COLD ENVIRONMENT ROBOT CONTROL SYSTEM DOCUMENTATION

Proprietary & Confidential

Document No. PDR-IP-2023-147

Version 3.2

Last Updated: December 15, 2023

1. SYSTEM OVERVIEW

1 This documentation describes the proprietary cold environment robot control system (the "System") developed by Polar Dynamics Robotics, Inc. ("PDR" or the "Company"), including the IceNav(TM) navigation platform and associated thermal management subsystems.

2 The System comprises both hardware and software components specifically engineered for operation in temperature-controlled environments ranging from -40 C to +25 C, as further detailed in Section 3 below.

2. INTELLECTUAL PROPERTY RIGHTS

1 The System and all its components are protected by the following intellectual property rights:

a) U.S. Patent No. 11,487,623 - "Method and System for Thermal-Resistant Actuator Control"

b) U.S. Patent No. 11,892,445 - "Advanced Environmental Compensation for Autonomous Navigation"

c) U.S. Patent Application No. 17/892,445 - "Distributed Thermal Management for Robotic Systems"

d) Copyright Registration No. TX-9-247-651 - "IceNav(TM) Control Software v4.2"

2 All associated trade secrets, know-how, and proprietary information related to the System are maintained under strict confidentiality protocols pursuant to PDR's Trade Secret Protection Program (Document No. PDR-IP-2023-112).

3. TECHNICAL SPECIFICATIONS

1 Core System Components:

a) Thermal-hardened actuator assembly (Model THA-2023)

b) Distributed temperature monitoring network

c) Environmental compensation algorithms

d) IceNav(TM) navigation and control software

e) Redundant safety systems

2 Operating Parameters:

a) Temperature range: -40 C to +25 C

b) Humidity tolerance: 5% to 95% non-condensing

c) Maximum payload: 1,500 kg

d) Navigation accuracy: 2.5 cm at -30 C

e) Runtime: 12 hours continuous operation

4. PROPRIETARY TECHNOLOGIES

1 The System incorporates the following proprietary technologies:

a) CryoCore(TM) processor architecture

b) ThermalSync(TM) distributed management protocol

c) FrostGuard(TM) actuator protection system

d) IceNav(TM) environmental mapping algorithm

2 Each technology component is subject to ongoing development and enhancement under PDR's R&D program, with all improvements and derivatives remaining the exclusive property of PDR.

5. CONFIDENTIALITY AND PROTECTION

1 This documentation and all information contained herein is strictly confidential and constitutes valuable trade secrets of PDR.

2 Access to this documentation is restricted to authorized personnel who have executed PDR's standard Non-Disclosure Agreement (Document No. PDR-LEG-2023-089).

3 No portion of this documentation may be copied, reproduced, or disclosed without PDR's prior written authorization.

6. COMPLIANCE AND CERTIFICATION

1 The System has obtained the following certifications:

a) UL 1740 - Safety Standard for Robots and Robotic Equipment

b) IP65 Environmental Protection Rating

c) CE Marking for European Market Compliance

d) ISO/TS 15066:2016 - Safety Requirements for Collaborative Robots

2 All testing and certification documentation is maintained in PDR's Technical Documentation Repository (Ref: PDR-TECH-2023-456).

7. VERSION CONTROL AND UPDATES

1 This documentation is subject to PDR's formal version control process under Document Control Procedure PDR-QMS-2023-078.

2 Updates and revisions are tracked in the Change Management Log (Appendix A) and require approval from PDR's Chief Technology Officer and Chief Robotics Officer.

8. LEGAL NOTICES

2 IceNav(TM), CryoCore(TM), ThermalSync(TM), and FrostGuard(TM) are registered trademarks of Polar Dynamics Robotics, Inc.

AUTHENTICATION

IN WITNESS WHEREOF, this documentation has been reviewed and approved by the undersigned authorized representatives of Polar Dynamics Robotics, Inc.

Date: December 15, 2023

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