Robots and robotic devices -- Collaborative robots

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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The committee responsible for this document is Technical Committee ISO/TC 299, *Robots and robotic devices*.

This Technical Specification is relevant only in conjunction with the safety requirements for collaborative industrial robot operation described in ISO 10218-1 and ISO 10218-2.

Introduction

The objective of collaborative robots is to combine the repetitive performance of robots with the individual skills and ability of people. People have an excellent capability for solving imprecise exercises; robots exhibit precision, power and endurance.

To achieve safety, robotic applications traditionally exclude operator access to the operations area while the robot is active. Therefore, a variety of operations requiring human intervention often cannot be automated using robot systems.

This Technical Specification provides guidance for collaborative robot operation where a robot system and people share the same workspace. In such operations, the integrity of the safety-related control system is of major importance, particularly when process parameters such as speed and force are being controlled.

A comprehensive risk assessment is required to assess not only the robot system itself, but also the environment in which it is placed, i.e. the workplace. When implementing applications in which people and robot systems collaborate, ergonomic advantages can also result, e.g. improvements of worker posture.

This Technical Specification supplements and supports the industrial robot safety standards ISO 10218-1 and ISO 10218-2, and provides additional guidance on the identified operational functions for collaborative robots.

The collaborative operations described in this Technical Specification are dependent upon the use of robots meeting the requirements of ISO 10218-1 and their integration meeting the requirements of ISO 10218-2.

NOTE Collaborative operation is a developing field. The values for power and force limiting stated in this Technical Specification are expected to evolve in future editions.

1 Scope

This Technical Specification specifies safety requirements for collaborative industrial robot systems and the work environment, and supplements the requirements and guidance on collaborative industrial robot operation given in ISO 10218-1 and ISO 10218-2.

This Technical Specification applies to industrial robot systems as described in ISO 10218-1 and ISO 10218-2. It does not apply to non-industrial robots, although the safety principles presented can be useful to other areas of robotics.

NOTE This Technical Specification does not apply to collaborative applications designed prior to its publication.

2 Normative references

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

ISO 10218-1:2011, *Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots*

ISO 10218-2:2011, *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 13850, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13855, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10218-1, ISO 10218-2 and ISO 12100 and the following apply.

3.1

collaborative operation

state in which a purposely designed robot system and an operator work within a collaborative workspace

[SOURCE: ISO 10218-1:2011, 3.4, modified]

3.2

power

mechanical power

mechanical rate of doing work, or the amount of energy consumed per unit time

Note 1 to entry: Power does not pertain to the electrical power rating on an electronic device, such as a motor.

3.3

collaborative workspace

space within the operating space where the robot system (including the workpiece) and a human can perform tasks concurrently during production operation

Note 1 to entry: See Figure 1.

[SOURCE: ISO 10218-1:2011, 3.5, modified]

3.4

quasi-static contact

contact between an operator and part of a robot system, where the operator body part can be clamped between a moving part of a robot system and another fixed or moving part of the robot cell

3.5

transient contact

contact between an operator and part of a robot system, where the operator body part is not clamped and can recoil or retract from the moving part of the robot system

3.6

protective separation distance

shortest permissible distance between any moving hazardous part of the robot system and any human in the collaborative workspace

Note 1 to entry: This value can be fixed or variable.

3.7

body model

representation of the human body consisting of individual body segments characterized by biomechanical properties

Bibliography

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