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International

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Robotics — Safety requirements —

Part 2: Industrial robot applications and robot cells

Robotique — Exigences de sécurité —

Partie 2: Applications robotisées industrielles et cellules robotisées

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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 document 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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This document was prepared by Technical Committee ISO/TC 299, *Robotics,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 310, *Advanced automation technologies and their applications,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 10218-2:2011), which has been technically revised.

The main changes are as follows:

— emphasising robot application and not robot system, as the robot application includes the workpieces, task program, and the machinery and equipment to support the application and intended tasks;

— incorporating safety requirements for collaborative applications (formerly, the content of ISO/TS 15066);

— clarifying requirements for functional safety;

— adding requirements for cybersecurity to the extent that it applies.

A list of all parts in the ISO 10218 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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This document has been created in recognition of the hazards that are presented by robots when they are integrated and installed with end-effectors into robot applications and robot cells. ISO 10218-1 addresses robots as partly completed machinery, while this document addresses robots integrated into completed machinery for specific robot applications.

This document is a type-C standard according to ISO 12100.

This document is of relevance for the following stakeholder groups representing the market players regarding safety of robot applications and robot cells:

— robot manufacturers (small, medium and large enterprises);

— robot application integrators (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organisations, market surveillance, etc).

Others can be affected by the level of safety achieved with the means of the document by the above-mentioned stakeholder groups:

— robot application users/employers (small, medium and large enterprises);

— robot application users/employees (e.g. trade unions);

— service providers, e.g. for maintenance (small, medium and large enterprises);

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

Robot applications, and the extent to which hazards, hazardous situations and events, are covered and indicated in the Scope of this document.

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.

Hazards associated with robot applications are well recognized, but the sources of the hazards are frequently unique to each robot application. The number and type(s) of hazard(s) are directly related to the nature of the automation process and the complexity of the application. The risks associated with these hazards vary with the robot used, its safety functions, and the integration, installed, programs, use, and maintenance. This document provides requirements for safety in the integration of robots into robot applications and robot cells. The requirements include safeguarding of operators during integration, commissioning, functional testing, programming, operation, maintenance and repair. Requirements for the robot can be found in ISO 10218-1.

The ISO 10218 series deals with robotics in an industrial environment, which is comprised of workplaces where the public is excluded or restricted from access and the allowed people (operators) are working adults. Other standards cover such topics as general characteristics, coordinate systems and axis motions, mechanical interfaces, performance criteria and related testing methods, and end-effectors.

There are a broad range of robot applications and robot cell(s). Therefore, it is not possible to provide a list of all significant hazards, hazardous situations or events into which a robot application can be integrated. Moreover, the same kind of applications can have different levels of risk, resulting from different designs which correspond to the intended application (e.g. paint spraying on large or small parts, handling of a small harmful payload like a hot metal bolt or a large harmless payload like a box of paper tissues).

Other standards can be applicable to associated machinery and equipment in robot applications and robot cells.

For ease of reading this document, the words “robot”, “robot system” and “robot application” refer to “industrial robot”, “industrial robot system” and “industrial robot application” as defined in ISO 10218-1 and this document.

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standard for robot applications and robot cells in an industrial environment. Providing for a safe robot application and a safe robot cell depends on the cooperation of a variety of "stakeholders". Stakeholders can include designers, manufacturers, suppliers and integrators. Users are the entity responsible for using robot applications and robot cells. Users can also be any of the other stakeholder roles.

Where appropriate, ISO/TS 15066:2016 on the safety of collaborative robot applications was added to the ISO 10218 series. Because human-robot collaboration relates to the application and not to the robot alone, most of the requirements of ISO/TS 15066 have been incorporated into this document. Safety functions that enable a collaborative application can be part of the robot (e.g. PFL), or can be provided by a protective device, or a combination.

It is important to emphasize that the term "collaborative robot" is not used in this document. Only the application can be developed, verified, and validated as a collaborative application. In addition, the term "collaborative operation" is not used in this document.

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