

ICS 13.110



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

GB/T 15706-2012

Replacing GB/T 15706.1-2007; GB/T 15706.2-2007; GB/T 16856.1-2008

**Safety of machinery -- General principles for design -- Risk
assessment and risk reduction**

机械安全 设计通则 风险评估与风险减小

(English Translation)

Issued on: November 5, 2012

Implemented on: March 1, 2013

Issued by: SAMR; SAC

Table of Contents

Foreword	
Introduction	
1 Scope	
2 Normative references	
3 Terms and Definitions	
4 Risk assessment and risk reduction strategies	
5 Risk Assessment	
5.1 Overview	
5.2 Risk assessment information	
5.3 Determination of mechanical restrictions	
5.3.1 Overview	
5.3.2 Restrictions on use	
5.3.3 Space restrictions	
5.3.4 Time Limit	
5.3.5 Other restrictions	
5.4 Hazard Identification	
5.5 Risk estimates	
5.5.1 Overview	
5.5.2 Risk element	
5.5.3 Aspects to be considered in the risk estimation process	
5.6 Risk Assessment	
5.6.1 Overview	
5.6.2 Adequate risk reduction	
5.6.3 Risk comparison	
6 Risk reduction	
6.1 Overview	
6.2 Intrinsically safe design measures	
6.2.1 Overview	
6.2.2 Considerations of geometric and physical characteristics	
6.2.3 General technical knowledge considering mechanical design	
6.2.4 Choice of applicable technology	
6.2.5 Direct mechanical action principle	

6.2.6 Stability requirements	
6.2.7 Maintenanceability regulations	
6.2.8 Follow ergonomic principles	
6.2.9 Electrical hazards	
6.2.10 Pneumatic and hydraulic hazards	
6.2.11 Applying intrinsically safe design measures to control systems	
6.2.12 Minimizing the probability of failure of a safety function	
6.2.13 Exposure to hazards through equipment reliability limits	
6.2.14 Exposure to hazards by mechanization or automation of loading (loading)/unloading (unloading) operations	
6.2.15 Place the location of the set and maintenance points outside the danger zone to limit exposure to hazards	
6.3 Safety protection and supplementary protection measures	
6.3.1 General requirements	
6.3.2 Selection and use of guards and guards	
6.3.3 Design requirements for guards and guards	
6.3.4 Reducing emissions through safety protection	
6.3.5 Supplementary protective measures	
6.4 Usage Information	
6.4.1 General requirements	
6.4.2 Location and Attributes of Information Used	
6.4.3 Signal and warning devices	
6.4.4 Signs, symbols (pictograms) and written warnings	
6.4.5 Accompanying documents (especially the user manual)	
7 Risk assessment and risk reduction documents	
Appendix A (informative) Graphical representation of the machine	
Appendix B (Informative) Examples of Hazardous, Hazardous, and Hazardous Events	
Appendix C (informative) Chinese-English index for specific terms and expressions of this standard	50
Reference	

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB/T 15706.1-2007 "Basic Concepts and Design Principles of Mechanical Safety Part 1: Basic Terms and Methods",

GB/T 15706.2-2007 "Basic Concepts and Design of Mechanical Safety - Part 2: Technical Principles" and GB/T 16856.1-2008 Mechanical Safety Risk Assessment Part 1: Principles. This standard integrates GB/T 15706.1-2007, GB/T 15706.2-2007 and Technical content of GB/T 16856.1-2008, and GB/T 15706.1-2007, GB/T 15706.2-2007 and GB/T 16856.1-2008, the main technical changes except editorial changes are as follows.

--- Change the standard name to "Mechanical Safety Design General Risk Assessment and Risk Reduction";

--- Change the term "maintenance (machine)" to "maintenance" (see 3.3, 3.3 of GB/T 15706.1-2007);

--- Change the term "legacy risk" to "residual risk" (see 3.13, 3.12 of GB/T 15706.1-2007 and GB/T 16856.1-3.11 of 2008);

--- Change the term "risk assessment" to "risk estimate" (see 3.14, 3.15 of GB/T 15706.1-2007 and GB/T 16856.1-3.15 of 2008);

--- Change the term "risk assessment" to "risk assessment" (see 3.16, 3.16 of GB/T 15706.1-2007 and GB/T 16856.1-3.16 of 2008);

--- Change the term "risk assessment" to "risk assessment" (see 3.17, 3.13 of GB/T 15706.1-2007 and GB/T 16856.1-3.14 of 2008);

--- Replace the term "foreseeable misuse" with "a misunderstanding that can reasonably be foreseen" (see 3.24, 3.23 of GB/T 15706.1-2007 and 3.10) of GB/T 16856.1-2008;

--- Replace the term "actuating device" with "enable device" (see 3.28.2, 3.26.2 of GB/T 15706.1-2007);

--- Change the term "stop-motion control device" to "hold-operate control device" (see 3.28.3, GB/T 15706.1-2007) 3.26.3);

--- Change the term "fault" to "failure" (see 3.37, 3.8 of GB/T 16856.1-2008).

This standard uses the translation method equivalent to ISO 12100:2010 "Mechanical Safety Design General Risk Assessment and Risk Reduction" (English) Text version).

This standard is equivalent to translation ISO 12100:2010. For ease of use, this standard makes the following editorial changes.

--- Revised the expression of the terms in the scope in accordance with the requirements of GB/T 1.1-2009, increasing the scope of application of the standard;

--- Removed the French and German indexes in Appendix C, added Chinese indexes, and reordered according to Chinese Pinyin.

Introduction

The main purpose of this standard is to provide designers with an overall framework and decision-making guides that enable machinery to be designed at the development stage.

Use a safe machine in the range. This standard also provides a strategy for standard setters to develop consistent and appropriate Class B Standard and Class C standards.

The concept of mechanical safety takes into account the ability of the machine to perform its intended function during its life cycle after the risk has been sufficiently reduced.

This standard is the basic standard for all standards in the mechanical safety standard system. The structure of the mechanical safety standard system is as follows.

--- Class A standard (Basic Safety Standard), giving basic concepts, design principles and general characteristics applicable to all machines.

---Class B (General Safety Standard), a type of safety device that covers a safety feature of a machine or has a wide range of use;

- Class B1, specific safety features (such as safety distance, surface temperature, noise) standards;

- Class B2, standard for safety devices (such as two-hand control devices, interlock devices, pressure sensitive devices, and protective devices).

--- Class C (Mechanical Safety Standard), a standard that specifies detailed safety requirements for a particular machine or group of machines. This standard is a Class A standard.

When the content of the C standard is inconsistent with one or more technical provisions of this standard or other Class B standards, the technology of the C standard The regulations are subject to the rules.

It is recommended that this standard be incorporated into a training course or manual so that the designer can master the basic terminology and general design methodology.

When drafting this standard, we have referred to the contents of GB/T 20000.4 as much as possible.

1 Scope

This standard specifies the basic terms, principles and methods used to achieve mechanical safety in the mechanical design process, as well as risk assessment and risk reduction.

Small principles to help designers achieve mechanical safety goals. These principles are based on mechanical design, use, events, accidents and winds.