

ARCTIC-GRADE SENSOR CALIBRATION GUIDELINES V2.1

ARCTIC-GRADE SENSOR CALIBRATION GU

Polar Dynamics Robotics, Inc.

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1. PURPOSE AND SCOPE

1. These Arctic-Grade Sensor Calibration Guidelines ("Guidelines") es
2. These Guidelines apply to all PDR employees, contractors, and au

2. DEFINITIONS

1. "Arctic-Grade Sensors" means any sensor component rated for con
2. "BlueCore(TM) Platform" means PDR's proprietary cold-environme
3. "Calibration Zone" means a temperature-controlled testing environr
4. "Critical Operating Parameters" means the set of sensor performan

3. LEGAL COMPLIANCE AND CERTIFICATION

1. All calibration procedures must comply with:
 - a) ISO/IEC 17025:2017 standards for testing laboratories
 - b) ANSI/ISA-92.00.01-2010 Performance Requirements for Automate

c) PDR's Quality Management System (QMS-2023-v3)

2. Calibration technicians must maintain current certification in:

a) PDR Arctic Systems Level II certification

b) BlueCore(TM) Platform technical certification

c) Cold Environment Safety protocols

4. CALIBRATION ENVIRONMENT REQUIREMENTS

1. Temperature Control

a) Primary calibration zone: -40 C to +25 C (0.5 C tolerance)

b) Secondary validation zone: -55 C to -25 C (1.0 C tolerance)

c) Temperature ramp rate: 2 C per minute maximum

2. Humidity Control

a) Operating range: 15% to 85% RH (non-condensing)

b) Stability: 2% RH over 24 hours

3. EMI/RFI Shielding

a) Minimum 60dB attenuation from 100kHz to 1GHz

b) Conducted emissions compliance per IEC 61000-4-6

5. CALIBRATION PROCEDURES

1. Pre-Calibration Requirements

a) Verify sensor firmware version matches PDR Approved Component

b) Document initial sensor parameters per Form PDR-CAL-101

c) Perform visual inspection for physical damage or contamination

2. Primary Calibration Sequence

- a) Execute BlueCore(TM) diagnostic routine BC-DIAG-2024
- b) Perform zero-point calibration at +20 C
- c) Conduct stepped temperature calibration at: +10 C, 0 C, -10 C, -20 C, -40 C
- d) Verify sensor response linearity at each temperature point
- e) Document all measurements in PDR Calibration Database

3. Validation Requirements

- a) Minimum 12-hour soak time at -40 C
- b) Three complete operational cycles at extreme temperatures
- c) Drift measurement over 72-hour period
- d) Cross-validation with redundant reference sensors

6. QUALITY CONTROL AND DOCUMENTATION

1. Required Documentation

- a) Calibration certificate with unique identifier
- b) Raw calibration data in PDR standard format
- c) Environmental condition logs
- d) Technician certification verification
- e) Non-conformance reports (if applicable)

2. Quality Control Measures

- a) 100% verification of Critical Operating Parameters
- b) Random audit of 10% of calibrated sensors
- c) Monthly calibration equipment verification
- d) Quarterly procedure compliance review

7. WARRANTY AND LIABILITY

1. Sensor calibration performed according to these Guidelines is warranted.
2. PDR's liability for calibration-related issues is limited to recalibration.
3. These Guidelines do not extend or modify any existing warranty terms.

8. REVISION AND CONTROL

1. These Guidelines shall be reviewed and updated annually or upon request.
2. Revision history shall be maintained in PDR's document control system.
3. Current version supersedes all previous versions.

AUTHORIZATION

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