

Acronyms for Safety-Related Terms

SRP/CS and **SCS** are any pieces of hardware that are used to provide safety functions and must meet ISO 13849-1 or IEC 62061.

- SRP/CS - safety-related parts of control system
- SCS - safety control system

PSD, SRS, and SRSS are devices used to detect the presence of an object. This can be used as a risk reduction method when used to stop the IMR before personnel can access the hazard. The devices must be applied according to IEC 62046 or ANSI 811.19.

- PSD - presence sensing device
- SRS - safety-related sensors
- SRSS - safety-related sensor systems

ESPE devices are used to detect personnel using a protective field of optical sensors. Light curtains and safety scanners are part of this family.

- ESPE - electro-sensitive protective equipment



Cybersecurity

IMR systems communicate via Wi-Fi so cybersecurity must be taken into account. The following should be considered to prevent unauthorized access to the IMR hardware or software:

- Setting up a separate SSID for the fleet network that can limit what
- IP addresses are allowed on the network. The IMRs and fleet manager should have static IP addresses.
- Verify that the Wi-Fi network is behind a firewall that needs a login
- Blocking physical access to the network connections
- Protection of safety configuration
- Changing default usernames and passwords
- Use of encrypted or authenticated protocols

Electromagnetic Compatibility (EMC) and Electrostatic Discharge (ESD)

Electromagnetic compatibility (EMC) is the ability of multiple pieces of electrical equipment to be used at the same time while resisting electrostatic interference and electrical noise. EMC-compliant equipment must resist a defined level of electrostatic discharge (ESD).

Industrial Mobile Robot Fleet (IMRF) and Fleet Manager

IMRs that communicate with a higher-level system are called an Industrial Mobile Robot fleet (IMRF). A fleet manager (software) is required to monitor the positions and movements of one or more IMRs in real time, resolving potential route conflicts.

Operating Environments

Specified Operating Environment (SOE) - Environmental conditions and requirements specified by the IMR manufacturer in which the system is designed to function. This can include temperature, floor conditions, and Wi-Fi strength.

Deployed Operating Environment (DOE) - Environmental conditions of the facility or space where the IMR system is deployed. Any differences in the DOE from the SOE need to be specified.



Personnel

Affected Person - Individual who operates, services, or maintains a machine or anyone else in proximity to the machine

Authorized Personnel - Qualified personnel identified by the employer or supplier to perform a specific task

Qualified Personnel - Trained and experienced individual that understands and demonstrates competence with the design, construction, operation, or maintenance of the machine and the associated hazards

Space

Generally, the term “space” refers to three-dimensional volume.

Free Space - Areas where the IMR can travel that is not a specified space or zone

Safeguarded Space - Area or volume enclosing a hazard zone that uses guards or protective devices to protect persons

Working Space - Area that includes the IMR system, attachments, and payloads. This is used to avoid obstacles during path planning (footprint). If something violates the working space of the IMR it should create a protective stop.

Stations

Generally, stations refer to locations where interactions with an IMR or IMR system are intended and can be static or dynamic.

Docking Station - A station where an IMR or IMR system physically connects to perform an intended operation

Transfer station - A station involving transfer of payload between the IMR to another part of the IMR system. For example, if you are transferring product from the conveyor attachment on top of the IMR to an operator station conveyor.

Workstation - Station designated for authorized personnel to perform task-based interactions with an IMR/IMR system



Zones

A “zone” refers to a segmented space within the total free space.

Collaborative Zone - Location(s) where collaborative IMR operations occur. Can be static or dynamic. Awareness methods should be used to inform affected personnel in the area.

Control Zone - Portion of an IMR system that is coordinated by the control system. For an IMR, this includes its working space.

Detection Zone - Zone within which a specified test piece is detected by sensitive protective equipment

Hazard Zone - Space within and around a machine where an individual can be exposed to a hazard

Keep-out Zone - Zone in free space that excludes the autonomous entry of an IMR (forbidden zone)

Task Zone - Zone in free space where personnel can perform work, which can be static or dynamic



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