

ROBOT PERFORMANCE SPECIFICATIONS - COLD CHAIN OPERATIONS

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Classification: Confidential

1. INTRODUCTION

1 This Performance Specification Document ("Specification") sets forth

2 These specifications apply to all BlueCore(TM)-enabled AMR models.

2. DEFINITIONS

1 "Cold Chain Environment" means any controlled temperature environment.

2 "Operating Temperature Range" means the temperature range within which the device can operate.

3 "BlueCore(TM) System" means PDR's proprietary cold-environment management system.

4 "Critical Performance Metrics" means the essential operational parameters that define device performance.

3. OPERATIONAL REQUIREMENTS

1 Temperature Tolerance

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Primary Operating Range: -30 C to +4 C

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Extended Operating Range: -40 C to +10 C (limited duration)

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Thermal Shock Resistance: 30 C within 60 seconds

2 Power Systems

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Minimum Runtime: 12 hours at -25 C

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Charging Temperature Range: -10 C to +25 C

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Battery Chemistry: Proprietary lithium-ion cold-formulation

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Charging Time: 45 minutes (20% to 80% charge)

3 Navigation Performance

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Positioning Accuracy: 15mm at -30 C

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Path Planning Update Rate: 10Hz minimum

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Obstacle Detection Range: 8 meters

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Emergency Stop Distance: 500mm at maximum speed

4. CRITICAL PERFORMANCE METRICS

1 Payload Specifications

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Maximum Load: 1,500kg

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Continuous Load Rating: 1,200kg

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Load Distribution Tolerance: 10% offset from center

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Maximum Incline (Loaded): 3 degrees

2 Speed Parameters

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Maximum Speed (Unloaded): 2.0 m/s

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Maximum Speed (Loaded): 1.5 m/s

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Minimum Speed Control: 0.1 m/s

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Rotational Speed: 45 degrees/second

3 Reliability Metrics

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Mean Time Between Failures (MTBF): 5,000 hours

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Scheduled Maintenance Interval: 2,000 hours

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System Availability: 98% minimum

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Error Recovery Time: 30 seconds

5. ENVIRONMENTAL COMPLIANCE

1 The AMR shall maintain specified performance levels under the following conditions:

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Relative Humidity: 15% to 95% non-condensing

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Floor Surface Moisture: IP54 rating maintained

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Air Pressure: 70kPa to 106kPa

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Electromagnetic Interference: EN 61000-6-2 compliance

2 Environmental Protection

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Ingress Protection: IP54 minimum

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Condensation Management: Active moisture control

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Static Discharge Protection: IEC 61000-4-2 Level 4

6. SAFETY SYSTEMS

1 Emergency Controls

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Emergency Stop Buttons: Minimum 2 locations

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Remote Emergency Stop: Wireless implementation

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System Status Indicators: 360° visibility

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Audible Warning System: 75dB at 1 meter

2 Safety Certifications

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CE Marking compliance

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ISO 3691-4:2020 conformance

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ANSI/RIA R15.08-1-2020 compliance

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Cold Storage Safety Standard adherence

7. MONITORING AND REPORTING

1 The AMR shall continuously monitor and report:

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Internal component temperatures

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Battery performance metrics

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Navigation system status

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Error conditions and recovery actions

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Payload weight and distribution

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Environmental conditions

2 Data Logging Requirements

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Minimum Storage: 30 days of operational data

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Sampling Rate: 1Hz for critical parameters

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Automatic upload to cloud storage

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Encrypted data transmission

8. WARRANTY AND DISCLAIMER

1 PDR warrants that AMRs meeting these specifications will maintain

2 These specifications are subject to change without notice and repre

9. CERTIFICATION

The undersigned hereby certifies that these specifications have been
and approved for implementation.

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POLAR DYNAMICS ROBOTICS, INC.

By: _

Dr. James Barrett

Chief Robotics Officer

Date: _

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Document End

