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Nuclear instrumentation – Constructional requirements and classification of radiometric gauges

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NUCLEAR INSTRUMENTATION – CONSTRUCTIONAL REQUIREMENTS AND CLASSIFICATION OF RADIOMETRIC GAUGES

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62598 has been prepared by IEC technical committee 45: Nuclear instrumentation.

This standard cancels and replaces the second edition of IEC 60405, issued in 2003. It constitutes a technical revision (see Introduction).

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

FDIS	Report on voting
45/718/FDIS	45/721/RVD

Full information on the voting for the 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 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

This International Standard is based on the second edition of IEC 60405 which was published in 2003. It modifies or supplements it with additional provisions, where required by current needs.

Compared to the second edition of IEC 60405, the following major changes have been made:

– Introduction of Category C for stand alone source housings intended for fixed radiometric gauges and associated test procedures.

– The system classification code has been amended by one digit indicating the applied revision of IEC 62598 and by a second digit indicating the fire test conditions.

– The term dose rate class shall be used instead of radiation protection class. Class 7, or alternatively E, represents the current ICRP regulations.

– Introduction of fire resistance classes.

– Revision of the procedure for dose equivalent measurements.

– Addition of Annex A (informative) "Guidelines for the installation of radiometric gauges".

NUCLEAR INSTRUMENTATION – CONSTRUCTIONAL REQUIREMENTS AND CLASSIFICATION OF RADIOMETRIC GAUGES

1 Scope and object

This International Standard applies to the manufacture and installation of electrical measuring systems and instruments utilizing radioactive sources (radiometric gauges, hereinafter called gauges). It also applies to source housings intended for use in the aforementioned measuring systems. This standard applies to equipment, which is not related to power production or to the fuel cycle.

It does not apply to portable gauges which, because of their construction and purposes for use, are intended to be operated as mobile equipment and it does not apply to gauges operated with X-ray tubes, but it can be analogously applicable to these gauges.

The object of this standard is to specify constructional requirements for the design of instruments utilizing radioactive sources in regard of radiation protection. This standard does not take into account mechanical or electrical hazards.

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.

IEC 60050-394:2007, *International Electrotechnical Vocabulary (IEV) – Part 394: Nuclear instrumentation – Instruments, systems, equipment and detectors*

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

IEC 60692:1999, *Nuclear instrumentation – Density gauges utilizing ionizing radiation – Definitions and test methods*

IEC 60846-1:2009, *Radiation protection instrumentation – Ambient and/or directional dose equivalent (rate) meters and/or monitors for beta, X and gamma radiation – Part 1: Portable workplace and environmental meters and monitors*

IEC 60846-2:2007, *Radiation protection instrumentation – Ambient and/or directional dose equivalent (rate) meters and/or monitors for beta, X and gamma radiation – Part 2: High range beta and photon dose and dose rate portable instruments for emergency radiation protection purposes*

IEC 60982:1989, *Level measuring systems utilizing ionizing radiation with continuous or switching output*

IEC 61005:2003, *Radiation protection instrumentation – Neutron ambient dose equivalent (rate) meters*

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements*

IEC 61326 (all parts), *Electrical equipment for measurement, control and laboratory use – EMC requirements*

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

ISO 361:1975, *Basic ionizing radiation symbol*

ISO 921:1997, *Nuclear energy – Vocabulary*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions as specified in ISO 921, IEC 60050-394 and IEC 60476, as well as the following apply.

3.1
collimation device
device for restricting the radiation in one or more directions

3.2
detector housing
that portion of the measuring head that includes the detector

NOTE This assembly may be incorporated with the source housing, especially in the case of a back-scatter measurement system.

3.3
measuring head
subassembly comprising one or several radioactive sources and detectors along with compensation sensors, if necessary, and devices that can be used to measure and correct the effects of undesirable influences

NOTE The measuring head may consist of separate source-housing and detector-housing subassemblies and it may include electronic devices for signal processing.

3.4
permanently installed radiometric gauge
radiometric gauge that is permanently installed at the measuring location

NOTE The measuring location may also be situated on mobile equipment (e.g., on a ship or a vehicle). The detector housing and the source housing may be installed both rigidly fixed and movable. The mobility of the system is limited and determined by the purpose for which it was designed.

3.5
radiometric gauge
control and measuring assembly consisting of at least one radioactive source, at least one detector and the mechanical devices required for non-destructive measurement of a process quantity

3.6
sealed source
radioactive source that is sealed in a solid and inert capsule or is permanently incorporated in solid and inert materials so that dispersion of radioactive substances under normal conditions of use is substantially prevented; at least one dimension shall be ≥ 0,2 cm