



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 41142-2021

**Hardware design requirements of computer-based
instrumentation and control systems important to safety for
nuclear power plants**

Issued on: December 31, 2021

Implemented on: July 1, 2022

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

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foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules of Standardization Documents"

drafted:

This document uses the redrafted law to modify and adopt IEC 60987:2007 "Computer-based system for instrumentation and control important to the safety of nuclear power plants"

Systematic Hardware Design Requirements":

Compared with IEC 60987:2007, this document has many adjustments in structure:

Appendix A lists this document and IEC 60987:2007 chapter:

Bar number change comparison list:

The technical differences between this document and IEC 60987:2007 and their reasons are as follows:

--- Regarding normative reference documents, this document has made adjustments with technical differences to adapt to the technical conditions of our country and the circumstances of the adjustment:

The situation is reflected in Chapter 2 "Normative References", and the specific adjustments are as follows:

- * Replace IEC 60780 with GB/T 12727 and GB/T 36044 (see Chapter 8);
- * Replacing IEC 61513 with NB/T:20026-2014 which has been modified to adopt international standards (see 7:9, 10:4, 12:2);
- * Replacing IEC 60880 with NB/T:20054 modified to adopt international standards (see 4:4, 5:2:3, 7:9);
- * Replacing IEC 62138 with NB/T:20055 modified to adopt international standards (see 4:4, 5:2:3, 7:9);

* Replace IAEANS-G-1:3 with GB/T 13626 (see 5:3:2):

--- Deleted some terms and definitions in IEC 60987:2007 to meet the needs of the standard;

--- Added the terms "computer-based system" and "computer-based system important to safety" (see 3:1 and 3:2) to accommodate the standard need;

--- Change the security classification of the system, from level 1 and level 2 to security level systems and other systems (see 4:4, 5:2:1, 5:3:5, 7:3:1, 7:3:2, 10:7) to adapt to the current state of technology in my country;

--- Deleted "Compliance with ISO 9001 is an acceptable method to meet these requirements" in 4:3, which is consistent with the quality of my country's nuclear power plants:

Quantity assurance requirements are inconsistent (see 4:3 of IEC 60987:2007);

--- Deleted "International" in 9:1:9 (see 9:1:9 of IEC 60987:2007/Amd1:2013), to apply to my country's certified national conditions;

--- Changed the requirements for dimensional control and sampling inspection plan in 9:5:4:5 (see IEC 60987:2007/Amd1:2013

9:5:4:5) to adapt to the technical conditions of our country and increase the operability:

The following editorial changes have been made to this document:

--- Incorporated the amendments to IEC 60987:2007/Amd1:2013, and the outer margins of the clauses involved use vertical

Double lines (||) are marked;

--- Editorial changes were made to the scope of Chapter 1;

--- Deleted the system lifetime overview, qualification diagram and maintenance procedure examples (see IEC 60987:2007 Appendix A, Appendix B and Appendix C);

--- Revised references:

Please note that some content of this document may be patented: The issuing agency of this document assumes no responsibility for identifying patents:

1 Scope

This document specifies the hardware design requirements for computer-based systems important to safety in nuclear power plants, including hardware requirements, design and development, verification

And confirmation, identification, manufacturing, installation and commissioning, operation, maintenance and other related content:

This document applies to the design of computer-based system hardware important to safety in nuclear power plants and the evaluation of pre-developed hardware (including firmware);

It is also applicable to the design process and design verification of programmable logic devices:

This document does not apply to computer hardware facilities used for software download and inspection:

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, dated citations

documents, only the version corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to

this document:

GB/T 12727 Appraisal of safety-grade electrical equipment for nuclear power plants

GB/T 13626 Single Fault Criterion Applied to Nuclear Power Plant Safety System

GB/T 36044 Code for Appraisal of Electrical Equipment Important to Safety in Nuclear Power Plants

NB/T:20026-2014 General requirements for instrumentation and control systems important to safety in nuclear power plants (IEC 61513:2011, MOD)

NB/T:20054 Computer software for performing Class A functions for instrumentation and control systems important to safety in nuclear power plants (NB/T:20054-2011,

IEC 60880:2006, MOD)

NB/T:20055 Computer software for instrumentation and control systems important to safety in nuclear power plants to perform Class B and Class C functions (NB/T:20055-

2011, IEC 62138:2004, MOD)

3 Terms and Definitions

The following terms and definitions apply to this document:

3:1

computer-basedsystem

Instrumentation and control (I

system:

Note: Computer-based systems are equivalent to digital systems, software-based systems, and programmable systems:

[Source: NB/T:20026-2014, 3:11]

3:2

computer-basedsystemimportanttosafety

System safety functions are systems important to safety in nuclear power plants that are implemented through built-in computer systems:

[Source: HAD102/16-2004, Glossary Explanation]

3:3

firmware firmware

A combination of hardware devices and computer instructions and data residing in read-only software in the device: