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**Safety of machinery—Two-hand control
devices—Functional aspects and design
principles**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Health, Labour and Welfare and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from The Japan Machinery Federation (JMF) with a draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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Safety of machinery—Two-hand control devices—Functional aspects and design principles

Introduction

This Japanese Industrial Standard has been prepared based on the first edition of ISO 13851 *Safety of machinery—Two-hand control devices—Functional aspects and design principles* published in 2002 without modifying the technical contents.

1 Scope

This Standard specifies the safety requirements of a two-hand control device and the dependency of the output signal from the input signals.

This Standard describes the main characteristics of two-hand control devices for the achievement of safety and sets out combinations of functional characteristics for three types. It does not apply to devices intended to be used as enabling devices, as hold-to-run devices or as special control devices.

This Standard does not specify with which machines two-hand control devices shall be used. It also does not specify which types of two-hand control device shall be used. Moreover, it does not specify the distance between the two-hand control device and the danger zone (see 9.8).

This Standard provides requirements and guidance on the design and selection (based on a risk assessment) of two-hand control devices including their assessment, the prevention of defeat and the avoidance of faults. It also provides requirements and guidance for two-hand control devices containing a programmable electronic system (see clause 7).

This Standard applies to all two-hand control devices, independent of the energy used, including:

- two-hand control devices which are or are not integral parts of a machine;
- two-hand control devices which consist of one or more than one separate element.

NOTE: The International Standard corresponding to JIS B 9712 is as follows.

ISO 13851:2002 *Safety of machinery—Two-hand control devices—Functional aspects and design principles* (IDT)

In addition, symbol which denote the degree of correspondence in the contents between the relevant International Standard and JIS are IDT (identical), MOD (modified), NEQ (not equivalent) according to ISO/IEC Guide 21.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. If the indication of the year is given to referred

standard, only the edition of indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply. The normative references without the indication of the year apply only to the most recent editions (including amendments).

JIS B 9700-1:2004 *Safety of machinery—Basic concepts, general principles for design—Part 1: Basic terminology, methodology*

NOTE: Corresponding International Standard: ISO 12100-1: 2003 *Safety of machinery—Basic concepts, general principles for design—Part 1: Basic terminology, methodology* (IDT)

JIS B 9700-2:2004 *Safety of machinery—Basic concepts, general principles for design—Part 2: Technical principles*

NOTE: Corresponding International Standard: ISO 12100-2: 2003 *Safety of machinery—Basic concepts, general principles for design—Part 2: Technical principles* (IDT)

JIS B 9705-1:2000 *Safety of machinery—Safety-related parts of control systems—Part 1: General principles for design*

NOTE: Corresponding International Standard: ISO 13849-1: 1999 *Safety of machinery—Safety-related parts of control systems—Part 1: General principles for design* (IDT)

JIS B 9960-1:1999 *Safety of machinery—Electrical equipment of machines—Part 1: General requirements*

NOTE: Corresponding International Standard: ISO 60204-1: 1997 *Safety of machinery—Electrical equipment of machines—Part 1: General requirements* (MOD)

JIS B 9715:2006 *Safety of machinery—Positioning of protective equipment with respect to the approach speeds of parts of the human body*

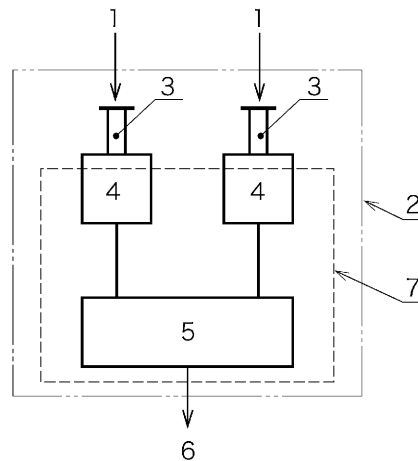
NOTE: Corresponding International Standard: ISO 13855: 2002 *Safety of machinery—Positioning of protective equipment with respect to the approach speeds of parts of the human body* (IDT)

3 Terms and definitions

For the purposes of this Standard, the following terms and definitions apply.

3.1 two-hand control device

a device which requires at least simultaneous actuation by the use of both hands in order to initiate and to maintain, whilst a hazardous condition exists, any operation of a machine thus affording a measure of protection only for the person who actuates it



Key

- | | | | |
|---|--------------------------|---|---------------------|
| 1 | Input signal | 5 | Signal processor(s) |
| 2 | Two-hand control device | 6 | Output signal |
| 3 | Control actuating device | 7 | Logic unit |
| 4 | Signal converter(s) | | |

Figure 1 Schematic representation of a two-hand control device

3.2 input signal

the externally actuated signal applied by hand to a control-actuating device (see figure 1)

3.3 control actuating device

a component of the two-hand control device which senses an input signal from one hand and transmits it to a signal converter (see figure 1)

