WAREHOUSE MANAGEMENT SYSTEM VALIDATION PROTOCOL

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Document Owner: Polar Dynamics Robotics, Inc.

1. PURPOSE AND SCOPE

1. This Warehouse Management System ("WMS") Validation Protoco

2. This protocol applies to all WMS integration projects involving Polar

2. DEFINITIONS

1. "System" means the integrated solution comprising Polar Dynamics

2. "Validation" means the documented testing process that provides a

3. "Critical Parameters" means the essential performance metrics that

3. VALIDATION REQUIREMENTS

1. Pre-Validation Activities

1.1. Documentation Review

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System requirements specification

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Functional design specification

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Hardware configuration documentation

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Software version control records

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Risk assessment documentation

1.2. Environmental Controls

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Temperature monitoring system calibration

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Climate control system verification

Backup power systems testing

2. Validation Testing Categories

2.1. Installation Qualification (IQ)

- Hardware component verification
- Software installation confirmation
- Network connectivity validation
- System access control verification

2.2. Operational Qualification (OQ)

Communication protocol testing

- Data transfer accuracy verification

- System response time measurement

- Error handling assessment

- User interface functionality testing

2.3. Performance Qualification (PQ)

- Full-load testing under various temperature conditions

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Extended operation stability assessment

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Recovery from power interruption testing

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Data integrity verification during peak operations

4. TEST SPECIFICATIONS

1. Temperature Performance Testing

1.1. The System shall maintain operational integrity within the followin

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Continuous operation at -30 C for 72 hours

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Temperature transition testing from -30 C to +25 C

- Navigation accuracy within 5cm at all operating temperatures
- Battery performance verification at temperature extremes

2. WMS Integration Testing

2.1. Data Exchange Validation

- Order processing latency <200ms
- Inventory update accuracy 99.99%
- Task assignment confirmation
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Location tracking precision

2.2. Error Handling

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Communication failure recovery

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Task queue management

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System redundancy verification

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Automatic failover testing

5. ACCEPTANCE CRITERIA

1. The System shall be deemed validated when:

1.1. All critical parameters meet specified tolerances

1.2. Zero critical defects identified during PQ testing

1.3. System uptime exceeds 99.9% during 168-hour continuous opera

1.4. All data integrity checks pass validation

1.5. Recovery procedures successfully demonstrated

6. DOCUMENTATION REQUIREMENTS

1. The following documentation must be maintained:

1.1. Validation master plan

1.2. Test scripts and results

1.3. Deviation reports and resolutions

1.4. Change control records

1.5. Training records

1.6. Final validation report

7. MAINTENANCE AND REVALIDATION

1. Periodic Review Requirements

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Annual system performance review

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Quarterly security assessment

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Monthly backup verification

2. Revalidation Triggers

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Major software updates

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Hardware modifications

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Significant environmental changes

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Regulatory requirement updates

8. APPROVAL AND AUTHORIZATION

This Validation Protocol has been reviewed and approved by:

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Dr. Elena Frost

Chief Executive Officer

Date: _

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Date: _

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Dr. James Barrett

Chief Robotics Officer

Date: _

9. REVISION HISTORY

Version | Date | Description | Approved By

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0 | 2024-01-15 | Initial Release | E. Frost

9 | 2023-12-10 | Final Draft | M. Chen

8 | 2023-11-15 | Technical Review | J. Barrett