

PDR-OPS-021 ROBOT WATERPROOFING TEST PROCEDURES

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Classification: Confidential - Internal Use Only

1. PURPOSE AND SCOPE

1. This document establishes the standardized procedures for waterp

2. These procedures apply to all PDR AMR models featuring BlueCor

2. REFERENCED DOCUMENTS

1. ISO 60529:1989 - Degrees of protection provided by enclosures (IP
2. PDR-QMS-001 Quality Management System Manual
3. PDR-OPS-015 Environmental Testing Standards
4. PDR-SAF-008 Laboratory Safety Procedures

3. DEFINITIONS

1. ****IP Rating****: Ingress Protection rating as defined by ISO 60529
2. ****Test Chamber****: PDR's certified environmental testing facility
3. ****DUT****: Device Under Test (referring to the AMR being tested)

4. **Critical Components**: Power systems, navigation sensors, and ECU

4. TESTING REQUIREMENTS

1. Environmental Conditions

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Temperature Range: -30 C to +25 C

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Relative Humidity: 20% to 95%

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Atmospheric Pressure: 86 kPa to 106 kPa

2. Equipment Requirements

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Calibrated spray nozzles (per ISO 60529)

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Environmental chamber with temperature control

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Water quality monitoring system

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Digital pressure gauges

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Video recording equipment

5. TEST PROCEDURES

1. Pre-Test Preparation

- a) Document AMR serial number and configuration
- b) Verify BlueCore(TM) system firmware version
- c) Perform standard operational checkout

- d) Install monitoring sensors at critical points
- e) Photograph initial condition of all seals and gaskets

2. Standard Water Resistance Test

- a) Position DUT in test chamber at specified angles
- b) Apply water spray at prescribed pressure (100 kPa - 10 kPa)
- c) Maintain spray for 10 minutes per orientation
- d) Rotate DUT through all critical angles
- e) Monitor sensor readings throughout test

3. Condensation Test

- a) Cycle temperature from -30 C to +25 C over 4 hours
- b) Maintain 95% relative humidity
- c) Operate AMR systems throughout test

- d) Monitor for condensation formation
- e) Record any operational anomalies

6. ACCEPTANCE CRITERIA

1. No water ingress in any critical component compartments
2. All electrical systems maintain normal operation
3. No degradation of BlueCore(TM) performance metrics
4. Seal integrity maintained throughout testing
5. Navigation system accuracy within 5mm of baseline

7. DOCUMENTATION REQUIREMENTS

1. Test Results

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Complete test data logs

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Environmental condition records

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System performance metrics

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Photographic documentation

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Video recordings of tests

2. Non-Conformance Reporting

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Document any deviations from specifications

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Record corrective actions taken

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Maintain failure analysis reports

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Track engineering change requests

8. SAFETY PROTOCOLS

1. Personal Protective Equipment

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Insulated waterproof footwear

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Eye protection

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Cold-weather gear when appropriate

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Electrical safety gloves

2. Emergency Procedures

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Location of emergency stops

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Electrical isolation protocols

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Emergency contact information

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First aid procedures

9. QUALITY ASSURANCE

1. All testing must be performed by certified PDR test engineers
2. Test equipment calibration must be current and documented
3. Results require review by Quality Assurance Manager
4. Maintain chain of custody for all test documentation

10. CONFIDENTIALITY

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11. DOCUMENT CONTROL

Approved by:

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Quality Assurance Director: _____ Date: _____

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Chief Technology Officer: _____ Date: _____

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Chief Robotics Officer: _____ Date: _____

Document History:

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Version 3.2: January 15, 2024 - Updated test parameters for GL-500

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Version 3.1: October 10, 2023 - Revised acceptance criteria

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Version 3.0: July 1, 2023 - Major revision incorporating BlueCore(TM)

