

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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**Nuclear power plants – Instrumentation and control important to safety –  
Resistance temperature detectors**

**Centrales nucléaires de puissance – Instrumentation et contrôle-commande  
importants pour la sûreté – Sondes à résistance**





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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

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### FOREWORD

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IEC 62397 has been prepared by subcommittee 45A: Instrumentation, control and electrical power systems of nuclear facilities, of IEC technical committee 45: Nuclear instrumentation. It is an International Standard.

This second edition cancels and replaces the first edition, published in 2007; it also cancels and replaces the first edition of IEC 61224:1993. This edition constitutes a technical revision.

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

- 1) The definitions, terms, references, test methods, test requirements and other contents in IEC 61224 are incorporated into the corresponding clauses of IEC 62397, including the situ response time test methods;
- 2) Move the second paragraph of Scope to 4.1 and add "certain design extension conditions" in the text;
- 3) Add the definition of temperature units of ITS-90;

- 4) Add reference standards, including IEC 60737:2010, IEC 60751:2022, IEC 62765-2:2019, IEC 62342:2007, IEC 62385:2007, IEC 61298-2, IEC 60068-2;
- 5) Update the reference IEC 60780 to IEC/IEEE 60780-323:2016; update the reference IEC 60980 to IEC/IEEE 60980-344:2020;
- 6) Delete the outdated definition of "accuracy (measurement)" and modify the definition of "calibration", "drift" and "response time";
- 7) Add the terms and definitions of "cross-calibration (cross-validation)", "self-heating index", "tolerance of RTD", "sheath", "*in situ* measurement", and some abbreviated terms (e.g., NPP);
- 8) Delete the reference values of failure rate, radiation dose, contact resistance and leak rate, environmental conditions and test conditions in 4.2, 4.3.2, 4.4.2.2, 4.6, 5.4.7;
- 9) Clarify 4.3.1;
- 10) Add "fast neutron damage" and " $\beta$  irradiation" in 4.3.2 and correct the requirement for material change to be "shall not";
- 11) Replace platinum description with general material requirement in 4.3.3;
- 12) Delete the statement on sealant elements and flat sealants;
- 13) Add labels of dust cover, spring and extension tube in Figure 3 and Figure 4 and correct a typo in Figure 6;
- 14) Add electrical connector configuration requirement referring to IEC 60751 in 4.4.2.1;
- 15) Modify the temperature rating requirement of type I connector in 4.4.2.2 and add the definition of manufacturer in the footnote;
- 16) Add the type of connection for RTD mounted in pipe and relax the statement on spring force in 4.4.3.1;
- 17) Modify the type I and type II statement in 4.4;
- 18) Change the subtitle to "Manufacturing Quality" and add detailed requirements in 4.5;
- 19) Considering the application for difference types of nuclear power plants, in 4.6 and 4.7 introduce the concept that the user shall specify the requirements, test method and acceptance criteria for tests depending on the application of the subject RTD;
- 20) Delete the last three paragraphs in 4.6;
- 21) Add detailed performance requirements in 4.7 and move the test requirements to a new subclause 5.4 "Test method";
- 22) Replace "330 °C" in the standard with the (highest) operating temperature;
- 23) Add a new subclause "4.7.1 General" to describe the general requirements and restate *in situ* response time measurement requirement;
- 24) Add the Callendar formula for temperature range of -200 °C to 0 °C and delete the temperature tolerance values and refer to IEC 60751 in 4.7.3;
- 25) Supplement detailed requirements of "self-heating error" in 4.7.4;
- 26) Change the subtitle to "thermal response time" in 4.7.5 and delete the definition of thermal response time;
- 27) Relax the performance requirements to "should" in 4.7.8, 4.7.9, 4.7.10, 4.7.11 and 4.7.13, and relax the steam test requirement to only RTDs used in steam environment;
- 28) Merge "Insulation resistance test after storage" into "Electrical insulation resistance", reduce the requirement and change insulation resistance under 200 °C to be 10 M $\Omega$  in 4.7.7;
- 29) Add "Dielectric inspection" and "Hydraulic strength" as 4.7.12 and 4.7.13;
- 30) Revise description on *in situ* response time testing in 4.7.14;
- 31) Add identifications in 4.8;
- 32) Delete the insulation breakdown test;
- 33) Refer to IEC 60751 for self-heating test in 5.4.3;

- 34) Delete the vibration spectrum for vibration test, and refer to IEC 60068-2-6 in 5.4.7;
- 35) Revise thermal cycling test requirement to be more general and refer to IEC 60068-2-30 in 5.4.9;
- 36) Add 5.4.13 "Cross-calibration testing";
- 37) Add dielectric inspection test and hydraulic test as product tests in 5.5 and note that the user can specify the test requirement;
- 38) Add dielectric inspection test and hydraulic test as qualification tests in 5.6, note that the user can specify the test requirement, and refer to IEC/IEEE 60780-323 and IEC/IEEE 60980-344 or pertinent national guides and regulations;
- 39) Change title from "Technical information required" to "Documentation" of Clause 6 and add "the regular maintenance strategy" in performance specification;
- 40) Add an informative annex "Annex A *In situ* response time test methods" to include the related information from IEC 61224, update figures and cross-references, and cite it in 4.7.13 and 5.4.12;
- 41) Add the IAEA documents in bibliography.

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

Draft	Report on voting
45A/1447/FDIS	45A/1454/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

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