

AUTONOMOUS ROBOT SAFETY PROTOCOL MANUAL

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Version 3.1

Effective Date: January 15, 2024

Document ID: PDR-SAFETY-3.1-2024

1. INTRODUCTION AND SCOPE

1. This Autonomous Robot Safety Protocol Manual ("Protocol") is issued to provide clear and concise safety guidelines for the operation of all PDR Series X-100, X-200, and X-300 autonomous robots.
2. This Protocol applies to all PDR Series X-100, X-200, and X-300 autonomous robots and their operators.

2. DEFINITIONS

1. "AMR" means any autonomous mobile robot manufactured by PDR
2. "Operating Environment" means any controlled temperature facility
3. "Safety Zone" means the designated perimeter surrounding an AMR
4. "Emergency Stop System" or "EMS" means PDR's proprietary emergency stop system

3. SAFETY CERTIFICATIONS AND COMPLIANCE

1. All AMRs must maintain current certification under:
 - a) ISO 10218-1:2011 (Robots and robotic devices)
 - b) ANSI/RIA R15.06-2012 (Industrial Robots and Robot Systems)

c) IEC-61496-1:2020 (Safety of machinery - Electro-sensitive protective equipment)

2. Operating Environment Requirements:

- a) Maximum floor grade variation: 1.5%
- b) Minimum aisle width: 2.8 meters
- c) Emergency exit clearance: 3.5 meters
- d) Floor surface friction coefficient: 0.4 minimum

4. OPERATIONAL SAFETY PROTOCOLS

1. Pre-Operation Verification

- a) System diagnostic check
- b) Sensor calibration verification

- c) Emergency Stop System test
- d) BlueCore(TM) temperature adaptation cycle
- e) Navigation system alignment

2. Operating Parameters

- a) Maximum velocity: 1.8 meters/second
- b) Minimum separation distance: 3.0 meters
- c) Load capacity: As specified per model
- d) Operating temperature range: -40 C to 0 C

3. Safety Zone Monitoring

- a) Continuous LiDAR scanning
- b) Infrared proximity detection
- c) Machine vision system monitoring

d) Audio-visual warning system activation

5. EMERGENCY PROCEDURES

1. Automatic Shutdown Triggers:

- a) Human presence within 1.0 meter
- b) Mechanical obstruction detection
- c) System temperature exceeding specifications
- d) Navigation system failure
- e) Power system anomaly

2. Manual Emergency Procedures:

- a) Emergency Stop Button activation
- b) Remote shutdown protocol

- c) Facility-wide system halt
- d) Emergency evacuation procedure

6. MAINTENANCE AND INSPECTION

1. Required Maintenance Schedule:

- a) Daily system diagnostics
- b) Weekly sensor calibration
- c) Monthly mechanical inspection
- d) Quarterly software updates
- e) Annual certification renewal

2. Documentation Requirements:

- a) Maintenance logs

- b) Incident reports
- c) Certification records
- d) Training records
- e) Software update history

7. TRAINING REQUIREMENTS

- 1. Required Personnel Training:
 - a) Basic AMR operation
 - b) Emergency response procedures
 - c) Maintenance protocols
 - d) Safety system operation
 - e) Regulatory compliance

2. Certification Requirements:

- a) Initial operator certification
- b) Annual recertification
- c) Safety officer designation
- d) Maintenance technician qualification

8. LIABILITY AND INDEMNIFICATION

- 1. Operation of AMRs in violation of this Protocol voids all warranties.
- 2. Operator assumes all liability for damages resulting from non-compliance with this Protocol.

9. PROTOCOL UPDATES AND REVISIONS

- 1. PDR reserves the right to update this Protocol as required by:

- a) Regulatory changes
- b) Technology updates
- c) Safety requirements
- d) Operating environment modifications

2. Operators must implement Protocol updates within 30 days of issuance.

AUTHORIZATION

This Protocol is authorized and approved by:

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Date: January 15, 2024

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