

Nuclear power plants — Instrumentation and control systems important to safety — Plant-wide radiation monitoring

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Summary of pages

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Systèmes d'instrumentation et de contrôle-
commande importants pour la sûreté –
Surveillance des rayonnements
sur l'ensemble du site d'une installation**

**Nuclear power plants –
Instrumentation and control systems
important to safety –
Plant-wide radiation monitoring**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

NUCLEAR POWER PLANTS – INSTRUMENTATION AND CONTROL SYSTEMS IMPORTANT TO SAFETY – PLANT-WIDE RADIATION MONITORING

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 61504 has been prepared by subcommittee 45A: Reactor instrumentation, of IEC technical committee 45: Nuclear instrumentation.

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

FDIS	Report on voting
45A/376/FDIS	45A/385/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 3.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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- withdrawn;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

INTRODUCTION

Advances in distributed computer system technology have led to the introduction of computer-based centralized radiation monitoring systems into nuclear facilities. IEC 61559 was introduced in 1996 to address centralized radiation monitoring systems in non-reactor nuclear facilities. That standard primarily focused upon category C functions, such as area monitoring and excluded nuclear power plant applications. As IEC 61559 was being released, subcommittee 45A determined that it would be useful to develop a similar standard to address nuclear power plant application of plant-wide radiation monitoring systems. The intent was that IEC 61504 would roughly parallel IEC 61559 but recognize the higher hazard posed by nuclear power plants as compared with other nuclear facilities and would integrate or directly reference the other nuclear power standards that are relevant to plant-wide radiation monitoring.

As IEC 61559 was in the final release process, subcommittee 45B recognized the need to broaden the scope of that standard to include other applications of centralized radiation monitoring in nuclear facilities. These broader applications included, for example, monitoring of plant discharges, interlock of control functions, and environmental monitoring. An amendment 1 to IEC 61559 is also being developed to cover these broader functions, including category B functions, in non-reactor nuclear facilities. These standards represent a common philosophy and, as far as possible, use common nomenclature.

During the development of IEC 61504, subcommittee 45A was developing a number of other relevant standards such as IEC 61513 and the supplement to IEC 61226. The user of IEC 61504 should consult these additional standards, once they are issued, for additional guidance that may prove useful to apply to plant-wide radiation monitoring systems.

NUCLEAR POWER PLANTS – INSTRUMENTATION AND CONTROL SYSTEMS IMPORTANT TO SAFETY – PLANT-WIDE RADIATION MONITORING

1 Scope and object

This International Standard provides guidance on the design principles and performance criteria for computer-based radiation monitoring systems (RMS). Such systems are provided to integrate the monitoring of plant-wide processes, effluent streams, and area radiation.

This standard describes the integration of functions including equipment such as those described in standards IEC 60761-1, IEC 60761-2, IEC 60761-3, IEC 60761-4, IEC 60761-5, IEC 60768, IEC 60910, IEC 60951-1, IEC 60951-2, IEC 60951-3, IEC 60951-4, IEC 60951-5, IEC 61031, and IEC 61250 into a plant-wide digital system. The requirements of system-level components (central computer, subsystem computers, operator consoles, and inter-connections) are discussed. For detection assemblies, processing units and alarm units, this standard contains only the requirements needed to allow connection into the centralized system. The standards referenced above contain the specific requirements for these components.

This standard provides criteria for the interface between monitors of different safety classes. This standard integrates data processing, storage, optimization, and correlation of data flow and displays.

This standard defines the communication criteria to link distributed radiation monitoring equipment in the plant with an open architecture configuration. This standard does not apply to the design and testing of detection and measurement assemblies and subassemblies except as necessary to define the interface with the plant-wide system.

Certain RMS functions, or a complete centralized radiation monitoring system may be entirely implemented with direct-connected analogue/relay technology. This standard does not apply to such functions or systems.

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(393):1996, *International Electrotechnical Vocabulary (IEV) – Chapter 393: Nuclear instrumentation – Physical phenomena and basic concepts*

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

IEC 60761-1, *Equipment for continuously monitoring radioactivity in gaseous effluents – Part 1: General requirements*

IEC 60761-2, *Equipment for continuously monitoring radioactivity in gaseous effluents – Part 2: Specific requirements for aerosol effluent monitors*

IEC 60761-3, *Equipment for continuously monitoring radioactivity in gaseous effluents – Part 3: Specific requirements for noble gas effluent monitors*

IEC 60761-4, *Equipment for continuously monitoring radioactivity in gaseous effluents – Part 4: Specific requirements for iodine monitors*

IEC 60761-5, *Equipment for continuously monitoring radioactivity in gaseous effluents – Part 5: Specific requirements for tritium effluent monitors*

IEC 60761-6, *Equipment for continuously monitoring radioactivity in gaseous effluents – Part 6: Specific requirements for transuranic aerosol effluent monitors*

IEC 60768, *Process stream radiation monitoring equipment in light water nuclear reactors for normal operating and incident conditions*

IEC 60780, *Nuclear power plants – Electrical equipment of the safety system – Qualification*

IEC 60880, *Software for computers in the safety systems of nuclear power stations*

IEC 60910, *Containment monitoring instrumentation for early detection of developing deviations from normal operation in light water reactors*

IEC 60951-1, *Radiation monitoring equipment for accident and post-accident conditions in nuclear power plants – Part 1: General requirements*

IEC 60951-2, *Radiation monitoring equipment for accident and post-accident conditions in nuclear power plants – Part 2: Equipment for continuously monitoring radioactive noble gases in gaseous effluents*

IEC 60951-3, *Radiation monitoring equipment for accident and post-accident conditions in nuclear power plants – Part 3: High range area gamma radiation dose rate monitoring equipment*

IEC 60951-4, *Radiation monitoring equipment for accident and post-accident conditions in nuclear power plants – Part 4: Process stream in light water nuclear power plants*

IEC 60951-5, *Radiation monitoring equipment for accident and post-accident conditions in nuclear power plants – Part 5: Radioactivity of air in light water nuclear power plants*

IEC 60987, *Programmed digital computers important to safety for nuclear power stations*

IEC 61031, *Design, location, and application criteria for installed area gamma radiation dose rate monitoring equipment for use in nuclear power plants during normal operation and anticipated operational occurrences*

IEC 61187:1993, *Electrical and electronic measuring equipment – Documentation*