3.4 simultaneous actuation

the continuing actuation of both control actuating devices during the same time period, whatever the time lag is between the start of one input signal and the start of the other (see figure 2)

3.5 synchronous actuation

a particular case of simultaneous actuation where the time lag between the start of one input signal and the start of the other is less than or equal to 0.5 s (see figure 3)

3.6 signal converter

a component of the two-hand control device which receives an input signal from a control actuating device and which transmits and/or converts this signal into a form acceptable to the signal processor (see figure 1)

3.7 signal processor

a part of the two-hand control device which generates the output signal as a conse-

quence of the two input signals (see figure 1)

3.8 output signal

the signal generated by the two-hand control device to be fed into the machinery to be controlled, and which is based on one pair of input signals (see figure 1)

3.9 response time

the time between the release of a control actuating device and the cessation of the output signal (see also 9.8)

3.10 mobile two-hand control device

a device which can be moved and used in more than one definable position relative to the danger zone of the machine which it controls

4 Types of two-hand control device and their selection

Table 1 defines three types of two-hand control device. It sets out the functional characteristics and the minimum measures for the safety of each type of two-hand control device in this Standard. All two-hand control devices shall comply with JIS B 9700-1, JIS B 9700-2 and JIS B 9960-1.

Table 1 List of types of two-hand control device and minimum safety requirements

Requirements	Subclause	Type				
		I	II	III		
				A	B	C
Use of both hands (simultaneous actuation)	5.1	×	×	×	×	×
Relationship between input signals and output signal	5.2	×	×	×	×	×
Cessation of the output signal	5.3	×	×	×	×	×
Prevention of accidental operation	5.4	×	×	×	×	×
Prevention of defeat	5.5	×	×	×	×	×
Re-initiation of the output signal	5.6	a)	×	×	×	×
Synchronous actuation	5.7			×	×	×
Use of category 1 (see JIS B 9705-1:2000)	6.2	×		×		
Use of category 3 (see JIS B 9705-1:2000)	6.3		×		×	
Use of category 4 (see JIS B 9705-1:2000)	6.4					×
Apply items with the symbol ×.						
Note a) For the selection of type I, see 8.6.						

The selection and the design of the type (see table 1) of two-hand control device will depend on

- the hazard(s) present;
- the risk assessment;
- experience in use of the technology;
- other factors, which shall be specified for each application [e.g. the prevention of accidental actuation and of defeat (see clause 8), as well as other conditions (see JIS

B 9700-1:2004, clause 4)].

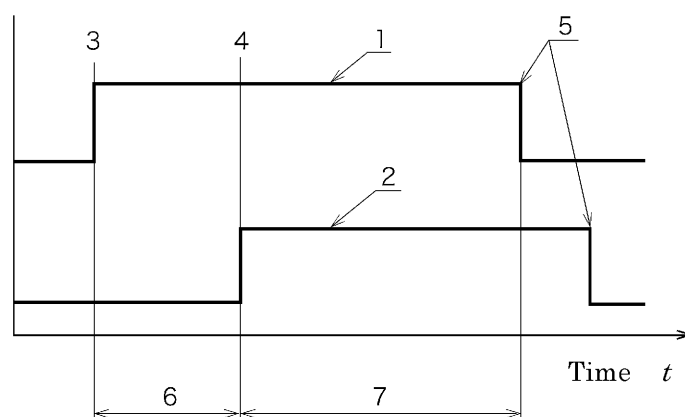
NOTE: Guidance on risk assessment may be found in JIS B 9700-1 and detailed guidance is given in JIS B 9702.

5 Characteristics of safety functions

The characteristics of safety functions described in 5.1 to 5.7 shall be included in two-hand control devices in accordance with table 1.

5.1 Use of both hands (simultaneous actuation)

The two-hand control device shall be designed so that the operator must use both hands during the same time period, one hand on each control-actuating device, to operate the two-hand control device. This is simultaneous actuation and is independent of any time lag between the initiation of each of the two input signals (see figure 2).



Key

- | | |
|-------------------------------------|--|
| 1 First hand | 5 Cessation of input signals |
| 2 Second hand | 6 Time lag undefined, simultaneous actuation |
| 3 Initiation of first input signal | 7 Time period of simultaneous actuation |
| 4 Initiation of second input signal | |

Figure 2 Input signals in the case of simultaneous actuation

5.2 Relationship between input signals and output signal

The input signals applied to each of the two control actuating devices shall together initiate and maintain the output signal from the two-hand control device only so long as both input signals are applied. The form of the output signal (e.g. number of channels, pulse, shape, etc.) may vary depending on the design requirements in each case. It shall always be regarded as, and shall be identified as, a single output signal by the machine control circuit.

5.3 Cessation of the output signal

The release of either one or both control actuating devices shall initiate the cessation