COLD CLIMATE CERTIFICATION REQUIREMENTS GUIDE

COLD CLIMATE CERTIFICATION REQUIREM

Polar Dynamics Robotics, Inc.

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1. PURPOSE AND SCOPE

1. This Cold Climate Certification Requirements Guide ("Guide") estab

2. This Guide applies to all BlueCore(TM)-enabled AMR units intende

2. DEFINITIONS

1. "Cold Climate Environment" means any controlled environment ma

2. "Critical Components" refers to all electronic, mechanical, and struc

3. "Certification Testing" encompasses all required validation procedu

3. CERTIFICATION REQUIREMENTS

1. Temperature Rating Requirements

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Primary Operating Range: -30 C to 0 C (-22 F to 32 F)

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Extended Operating Range: -40 C to -30 C (-40 F to -22 F)

Survival Temperature Range: -45 C to 50 C (-49 F to 122 F)

2. Component-Specific Requirements

a) Battery Systems

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Cold-start capability at -40 C

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Minimum 6-hour runtime at -30 C

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UL 2580 compliance for extreme temperature operation

b) Navigation Systems

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Sensor functionality verification at -35 C

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Position accuracy 5cm at all operating temperatures

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BlueCore(TM) system stability validation

c) Mechanical Systems

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Low-temperature lubricant certification

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Cold-impact resistance testing

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Thermal expansion compensation verification

4. TESTING PROTOCOLS

1. Environmental Chamber Testing

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Minimum 72-hour continuous operation test

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Temperature cycling between operating extremes

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Humidity variation 20% to 90% RH

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Documentation per ISO/IEC 17025 standards

2. Component-Level Testing

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Individual subsystem validation

-

Thermal imaging analysis

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Power consumption profiling

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Stress testing at temperature extremes

3. System Integration Testing

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Full-system operational validation

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Navigation accuracy verification

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Emergency stop functionality

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Communication system reliability

5. DOCUMENTATION REQUIREMENTS

1. Required Documentation

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Test results from approved facilities

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Component certification records

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Thermal analysis reports

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Performance validation data

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Compliance declarations

2. Record Retention

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Maintain all certification records for 7 years

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Electronic backup in secure repository

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Annual review and validation

6. COMPLIANCE AND AUDITING

1. Internal Audits

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Quarterly review of certification processes

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Documentation completeness verification

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Testing facility qualification review

2. External Validation

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Annual third-party certification review

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Independent laboratory verification

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Regulatory compliance assessment

7. CERTIFICATION RENEWAL

1. Renewal Requirements

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Annual recertification of active units

- Updated compliance documentation

- Performance history review

- Component degradation analysis

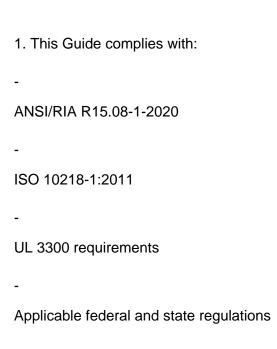2. Modification Requirements

- Re-certification after major modifications

- Engineering change impact assessment

- Updated test documentation

8. LEGAL COMPLIANCE

1. This Guide complies with:

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ANSI/RIA R15.08-1-2020

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ISO 10218-1:2011

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UL 3300 requirements

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Applicable federal and state regulations

9. DISCLAIMER

1. This Guide is confidential and proprietary to Polar Dynamics Robot

2. Certification requirements may be updated without notice to mainta

10. AUTHORIZATION

APPROVED AND ADOPTED by Polar Dynamics Robotics, Inc.

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