WEATHER RESISTANCE TESTING PROTOCOL

Polar Dynamics Robotics, Inc.

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1. PURPOSE AND SCOPE

1. This Weather Resistance Testing Protocol ("Protocol") establishes the mandatory procedures and standards for testing the weather resistance capabilities of all Polar Dynamics Robotics, Inc. ("Company") autonomous mobile robots ("AMRs") and their component systems.

2. This Protocol applies to all production models of Company AMRs, including but not limited to the Arctic Series(TM), Frost Runner(TM), and ColdNav(TM) product lines.

2. DEFINITIONS

1. "Test Unit" refers to any Company AMR or component system undergoing weather resistance testing.

2. "Environmental Chamber" means the Company's proprietary testing facility capable of simulating extreme weather conditions.

3. "Testing Cycle" means a complete sequence of environmental exposure tests as specified in Section 4.

4. "Critical Systems" include, but are not limited to:

a) IceNav(TM) navigation system

b) Cold-resistant actuators

c) Thermal management systems

d) Battery systems

e) Sensor arrays

3. TESTING FACILITIES AND EQUIPMENT

1. All weather resistance testing shall be conducted in Company-approved Environmental Chambers

meeting the following specifications:

a) Temperature range: -40 C to +50 C

b) Humidity control: 10% to 95% RH

c) Ice/frost simulation capability

d) Wind speed simulation up to 50 mph

e) Calibration certification within last 6 months

2. Testing equipment must include:

a) Certified temperature monitoring systems

b) Digital humidity sensors

c) Thermal imaging cameras

d) Data logging systems

e) Performance monitoring equipment

4. TESTING PROCEDURES

1. Pre-Test Requirements

a) Complete system diagnostic check

b) Calibration verification of all sensors

c) Documentation of initial conditions

d) Safety system verification

2. Standard Testing Cycle

a) Cold Operation Test (-30 C, 8 hours)

b) Rapid Temperature Transition Test

c) High Temperature Operation Test (+40 C, 4 hours)

d) Humidity Resistance Test (95% RH, 4 hours)

e) Frost Accumulation Test

f) Condensation Resistance Test

3. Extended Environmental Testing

a) Thermal shock cycling

b) Ice buildup resistance

c) Water ingress protection

d) Wind resistance testing

e) Extended cold operation (24 hours)

5. PERFORMANCE CRITERIA

1. Test Units must maintain the following performance standards:

a) Navigation accuracy within 5cm

b) Battery performance >80% of rated capacity

c) Actuator response time <150ms

d) Sensor data reliability >99.9%

e) System uptime >99.5%

2. Failure Conditions

a) System shutdown or reset

b) Loss of navigation capability

c) Battery performance <70%

d) Communication system failure

e) Mechanical system malfunction

6. DATA COLLECTION AND REPORTING

1. Required Test Documentation:

a) Test conditions and parameters

b) System performance metrics

c) Environmental data logs

d) Failure incidents and analysis

e) Photo and video documentation

2. Test Reports must include:

a) Executive summary

b) Detailed test results

c) Performance analysis

d) Recommendations

e) Certification status

7. QUALITY ASSURANCE

1. Testing Personnel Requirements:

a) Certified testing engineers

b) Current safety training

c) Protocol proficiency verification

d) Documentation training

2. Quality Control Measures:

a) Regular equipment calibration

b) Testing procedure audits

c) Data verification processes

d) Independent review of results

8. COMPLIANCE AND CERTIFICATION

1. All testing must comply with:

a) ISO 9001:2015 requirements

b) IP67 testing standards

c) UL 3300 requirements

d) Company quality standards

2. Certification Requirements:

a) Test completion documentation

b) Performance verification

c) Quality assurance sign-off

d) Engineering approval

9. PROTOCOL REVISION

1. This Protocol shall be reviewed annually and updated as necessary to reflect:

a) New product requirements

b) Technology advances

c) Regulatory changes

d) Process improvements

10. CONFIDENTIALITY

1. This Protocol contains proprietary and confidential information of Polar Dynamics Robotics, Inc. and may not be disclosed without written authorization.

APPROVAL AND EXECUTION

APPROVED AND ADOPTED this 1st day of January, 2024.

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