# OPERATIONS DOCUMENT 374

## STANDARD OPERATING PROCEDURES FOR AUTONOMOUS MOBILE ROBOT DEPLOYMENT AND MAINTENANCE

*Effective Date: January 1, 2024*

*Document Version: 3.2*

*Last Updated: December 15, 2023*

## 1. PURPOSE AND SCOPE

1. This Operations Document ("Document") establishes 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. "Thermal Management Protocol" or "TMP" means the Company's standardized procedures for maintaining optimal AMR operating temperatures.

## 3. DEPLOYMENT PROCEDURES

1. Pre-Deployment Assessment

a) Conduct comprehensive site survey of Deployment Zone

b) Document all thermal zones and transition areas

c) Map facility layout using IceNav mapping protocols

d) Verify facility power infrastructure compatibility

e) Assess wireless communication coverage

2. Installation Requirements

a) AMR units must undergo 24-hour cold-soak testing

b) IceNav calibration must achieve 99.9% accuracy

c) Emergency stop systems verified at all critical points

d) Thermal sensors calibrated to  0.5 C accuracy

## 4. MAINTENANCE PROTOCOLS

1. Scheduled Maintenance

a) Weekly diagnostic scans of IceNav system

b) Monthly actuator performance verification

c) Quarterly thermal management system inspection

d) Semi-annual full system calibration

2. Preventative Maintenance

a) Daily automated self-diagnostic routines

b) Weekly thermal stress analysis

c) Monthly wear pattern analysis

d) Quarterly predictive failure analysis

## 5. SAFETY AND COMPLIANCE

1. All AMR operations must comply with:

a) ANSI/RIA R15.08-1-2020 safety requirements

b) ISO 10218-1:2011 robotics safety standards

c) Company's Cold Environment Safety Protocol

d) Customer-specific safety requirements

2. Emergency Procedures

a) Automated shutdown if thermal limits exceeded

b) Remote kill-switch activation protocols

c) Emergency evacuation procedures

d) Incident reporting requirements

## 6. QUALITY CONTROL

1. Performance Metrics

a) Navigation accuracy >99.5% in sub-zero conditions

b) Thermal management efficiency >95%

c) System uptime >98% in Critical Operating Temperature

d) Battery performance >90% of rated capacity

2. Documentation Requirements

a) Daily operation logs

b) Maintenance records

c) Incident reports

d) Performance analytics

## 7. PROPRIETARY INFORMATION

1. All technical specifications, operational procedures, and maintenance protocols contained herein constitute confidential and proprietary information of the Company.

2. This Document may not be disclosed to third parties without written authorization from the Company's Chief Technology Officer or General Counsel.

## 8. AMENDMENTS AND UPDATES

1. This Document shall be reviewed quarterly by the Operations Committee.

2. Amendments require approval from:

a) Chief Technology Officer

b) Chief Operations Officer

c) Chief Robotics Officer

d) Director of Quality Assurance

## 9. EXECUTION AND APPROVAL

IN WITNESS WHEREOF, this Operations Document has been executed by the duly authorized representatives of the Company:

Dr. Elena Frost

Chief Executive Officer

Date: January 1, 2024

Sarah Nordstrom

Chief Operations Officer

Date: January 1, 2024

Dr. James Barrett

Chief Robotics Officer

Date: January 1, 2024

## 10. DOCUMENT CONTROL

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