



Designation: F3200 – 23

Standard Terminology for Robotics, Automation, and Autonomous Systems¹

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1. Scope

1.1 This terminology covers terms associated with robotic, automation, and autonomous systems. By providing a common and consistent lexicon, the purpose of this terminology is to facilitate communication between individuals who may be involved in the research, design, deployment, and use of robotic, automation, and autonomous systems, including but not limited to, for manufacturing, distribution, security, healthcare, response, etc. The terminology covers, but is not limited to, terms used in performance test methods of for example: robot arms, automatic guided vehicles (AGVs), autonomous mobile robots, and all other automatic or autonomous industrial systems.

1.2 For the terminology to be harmonious with the practices in the field, definitions have been drawn from the literature or other public sources when possible. When no definition is available, is similar but requires change for use within standards produced by Committee F45, or in dispute, a consensus-based approach will be used to resolve definitions and add them to the lexicon. The development of this terminology is taking place in close coordination with corresponding efforts in all Committee F45 subcommittees to ensure comprehensive and consistent coverage.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This terminology is under the jurisdiction of ASTM Committee F45 on Robotics, Automation, and Autonomous Systems and is the direct responsibility of Subcommittee F45.91 on Terminology.

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2. Referenced Documents

2.1 ASTM Standards:²

F3244 Test Method for Navigation: Defined Area

F3499 Test Method for Confirming the Docking Performance of A-UGVs

2.2 ANSI/ITSDF Standard:³

ANSI/ITSDF B56.5 Safety Standard for Driverless, Automatic Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles

2.3 ISO Standards:⁴

ISO 8373 Robots and Robotic Devices – Vocabulary

ISO 12100 Safety of machinery – General principles for design – Risk assessment and risk reduction

3. Terminology

3.1 Terminology is delineated into multiple sub-sections of terms and definitions beginning with general definitions that may be useful across all robotic, automation, and autonomous systems areas. Following are sub-sections for specific areas within robotic, automation, and autonomous systems areas. Each F45 standard includes a statement in the Terminology section referencing the sub-section(s) and term(s) within this standard. F45 standards may include terminology from one or more sections. For example, A-UGV terms within A-UGV-specific Test Methods F3244 and F3499 include terms within General and A-UGV Definition sections.

3.2 General Definitions:

adaptive control, *n*—control scheme whereby the control system parameters are adjusted from conditions detected during the process.

aisle, *n*—in a facility, the passageway between locations where temporary or permanent obstructions may exist.

ambient temperature, *n*—temperature of the atmosphere surrounding equipment.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Industrial Truck Standards Development Foundation, 1750 K St., NW, Suite 460, Washington, DC 20006, <http://www.itsdf.org>.

⁴ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

ampere-hour capacity, *n*—amount of electrical energy that can be delivered from an energy storage unit at a specified discharge rate under specified conditions.

authorized person, *n*—trained or qualified personnel approved or assigned to perform a specific duty or duties.

automatic data capture, *n*—identification and direct collection of data into a computer system or other microprocessor-controlled device without using a keyboard (for example, technologies that support the function are: barcode, radio frequency data communication, radio frequency identification, and other emerging technologies).

DISCUSSION—Other similar terms are *automatic data collection* or *automatic identification*.

axis of motion, *n*—axis along which the robotic joint or A-UGV moves.

barcode, *n*—system of printed patterns that represent alphanumeric data that are able to be read optically.

barcode reader, *n*—device used to read a barcode.

benchmarking, *v*—measurement process that can be used for comparison against best industry practices or established goals, operating targets, and performance expectations.

braking, *v*—any processor or actuator used to slow or stop the robotic system (for example, robot, A-UGV).

bumper, physical, *n*—surface designed to absorb or withstand impact.

clearance, *n*—additional margin, beyond the contour area, that is defined for uninterrupted system operation. See Fig. 1.

collision prevention, *n*—use of sensors to detect the presence of obstacles and, through the use of integrated controls, prevent a collision from occurring; see **obstacle avoidance**.

commissioning, *v*—sequence of actions of setting up and checking the robotic system (for example, robot, A-UGV) followed by the verification of the robotic system functions after installation.

DISCUSSION—Sometimes called *acceptance*.

configuration, *n*—all hardware, software, and settings needed to operate the robotic system (for example, robot, A-UGV) as specified.

contour area, *n*—area that includes the physical boundaries of an object or system (for example, A-UGV, robot) including payload, onboard equipment, trailer, or combinations thereof with respect to a referenced viewpoint (for example, A-UGV, robot vision system, from above).

controls and control system, *n*—hardware and software required to operate the robotic system (for example, robot, A-UGV) and communicate with the environment (equipment and users).

cycle, single, *n*—single execution of a task program.

DISCUSSION—A repetition may contain one or more cycles; see **repetition**.

cycle time, *n*—time required to perform a cycle.

defined areas, *n*—space constrained by test method boundaries for robotic system (for example, robot, A-UGV) operation.

distance accuracy, *n*—difference between a command distance and the attained distance over a set of points.

drift, *n*—movement from the designated hold point because of the system's inability to maintain a fixed position.

echo, *n*—time elapsed between signal emission and reception that is used to determine target position in a sensor.

emergency stop (E-stop), *n*—function which is intended to:
(1) avert arising or reduce existing hazards to persons, damage to machinery or to work in progress, and
(2) be initiated by a single human action. **ISO 12100**

environment map or environment model, *n*—map or model that describes an environment with its distinguishable features. **ISO 8373**

DISCUSSION—Examples are grid map, geometrical map, topological map, and so forth.

exteroceptive sensor or external state sensor, *n*—robotic system (for example, robot, A-UGV) sensor intended to

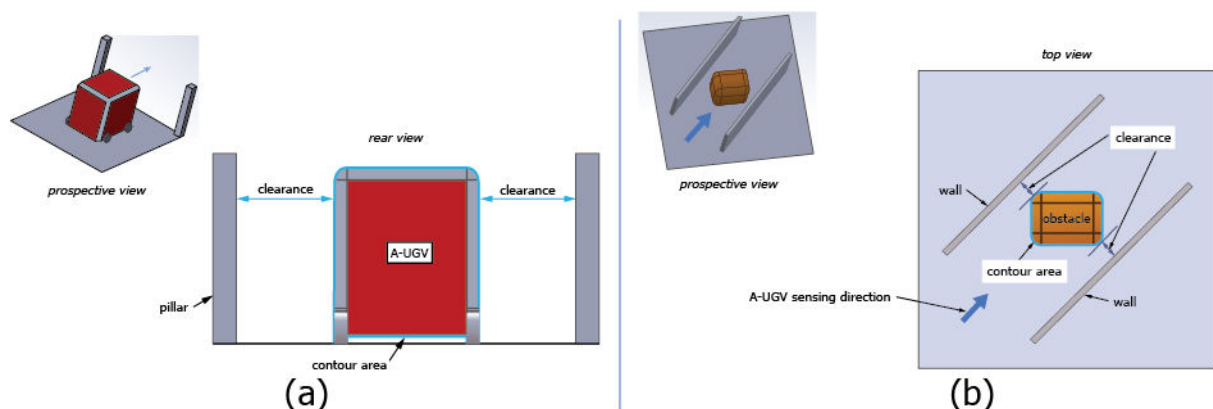


FIG. 1 Contour area and Clearance
(a) Between an A-UGV and Infrastructure and
(b) Between an Obstacle and Infrastructure