

PDR-CAL-2023 TEMPERATURE SENSOR CALIBRATION DATA

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Document Reference: PDR-CAL-2023-TS-REV2

Effective Date: January 11, 2024

Classification: CONFIDENTIAL - Technical Documentation

Document Owner: Polar Dynamics Robotics, Inc.

1. PURPOSE AND SCOPE

1. This document establishes the official calibration specifications, tes

2. The calibration data and procedures contained herein apply to all S

2. DEFINITIONS

1. "Calibration Period" means the 72-hour testing and validation cycle

2. "Reference Temperature" means the independently verified ambien

3. "Sensor Array" means the complete assembly of primary and redu

4. "Validation Protocol" means the sequence of testing procedures ou

3. CALIBRATION SPECIFICATIONS

1. Temperature Measurement Range

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Operating Range: -40 C to +25 C

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Optimal Performance Range: -30 C to +5 C

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Critical Accuracy Range: -25 C to -15 C

2. Accuracy Requirements

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Primary Sensor: 0.3 C within Critical Accuracy Range

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Secondary Sensor: 0.5 C within Critical Accuracy Range

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System Average: 0.4 C across Operating Range

3. Response Time

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Maximum Response Time (t_{90}): 2.5 seconds

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Stabilization Period: 5 minutes

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Measurement Interval: 250ms

4. VALIDATION PROTOCOLS

1. Pre-Calibration Procedures

- a) Equipment warm-up period: minimum 30 minutes
- b) Verification of reference equipment calibration
- c) Environmental chamber stabilization: 0.1 C
- d) System diagnostic check completion

2. Primary Calibration Sequence

- a) Zero-point calibration at 0 C
- b) Five-point calibration at: -40 C, -30 C, -20 C, -10 C, 0 C
- c) Three measurement cycles per calibration point
- d) Minimum dwell time: 15 minutes per point

3. Validation Requirements

- a) Maximum permitted deviation: 0.5 C
- b) Minimum sample size: 1000 measurements per point
- c) Statistical confidence level: 95%
- d) Maximum hysteresis: 0.3 C

5. QUALITY CONTROL MEASURES

1. Documentation Requirements

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Calibration date and time

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Serial number of sensor array

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Reference equipment identification

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Technician certification number

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Environmental conditions

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Raw measurement data

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Statistical analysis results

2. Quality Assurance Checks

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Independent verification of calibration results

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Cross-reference with historical data

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System integrity verification

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Documentation completeness review

6. CERTIFICATION AND COMPLIANCE

1. This calibration data and associated procedures comply with:

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ISO/IEC 17025:2017

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ASTM E220-19

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Internal PDR Quality Standard QS-2023-15

2. All calibration equipment maintains current NIST traceability.

7. CONFIDENTIALITY AND USE RESTRICTIONS

1. This document contains confidential and proprietary information be

2. Reproduction, distribution, or disclosure of this information without

8. REVISION AND CONTROL

1. Document Control

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Revision Number: 2.0

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Previous Revision: 1.4 (October 15, 2023)

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Next Review Date: July 11, 2024

2. Change History

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Rev 2.0: Updated accuracy specifications

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Rev 1.4: Added extended temperature range

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Rev 1.3: Modified validation protocols

AUTHORIZATION

APPROVED AND AUTHORIZED BY:

—

Dr. James Barrett

Chief Robotics Officer

Polar Dynamics Robotics, Inc.

Date: January 11, 2024

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Chief Technology Officer

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Date: January 11, 2024

CERTIFICATION

I hereby certify that the calibration data and procedures contained in this document have been reviewed and verified in accordance with PDR Calibration Management System requirements.

—

Sarah Nordstrom

Chief Operating Officer

Polar Dynamics Robotics, Inc.

Date: January 11, 2024

