

Installation Requirements - FrostLine Logistics Centers

Polar Dynamics Robotics, Inc.

Document Version: 2.4

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1. GENERAL PROVISIONS

1 This Installation Requirements document ("Requirements") sets forth the mandatory specifications and conditions for installing Polar Dynamics Robotics, Inc. ("PDR") autonomous mobile robot systems ("AMR Systems") in FrostLine Logistics Centers ("Facilities").

2 These Requirements shall be binding upon all parties involved in the installation, including PDR personnel, authorized contractors, Facility operators, and any third-party service providers.

2. FACILITY PREREQUISITES

1 Temperature Control Systems

- Facility must maintain consistent operating temperatures between -30 C and +5 C
- Temperature variation shall not exceed 2 C within any 24-hour period
- Dedicated climate control redundancy systems must be operational
- Temperature monitoring systems must interface with PDR's IceNav platform

2 Floor Specifications

- Concrete slab thickness minimum 6 inches (150mm)
- Floor flatness rating: FF35 minimum
- Floor levelness rating: FL25 minimum
- Surface treatment: Non-slip, epoxy-based coating
- Maximum allowable floor gaps: 10mm
- Load capacity: Minimum 2,000 kg/m

3 Network Infrastructure

- Dedicated fiber optic backbone
- Minimum 10Gb/s network capacity
- Redundant wireless access points with -85dBm minimum signal strength

- Separate VLAN for AMR operations
- UPS backup for all network components

3. INSTALLATION REQUIREMENTS

1 Power Infrastructure

- 480V three-phase power supply
- Dedicated charging station circuits: 50A per station
- Emergency power cutoff systems at 50-meter intervals
- Ground fault protection systems
- Power quality monitoring systems

2 Safety Systems

- Emergency stop buttons at 25-meter intervals
- Light curtains at all interaction zones
- Safety laser scanner zones properly configured
- Audible and visual warning systems
- Fire suppression system compatibility verification

3 Navigation Infrastructure

- QR code grid installation: 2-meter intervals
- Minimum lighting: 150 lux at floor level
- Reflective marker installation per PDR specification PS-2023-14
- Clear line of sight maintenance for lidar systems
- Installation of PDR IceNav beacons per zone

4. ENVIRONMENTAL CONTROLS

1 Humidity Requirements

- Operating range: 20% to 60% RH
- Condensation prevention systems
- Dehumidification capacity: 50 liters/hour minimum
- Moisture sensors at 10-meter intervals

2 Air Quality

- MERV 13 filtration minimum
- Positive pressure maintenance
- Air exchange rate: 6 ACH minimum
- Particulate monitoring systems
- Anti-static controls

5. COMPLIANCE AND TESTING

1 Pre-Installation Verification

- Site survey documentation
- Environmental compliance audit
- Power quality analysis
- Network infrastructure testing
- Floor quality assessment

2 Post-Installation Testing

- Full system commissioning protocol
- Safety system verification
- Navigation accuracy testing
- Communication system validation
- Performance benchmark testing

6. MAINTENANCE ACCESS

1 Service Areas

- Minimum 2-meter clearance around charging stations
- Dedicated maintenance bays: 1 per 10 AMR units
- Tool storage and workspace requirements
- Spare parts storage area: 20m² minimum
- Technical documentation station

7. LEGAL COMPLIANCE

1 The installation must comply with:

- OSHA workplace safety requirements
- ANSI/RIA R15.06 safety standards
- Local building codes and regulations
- Fire safety regulations
- Insurance underwriter requirements

8. WARRANTY AND LIABILITY

1 Failure to maintain these Installation Requirements may void PDR's equipment warranty and performance guarantees.

2 PDR assumes no liability for system failures or performance issues resulting from non-compliance with these Requirements.

9. MODIFICATIONS

1 These Requirements may be modified only in writing by authorized PDR representatives.

2 Facility operators must obtain written approval from PDR before implementing any modifications that may affect AMR System operation.

EXECUTION

IN WITNESS WHEREOF, the undersigned acknowledges receipt and understanding of these Installation Requirements.

Facility Operator: _

Name: _

Title:

Date:

PDR Representative:

Name: _

Title:

Date:

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