1992, *Radiation protection – Sealed radioactive sources – Leakage test methods*

3 Definitions

For the purposes of this International Standard, the following definitions apply:

3.1 Definitions relating to the apparatus

3.1.1

density gauge

measuring assembly having an ionizing radiation source and designed to determine the average density (or per cent solids) of a homogeneous material or of a heterogeneous mixture, within a defined configuration, using the variation of the attenuation or backscatter of the ionizing radiation [IEC 60476, definition 3.1.2, modified; IEC 394-17-06, modified]

3.1.2

transmission density gauge

density gauge that utilizes the radiation transmitted through the material being measured. The source and detector are on opposite sides of the material being measured

3.1.3

backscatter measurement system

density gauge that utilizes the ionizing radiation backscattered by the material being measured. The source and detector are positioned on the same side of the material being measured

3.1.4

mass flow measurement system

density gauge in conjunction with a flow-measuring device providing a mass per unit time or total throughput of a suspended solid

3.1.5

measuring head

subassembly comprising the radiation sources contained in an emitting assembly, the radiation detectors contained in a receiving assembly and associated devices [IEC 61336, definition 1.3.5, modified; IEC 60476, definition 3.1.7, modified]

3.1.6

electronic measuring subassembly

subassembly which, by means of incorporated electrical or electronic devices, serves to process the electrical quantities delivered by the measuring head and to supply electrical quantities having convenient values for measurement purposes [IEC 61336, definition 1.3.6, modified]