AS 4024.3301:2017
ISO 10218-1:2011

AS 4024.3301:2017

Australian STANDARD

Safety of machinery

Part 3301: Robots and robotic devices—Safety requirements for industrial robots—Robots

STANDARDS Australia

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- Australian Manufacturing Workers Union
- Department of Industry, Skills and Regional Development (NSW)
- Engineers Australia
- Human Factors and Ergonomics Society of Australia
- Institute of Instrumentation, Control and Automation, Australia
- National Safety Council of Australia
- Safety Institute of Australia
- SafeWork NSW
- The University of Melbourne
- Winery Engineering Association
- Workplace Health and Safety Queensland
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Part 3301: Robots and robotic devices—Safety requirements for industrial robots—Robots

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PREFACE

This Standard was prepared by the Standards Australia Committee SF-041, Safety of Machinery, to supersede AS 4024.3301—2009, *Safety of machinery*, Part 3301: *Robots for industrial environments—Safety requirements*.

The objective of this Standard is to specify requirements and guidelines for the inherent safe design, protective measures and information for use of industrial robots. It describes basic hazards associated with robots and provides requirements to eliminate, or adequately reduce, the risks associated with these hazards.

This Standard is identical with, and has been reproduced from, ISO 10218-1:2011, *Robots and robotic devices—Safety requirements for industrial robots*, Part 1: *Robots*.

As this Standard is reproduced from an International Standard, the following applies:

(a) In the source text 'this part of ISO 10218' should read 'this Australian Standard'.

(b) A full point substitutes for a comma when referring to a decimal marker.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative references may be used interchangeably. Refer to the online catalogue for information on specific Standards.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the annex to which they apply. A 'normative' annex is an integral part of a Standard, whereas an 'informative' annex is only for information and guidance.

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10218-1 was prepared by Technical Committee ISO/TC 184, *Automation systems and integration*, Subcommittee SC 2, *Robots and robotic devices*.

This second edition cancels and replaces the first edition (ISO 10218-1:2006), which has been technically revised. It also incorporates Technical Corrigendum ISO 10218-1:2006/Cor 1:2007.

ISO 10218 consists of the following parts, under the general title *Robots and robotic devices — Safety requirements for industrial robots*:

— *Part 1: Robots*

— *Part 2: Robot systems and integration*

INTRODUCTION

ISO 10218 has been created in recognition of the particular hazards that are presented by industrial robots and industrial robot systems.

This part of ISO 10218 is a type-C standard as outlined in ISO 12100.

When provisions of a type-C standard are different from those which are stated in type-A or type-B standards, the provisions of the type-C standard take precedence over the provisions of the other standards for machines that have been designed and built in accordance with the provisions of the type-C standard.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the Scope of this part of ISO 10218.

Hazards associated with robots are well recognized, but the sources of the hazards are frequently unique to a particular robot system. The number and type(s) of hazard(s) 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 purpose, and the way in which it is installed, programmed, operated and maintained.

NOTE Not all of the hazards identified by ISO 10218 apply to every robot, nor will the level of risk associated with a given hazardous situation be the same from robot to robot. Consequently, the safety requirements, or the protective measures, or both, can vary from what is specified in ISO 10218. A risk assessment can be conducted to determine what the protective measures should be.

In recognition of the variable nature of hazards with different uses of industrial robots, ISO 10218 is divided into two parts. This part of ISO 10218 provides guidance for the assurance of safety in the design and construction of the robot. Since safety in the application of industrial robots is influenced by the design and application of the particular robot system integration, ISO 10218-2 provides guidelines for the safeguarding of personnel during robot integration, installation, functional testing, programming, operation, maintenance and repair.

This part of ISO 10218 has been updated based on experience gained in developing the ISO 10218-2 guidance on system and integration requirements, in order to ensure it remains in line with minimum requirements of a harmonized type-C standard for industrial robots. Revised technical requirements include, but are not limited to, definition and requirements for singularity, safeguarding of transmission hazards, power loss requirements, safety-related control circuit performance, addition of a category 2 stopping function, mode selection, power and force limiting requirements, marking, and updated stopping time and distance metric and features.

This part of ISO 10218 is not applicable to robots that were manufactured prior to its publication date.

AUSTRALIAN STANDARD

Safety of machinery

Part 3301:
Robots and robotic devices—Safety requirements for industrial robots—Robots

1 Scope

This part of ISO 10218 specifies requirements and guidelines for the inherent safe design, protective measures and information for use of industrial robots. It describes basic hazards associated with robots and provides requirements to eliminate, or adequately reduce, the risks associated with these hazards.

This part of ISO 10218 does not address the robot as a complete machine. Noise emission is generally not considered a significant hazard of the robot alone, and consequently noise is excluded from the scope of this part of ISO 10218.

This part of ISO 10218 does not apply to non-industrial robots, although the safety principles established in ISO 10218 can be utilized for these other robots.

NOTE 1 Examples of non-industrial robot applications include, but are not limited to, undersea, military and space robots, tele-operated manipulators, prosthetics and other aids for the physically impaired, micro-robots (displacement less than 1 mm), surgery or healthcare, and service or consumer products.

NOTE 2 Requirements for robot systems, integration, and installation are covered in ISO 10218-2.

NOTE 3 Additional hazards can be created by specific applications (e.g. welding, laser cutting, machining). These system-related hazards need to be considered during robot design.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9283:1998, *Manipulating industrial robots — Performance criteria and related test methods*

ISO 10218-2, *Robots and robotic devices — Safety requirements for industrial robots — Part 2: Robot systems and integration*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13850, *Safety of machinery — Emergency stop — Principles for design*

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

IEC 62061:2005, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

