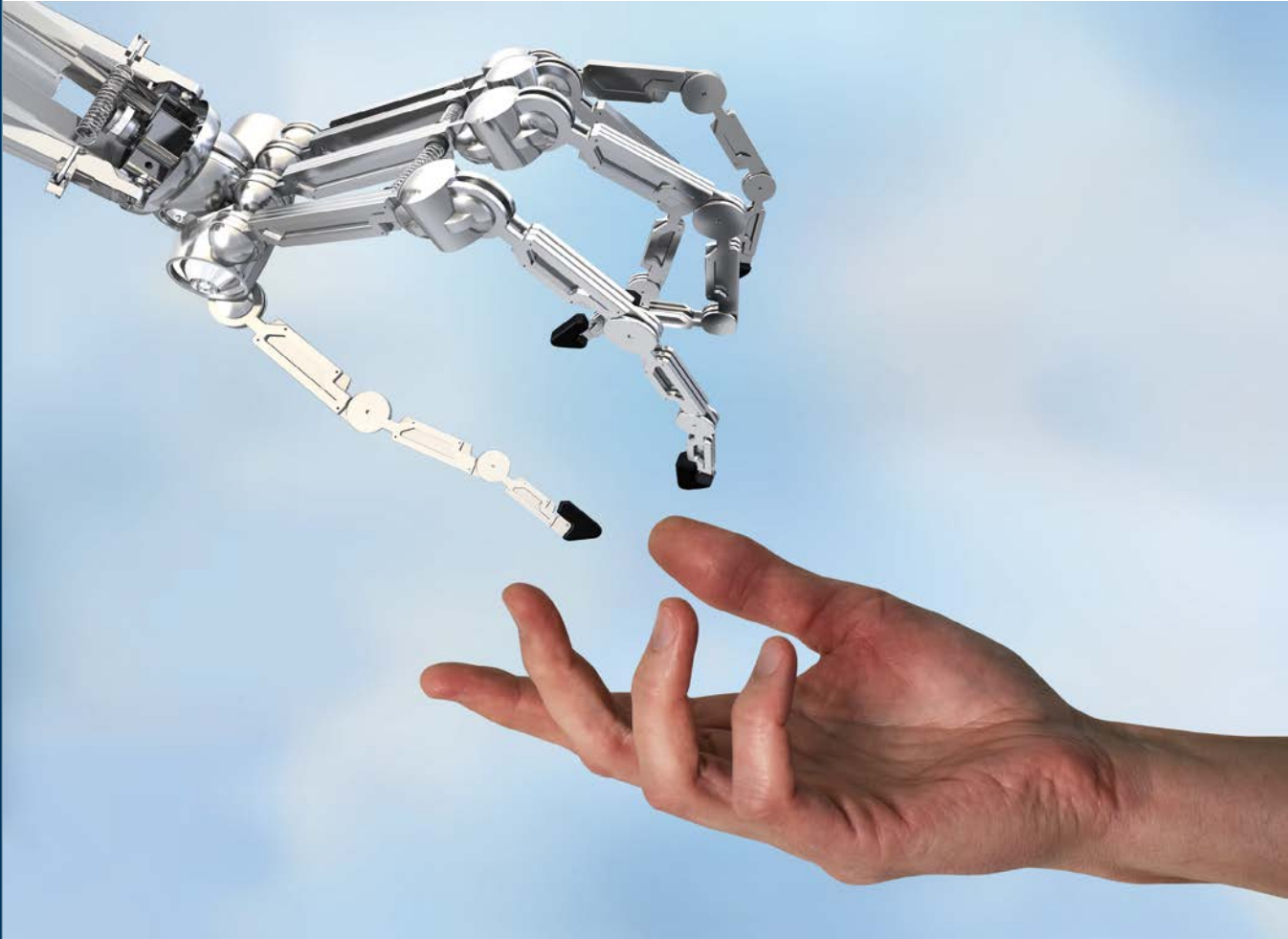


Collaborative Robots

Safety-Rated Monitored Stop



Safe Applications

- Description
- Definitions
- Guidelines

“Human error is not a potential, it is a given.”

Description

In a safety-rated monitored stop application, the collaborative robot **stops** and remains stopped while the operator is in the collaborative workspace. This application may be useful when the operator needs limited access to the collaborative workspace for functions such as setting up new fixtures, adjusting parts, etc. It may be done with traditional robots as well.

Information can be found in the Industrial Robots and Robot Systems – Safety Requirements standard, ANSI RIA R15.06-2012, which is harmonized with ISO 10218-1:2011 and ISO 10218-2:2011.

Detailed collaborative safety requirements will be available in the ISO/TS 15066 Technical Specification, which is expected to be available in early 2016.

Definitions

Collaborative Workspace

It is the space within the operating space where the robot system and a human can perform tasks concurrently.

Collaborative Operation

The purposely designed robot system and operator work within a collaborative workspace.

Safety-Rated Monitored Stop

The robot/collaborative robot stops before the operator enters the collaborative workspace.

With a traditional robot this may be achieved with a safety-rated control system that complies with the requirements in ANSI/RIA 15.06-2012.

With a collaborative robot this may be achieved through inherently-safe design.

Safety-Rated Space Limiting

A limit is placed on the robot's range of motion by a software- or firmware-based system having a sufficient safety-rated performance.

Guidelines for all Systems

These guidelines are applicable for collaborative robot systems. Detailed information can be found in the ISO/TS 15066 technical specification.

- The robot shall be equipped with a safety-rated monitored stop function.
- The collaborative robot system needs to know when an operator is entering the collaborative workspace
- The robot is not allowed to be moving when the operator enters or is within the collaborative workspace.
- The collaborative workspace is defined as any area where the robot can move. In many cases this will be the same as the robot's defined workspace (including the end-effector and part.)
- If an operator enters the collaborative workspace while the robot is moving, the robot shall generate a protective stop. The operator must exit the collaborative workspace and reset the system before the collaborative robot system can be started.
- Most collaborative robots are equipped with safety-rated soft axis and space limiting function, which should be utilized.
- The robot may resume normal operation after the operator has left the safeguarded space. Additional means requiring operator verification, such as the operator pressing a restart button, may be used.
- If operator safety is dependent on the movement or location of the robot, the robot shall have a way to know its position.
- Transition to and from a safety-rated monitored stop application shall not lead to:
 - a. unexpected motion;
 - b. unexpected behaviors;
 - c. additional hazards.

Collaborative Robot Guidelines

Most collaborative robots are inherently safe by their design. This may include features such as force amplification, virtual safety zones, and tracking technologies. This guideline may not be applicable for traditional robot applications unless specified by the risk assessment.

The transient contact chart in the annex of ISO/TR 15066 should be used to determine robot's maximum speed.

ISO 13855 should be used to establish the safe distance.

Note: Each application is unique and may include topics not listed.

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Note: Specifications are subject to change

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