PDR-2023-112 COLD WEATHER MATERIAL SPECIFICATIONS

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Classification: Technical Specifications - Confidential

Owner: Polar Dynamics Robotics, Inc.

1. PURPOSE AND SCOPE

1. This specification document ("Specification") establishes the manda

2. This Specification applies to all BlueCore(TM) technology platform

2. DEFINITIONS

1. "Cold Environment" means any operating environment with sustain

2. "Critical Components" means any mechanical, electrical, or structu

3. "BlueCore(TM) Components" refers to proprietary components spe

3. MATERIAL REQUIREMENTS

1. **Structural Materials**

a) Primary chassis components must utilize SAE 4340 alloy steel or e

with certified low-temperature impact resistance to -40 C.

b) External panels and protective housings shall be constructed from
composite materials meeting or exceeding MIL-STD-810H Method 50

c) All welded joints must maintain structural integrity at temperatures
-45 C.

2. **Electronic Components**

a) Circuit boards must utilize FR-4 material with Tg 170 C and meet
IPC-4101E/126 specifications.

b) All semiconductor components shall be rated for industrial tempera
(-40 C to +85 C).

c) Battery cells must be certified for operation at -40 C with capacity
degradation not exceeding 15%.

3. **Seals and Gaskets**

a) All sealing materials must maintain flexibility and compression set resistance at -45 C.

b) Gasket materials shall be silicone-based compounds with Shore A ratings of 60 5.

c) O-rings must be manufactured from low-temperature fluorosilicone AMS-R-25988 Type 2 Class 1 specifications.

4. TESTING AND VALIDATION

1. **Material Certification**

a) All Critical Components must be accompanied by material certificat conformance.

b) Third-party laboratory validation required for all BlueCore(TM) Com

2. **Environmental Testing**

a) Components shall undergo thermal cycling from -45 C to +85 C for
cycles.

b) Impact resistance testing required at -40 C per ASTM D256.

3. **Quality Control**

a) Batch testing of incoming materials required per PDR-QC-203 prot

b) Non-conforming materials must be quarantined and reported per P

5. SUPPLIER REQUIREMENTS

1. Suppliers must maintain ISO 9001:2015 certification and demonstra

2. Material substitutions require written approval from PDR Engineerin

3. Suppliers shall maintain material traceability records for minimum 5

6. COMPLIANCE AND DOCUMENTATION

1. All materials must comply with applicable REACH and RoHS regula

2. Documentation requirements:

- Material Safety Data Sheets (MSDS)
- Certificates of Conformance
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Test Reports

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Traceability Records

7. REVISION CONTROL

1. This Specification shall be reviewed annually and updated as requi

2. Revision history shall be maintained in PDR document control syste

8. PROPRIETARY INFORMATION

1. This document contains confidential and proprietary information of

9. APPROVAL AND AUTHORIZATION

APPROVED BY:

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Dr. James Barrett

Chief Robotics Officer

Date: January 11, 2024

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Date: January 11, 2024

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Chief Operating Officer

Date: January 11, 2024

10. DOCUMENT CONTROL

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