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

GB/T 21109.3-2026

Replacing GB/T 21109.3-2007

**Functional safety of safety instrumented systems in the
process industry sector - Part 3: Guidance for the determination
of the required safety integrity levels**

过程工业领域安全仪表系统的功能安全 第3部分：确定要求的安全完整性等级的
指南

(English Translation)

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Table of Contents

Preface

Introduction

1 Scope

2 Normative References

3 Terms, Definitions, and Abbreviations

Appendix A (Informative) Risk and Safety Integrity - General Guidance

A.1 Overview

A.2 Necessary risk reduction

A.3 The Role of Safety Instrumented Systems

A.4 Risk and Security Integrity

Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is Part 3 of GB/T 21109 "Functional Safety of Safety Instrumented Systems in Process Industries". GB/T 21109 has been...

The following sections were published.

---Part 1: Framework, Definitions, System, Hardware, and Application Programming Requirements;

---Part 2: Application Guidelines for GB/T 21109.1-2022;

---Part 3: Guidelines for determining required security integrity levels.

This document replaces GB/T 21109.3-2007 "Functional safety of safety instrumented systems in process industries - Part 3: Determining requirements".

The "Guidelines on Security Integrity Levels" differs from GB/T 21109.3-2007 in that, aside from structural adjustments and editorial changes, the main technical changes are as follows.

as follows.

---Added explanations of the appendix to this document and the application of specific methods (see Chapter 3);

---Appendix A has been modified. The original Chapter 3 has been reorganized into Appendix A of this document, and a section on "Dangerous Events and Dangerous Situations" has been added.

Description of "situation and injury incident" (see Appendix A, Chapter 3, 2007 edition);

---The legend regarding the relationship between GB/T 21109, DIN V19250, and VDI/VDE 2180 has been removed (see the 2007 edition).

Figure E.2).

This document adopts IEC 61511-3:2017 "Functional safety - Safety instrumented systems in process industries - Part 3: Determining requirements" the guidelines for security integrity levels.

The following editorial changes have been made to this document.

---To harmonize with existing standards, the standard name has been changed to "Functional safety of safety instrumented systems in the process industry - Part 3: Safety".

Guidelines for defining required security integrity levels.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the China Machinery Industry Federation.

This document is under the jurisdiction of the National Technical Committee on Standardization of Industrial Process Measurement, Control and Automation (SAC/TC124).

Introduction

In process industries, Safety Instrumented Systems (SIS) used to perform Safety Instrumented Functions (SIFs) have been in use for many years. To ensure the instruments are effective...

For safety instrument functions, the most important thing is that the instrument must meet certain minimum standards and performance levels.

GB/T 21109 describes the application of safety instrumented systems in the process industry. It involves performing a process hazard and risk assessment to derive...

Specifications for safety instrumented systems. The contributions of other safety systems are considered only when relevant to the performance requirements of the safety instrumented system.

The instrumentation system includes all devices and subsystems, from sensors to final components, necessary to perform safety instrumented functions.

GB/T 21109 includes the following parts.

---Part 1: Framework, Definitions, System, Hardware, and Application Programming Requirements. The aim is to define the specifications, design, and requirements for Safety Instrumented Systems (SIS).

Design, installation, operation, and maintenance requirements to ensure that the system enables the process to reach or remain in a safe state.

---Part 2: Application Guidelines for GB/T 21109.1-2022. The purpose is to provide guidance on safety devices as defined in GB/T 21109.1.

Guidelines for the specification, design, installation, operation, and maintenance of instrumented safety systems and related safety instrumented systems.

---Part 3: Guidelines for Determining Required Safety Integrity Levels. The aim is to determine the safety integrity level of safety instrumented functions.

Various different methods.

GB/T 21109 includes two concepts that form the basis of the application. security lifecycle and security integrity level.

GB/T 21109 addresses safety instrumented systems based on the use of electrical (E)/electronic (E)/programmable electronic (PE) technologies. In logic solution...

When the calculator uses other technologies, the basic principles of GB/T 21109 must be applied to ensure that functional safety requirements are met. GB/T 21109 it also covers sensors and final components of safety instrumented systems, regardless of the technology used. GB/T 21109 is within the framework of GB/T 20438.

It is designed specifically for process applications within the framework.

GB/T 21109 provides a method for achieving minimum standards in SIS safety lifecycle activities. This method enables reasonable consistency.

The use of technical strategies.

In most cases, inherent safety process design can achieve good safety. When necessary, one or more protection systems can be combined.

To mitigate identified residual risks, a comprehensive approach is needed. Protection systems can rely on various technologies (chemical, mechanical, hydraulic, pneumatic, electrical, and electromechanical).

(Including programmable electronic components). Any security strategy needs to be determined for each individual SIS, taking into account other protection systems.

To implement this method, GB/T 21109 requires.

---Perform a hazard and risk assessment to determine overall safety requirements;

- Assign safety requirements to the safety instrumented system;
- Works within a framework that applies to all instrumentation measures for achieving functional safety;
- Details how certain activities (such as safety management) can be used, which are applicable to all approaches to achieving functional safety;
- Includes all SIS security lifecycle phases from initial concept, design, implementation, operation and maintenance until decommissioning;
- Enables existing or new national standards specifically for process industries to be harmonized with GB/T 21109.

GB/T 21109 aims to achieve a high degree of consistency in the process industry (such as basic principles, terminology, and information). This will bring safety and it has both economic and social benefits.

Regarding authority, process safety design, process safety management, or other [mechanisms] have been established at the management level (such as national, provincial, or autonomous region levels).

Under specified circumstances, these requirements should take precedence over those defined in GB/T 21109.

GB/T 21109.3 provides guidance on determining the SIL (Safety Integrity Level) requirements in hazard and risk assessments. This document aims to provide guidance on various hazards.

A broad overview of risk assessment methods is provided. However, the information provided is not detailed enough to implement these methods.

First, we need to review the concept and determination requirements of SIL given in GB/T 21109.1-2022.GB/T 21109.3...

The informative appendix describes the following.

Appendix A provides information common to each hazard and risk assessment method shown in this document.

Appendix B provides an overview of semi-quantitative methods for determining the required SIL.

Appendix C provides an overview of the security layer matrix method used to determine the required SIL.

Appendix D provides an overview of the method for determining the required SIL using a semi-quantitative risk map approach.

Appendix E provides an overview of the method for determining the required SIL using the