

# ENVIRONMENTAL SEALING STANDARDS COMPLIANCE

## CERTIFICATION

**EFFECTIVE DATE:** January 11, 2024

**DOCUMENT NUMBER:** ESC-2024-011

**ISSUING ENTITY:** Polar Dynamics Robotics, Inc.

**CLASSIFICATION:** Technical Compliance Documentation

### 1. PURPOSE AND SCOPE

1. This document certifies compliance with applicable environmental sealing standards for Polar Dynamics Robotics, Inc.'s ("Company") autonomous mobile robot ("AMR") product lines, specifically relating to ingress protection and environmental resistance requirements for cold storage and extreme temperature operations.
2. This certification covers all current production models in the IceNav(TM) series (Models IN-2000, IN-3000, and IN-4000) manufactured at Company's Delaware facility.

### 2. APPLICABLE STANDARDS

1. The Company hereby certifies compliance with the following standards:
  - a) IP67 Rating (IEC 60529) for complete dust protection and water immersion protection
  - b) NEMA 4X certification for indoor/outdoor corrosion protection
  - c) MIL-STD-810H (Methods 501.7, 502.7) for high and low temperature operation
  - d) IEC 60068-2-1 Environmental Testing - Cold
  - e) IEC 60068-2-14 Environmental Testing - Temperature Cycling

### 3. TECHNICAL SPECIFICATIONS

#### 1. Enclosure Sealing Systems

The Company's AMR products incorporate the following sealing technologies:

- a) Proprietary triple-seal gasket system (Patent Pending #US2023/0456789)
- b) Chemical-resistant EPDM compression seals

- c) Thermally-compensating seal profiles
- d) Multi-stage positive pressure maintenance system

## 2. Operating Environment Parameters

Certified operational capabilities:

- Temperature Range: -40 C to +50 C
- Humidity: 5% to 95% non-condensing
- Pressure Differential: 15 kPa
- Impact Resistance: IK08 rating

## 4. TESTING AND VALIDATION

### 1. Testing Protocols

All sealing systems undergo the following validation procedures:

- a) Environmental chamber cycling (1,000 hours minimum)
- b) Thermal shock testing (-40 C to +50 C, 100 cycles)
- c) Pressure differential testing ( 20 kPa, 500 cycles)
- d) Vibration testing per IEC 60068-2-6
- e) Salt spray exposure (1,000 hours)

### 2. Quality Assurance

Each production unit undergoes:

- Helium leak detection testing
- Thermal imaging verification
- Pressure decay testing
- Environmental chamber validation

## 5. MAINTENANCE AND INSPECTION

### 1. Scheduled Maintenance Requirements

The Company mandates the following maintenance schedule:

- a) Quarterly visual inspection of all seals

- b) Semi-annual pressure testing
- c) Annual complete seal replacement
- d) Bi-annual thermal imaging inspection

## 2. Documentation Requirements

Maintenance records must include:

- Date and type of inspection
- Serial number of unit
- Test results and measurements
- Technician certification number
- Environmental conditions during testing

## 6. COMPLIANCE VERIFICATION

1. The Company maintains the following compliance documentation:

- a) Third-party testing certificates
- b) Internal validation reports
- c) Component traceability records
- d) Manufacturing process controls
- e) Quality management system records

2. All documentation is maintained for a minimum of seven (7) years from the date of manufacture.

## 7. WARRANTY AND LIABILITY

1. Environmental sealing compliance is warranted under normal operating conditions for a period of three (3) years from the date of installation.

2. Warranty is contingent upon:

- Adherence to maintenance schedule
- Use within specified environmental parameters
- Installation by certified technicians
- Proper documentation maintenance

## **8. CERTIFICATION**

The undersigned hereby certifies that all statements contained herein are true and correct to the best of their knowledge and belief.

POLAR DYNAMICS ROBOTICS, INC.

**By:**

Dr. James Barrett

Chief Robotics Officer

Date: January 11, 2024

**Witness:**

Katherine Wells

Chief Financial Officer

## **9. REVISION HISTORY**

Version 1.0 - January 11, 2024 - Initial Release

Version 1.1 - January 11, 2024 - Updated testing protocols

Version 1.2 - January 11, 2024 - Added compliance verification section

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