

ICS 29.020
CCS J 07



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

GB/T 34136-2017

**Electrical safety of machinery -- Guidance on the application of
GB 28526 and GB/T 16855.1 in the design of safety-related
control systems for machinery**

机械电气安全 GB 28526和GB/T 16855.1用于机械安全相关控制系统设计的应用
指南

(English Translation)

Issued on: July 31, 2017

Implemented on: February 1, 2018

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the People's Republic of China, Standardization
Administration of the People's Republic of China**

Table of Contents

- 1 Scope
- 2 Overview
- 3 Standard comparison
- 4 Risk assessment and required performance allocation
- 5 Specification of safety requirements
- 6 Performance Target Assignment. PL vs. SIL
- 7 System Design
 - 7.1 General requirements for system design using GB 28526 and GB/T 16855.1
 - 7.2 Estimation of PFHD and MTTFd and Use of Troubleshooting
 - 7.3 System design using subsystems or SRP/CS conforming to GB 28526 or GB/T 16855.1
 - 7.4 System design using subsystems or SRP/CS already designed by other standards
- 8 Examples
 - 8.1 Overview

1 Scope

This standard specifies the application guidelines of GB 28526 and GB/T 16855.1 for the design of mechanical safety-related control systems.

2 Overview

2.1

GB 28526 and GB/T 16855.1 both stipulate the relevant requirements for the design and implementation of machinery safety-related control systems. These two standards Although the methods specified in the standard are different, when used correctly, the risk can be reduced to the corresponding level.

2.2

These two standards classify safety-related control systems that perform safety functions according to the probability of dangerous failure per hour.

GB/T 16855.1 is divided into 5 performance levels (PL). a, b, c, d and e; while GB 28526 is divided into 3 safety integrity levels (SIL).

1, 2 and 3.

2.3

Safety requirements for safety-related control systems specified by technical committees of product standards (Category C), it is recommended that these technical committees comply with PL Classify with the confidence level required by SIL.

2.4

Mechanical designers can choose GB 28526 or GB/T 16855.1 standard according to specific application characteristics.

2.5

Which standard to choose and use needs to be determined by considering the following factors, such as.

---In the design of mechanical safety-related control systems, previous knowledge and experience are based on the classes described in GB/T 16855.1-2008.

different concepts, it may mean that GB/T 16855.1-2008 is more appropriate;

--- For safety-related control systems based on media other than electrical technology, GB/T 16855.1 is more appropriate;

--- When the user requires the term SIL to prove the safety integrity level of the mechanical safety-related control system, the GB 28526 update is used.

Suitable;

--- When mechanical safety-related control systems are used, for example, in the process industry, when other safety-related systems (such as complying with GB/T 21109 the safety instrumented system) is characterized by SIL, then GB 28526 is more appropriate.

3 Standard comparison

3.1

The technical requirements of GB/T 16855.1 and GB 28526 are compared as follows.

---the term;

--- risk assessment and performance allocation;

--- Specification of safety requirements;

--- system integrity requirements;

---Diagnostic function;

--- Software security requirements.

3.2

In addition, both standards give the probability of dangerous failure per hour (PFHD) and the mean time between failures for evaluation.

Simplified mathematical formula for (MTTFd).

3.3

The standard comparison conclusions are as follows.

---By integrating non-complex safety-related electrical control systems designed in accordance with GB 28526 or GB/T 16855.1 standards (SRECS) subsystems or control system safety-related parts (SRP/CS), designed using either of these two standards all safety-related control systems can achieve an acceptable level of functional safety;

--- By integrating subsystems of electrical/electronic/programmable electronic equipment designed in accordance with GB/T 20438, these two standards are also available to provide design solutions for complex SRECS and SRP/CS;

---Currently, it is meaningful for the machinery industry to use these two standards, and experience shows that users will benefit. Actual application for a reasonable period of time with feedback, it is necessary to promote the merger of the two standards of GB 28526 and GB/T 16855.1;

---Due to differences in details, and some concepts (e.g. functional safety management) further work is required to establish the respective design methods Correspondence between laws and some technical requirements.

4 Risk assessment and required performance allocation

4.1

Compare methods of assigning SIL and/or PLr to specific safety functions. One of the respective methods provided in Appendix A of each standard There is a good level of correspondence.

4.2

Regardless of the method used, care should be taken to ensure that appropriate judgments are made on the risk parameters to determine what is applicable to the specific safety function.

SIL and/or PLr. This judgment is best done with the participation of relevant personnel (such as design, maintenance and operators) to ensure a correct understanding of the machinery possible danger.

4.3

See GB/T 15706 and GB/T 20438.5 for more information on the risk assessment process and allocation of performance objectives.

5 Specification of safety requirements

5.1

The respective methods of GB/T 16855.1 and GB 28526 require that the safety function be implemented by the safety-related control system in the first stage.

5.2

Each safety function performed by the control circuit should be evaluated, for example, using Appendix A of GB/T 16855.1 or GB 28526.

Appendix A. It should be determined what level of risk reduction the specific safety function of each machine provides, and in turn the controls that perform that safety function.

The confidence level required by the circuit.

5.3

The given confidence level of PL and/or SIL is related to the specific safety function.

5.4

The information related to the safety function shown below should be provided by the product standard (Category C).

Safety functions to be performed by the control circuit.

--- the name of the safety function;

--- a description of the function;

---Performance level required by GB/T 16855.1.PLra~e; or/and

--- According to the safety integrity level required by GB 28526.SIL1~3.

6 Performance Target Assignment. PL vs. SIL

Table 1 presents the relationship between PL and SIL based on the average probability of dangerous failure per hour. However, for these probabilistic objectives, two

This standard also specifies other requirements (such as system safety integrity, etc.), which also apply to safety-related control systems. The harshness of these requirements the grades are related to the respective PL and SIL.