

SINGAPORE STANDARD

Code of practice for safe use of industrial robots



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Foreword

This Singapore Standard was prepared by the Technical Committee on Equipment and Machinery Safety in Workplace under the direction of the Industrial Safety Standards Committee.

There are particular hazards which exist in automation systems incorporating manipulating industrial robots. Hazards are well recognised but the sources of the hazards are frequently unique to a particular robot system. The number and types of hazards are directly related to the nature of the automation process and the complexity of the installation. The risks associated with these hazards vary with the type of robot used and its application and the way in which it is installed, programmed, operated and maintained and type of safety devices installed.

In recognition of the variable nature of hazards with application of industrial robots, this Code provides guidance for the assurance of safety in design and construction of robots. Since safety in the application of industrial robots is influenced by the design and application of the particular robot system, a supplementary, though equally important, purpose is to provide guidelines for the safeguarding of personnel during installation, functional testing, programming, operation, maintenance, and repair of robots and robot systems. Recommendations given in this Code are advisory in nature. Annex A of this Code is for information only.

This Code is a redraft and modified adoption of ISO 10218 : 1992 and replaces the CP 53 : 1990. It contains requirements which can be used for references when complying with The Factories Act (Chapter 104). For comparison purposes, the flow of clauses in this Code and the ISO 10218 : 1992 remains the same.

Certain deviations have been made due to the needs of the industry. These deviations have been incorporated and are marked by a single bar in the margin. A list of deviations, together with the reason for the deviations, is given in Annex B.

For the purpose of this Code, the following editorial changes have also been made:

- i) the words "this International Standard" have been replaced by "this Code".
- ii) Subclause 4.2.1 *Amend* the sentence to "Example of sources of hazards are, but not limited to:"
- iii) Subclause 6.2 *Amend* the third paragraph to:
"Pertinent information shall be provided **indicating clearly** robot working modes and"
- iv) Subclause 8.7.3 *Insert* the word "take" in the last sentence as "...shall **take** account of risk assessment."
- v) Subclause 9.3.3 a) Replace the word in ii) "power" with "power supply".

The references made in ISO 10218 : 1992 have been updated in this Code to the following:

Normative References

IEC 204-1: 1981, *Electrical equipment of industrial machines – Part 1: General requirements*

ISO/TR 8373: 1988, *Manipulating industrial robots – Vocabulary.*

Updated References

IEC 60204-1 : 1997, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

ISO 8373 : 1994, *Manipulating industrial robots – Vocabulary*

ISO 8373 : 1994/Cor.1 : 1996, *Technical Corrigendum 1*

NOTE

1. *Singapore Standards are subject to periodic review to keep abreast of technological changes and new technical developments. The revisions of Singapore Standards are announced through the issue of either amendment slips or revised editions.*
2. *Compliance with a Singapore Standard does not exempt users from legal obligations.*

Code of practice for safe use of industrial robots

1 Scope

This Code provides guidance on the safety considerations for the design, construction, programming, operation, use, repair, and maintenance of manipulating industrial robots and robot systems as defined in clause 3. It does not apply to other types of robots although the safety principles established in this Code may be utilised for these other types.

NOTE – For the purpose of this Code, the term 'robot' means manipulating industrial robot.

For systems comprising multiple robots and/or associated material handling equipment or mobile robots, this Code may be used for the robot system portion of the equipment.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Code. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Code are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60204-1: 1997, *Electrical equipment of industrial machines - Part 1: General requirements*.

ISO 6385: 1981, *Ergonomic principles of the design of work systems*.

ISO 8373 : 1994, *Manipulating industrial robots - Vocabulary*.
Cor.1 : 1996, Technical Corrigendum 1

ISO 9946: 1991, *Manipulating industrial robots - Presentation of characteristics*,