OPERATIONS DOCUMENT 401

STANDARD OPERATING PROCEDURES FOR AUTONOMOUS MOBILE ROBOT DEPLOYMENT AND MAINTENANCE

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1. PURPOSE AND SCOPE

1. This Operations Document 401 ("Document") establishes the binding operational procedures and protocols for the deployment, maintenance, and decommissioning of Polar Dynamics Robotics, Inc. ("Company") autonomous mobile robots ("AMRs") in temperature-controlled environments.

2. This Document applies to all Company personnel involved in AMR operations, including but not limited to field technicians, deployment specialists, maintenance engineers, and operational supervisors.

2. DEFINITIONS

1. "IceNav System" means the Company's proprietary cold-environment navigation and operation platform.

2. "Critical Operating Temperature" means any ambient temperature below -30 C (-22 F).

3. "Deployment Zone" means any customer facility where Company AMRs are installed and operational.

4. "Maintenance Protocol" means the prescribed series of inspection, service, and repair procedures detailed in Section 4.

3. DEPLOYMENT PROCEDURES

1. Pre-Deployment Assessment

a) Conduct comprehensive site survey of Deployment Zone

b) Document temperature mapping of operational areas

c) Verify IceNav System compatibility with facility layout

d) Assess RF interference patterns and signal strength

e) Validate emergency stop system placement

2. Installation Requirements

a) AMR units shall only be installed by Company-certified technicians

b) Minimum two-person deployment team required

c) Installation must follow Company Safety Protocol 201

d) All calibrations must be documented in the Central Deployment Registry

3. System Integration

a) IceNav System configuration must match facility specifications

b) Integration with customer WMS must be validated

c) Thermal management system must be calibrated to zone temperatures

d) Emergency protocols must be tested and documented

4. MAINTENANCE PROTOCOLS

1. Scheduled Maintenance

a) Level 1 inspection every 500 operational hours

b) Level 2 service every 2,000 operational hours

c) Full system overhaul every 10,000 operational hours

d) Actuator replacement every 15,000 operational hours

2. Critical Component Monitoring

a) Daily automated diagnostics of thermal management systems

b) Weekly manual inspection of cold-resistant actuators

c) Monthly validation of IceNav sensor arrays

d) Quarterly assessment of power systems

3. Emergency Maintenance

a) 24-hour response time for critical failures

b) Immediate shutdown protocol for thermal system failures

c) Backup unit deployment procedures

d) Customer notification requirements

5. SAFETY AND COMPLIANCE

1. All maintenance and deployment activities must comply with:

a) OSHA standards for industrial robotics

b) ISO/TS 15066 safety requirements

c) Company Safety Protocol 201

d) Customer facility safety requirements

2. Required Safety Equipment

a) Cold-environment personal protective equipment

b) Emergency stop devices

c) Calibrated testing equipment

d) Safety barriers and signage

6. DOCUMENTATION AND REPORTING

1. Required Documentation

a) Deployment checklists

b) Maintenance logs

c) Incident reports

d) Performance metrics

e) Temperature monitoring logs

2. Reporting Requirements

a) Daily operational status reports

b) Weekly performance summaries

c) Monthly maintenance reviews

d) Quarterly compliance audits

7. PROPRIETARY INFORMATION

1. This Document contains confidential and proprietary information of Polar Dynamics Robotics, Inc. and may not be disclosed to third parties without written authorization from the Company's Legal Department.

8. AMENDMENTS AND UPDATES

1. This Document may be amended or updated by the Company at any time, with notice to relevant personnel.

2. Current version maintained in Company document control system.

9. APPROVAL AND EXECUTION

APPROVED AND ADOPTED this 1st day of January, 2024.

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