EMERGENCY STOP SYSTEM CERTIFICATION

PR-7000 ROBOT SERIES

POLAR DYNAMICS ROBOTICS, INC.

Document ID: ESC-PR7000-2024-001

Effective Date: January 15, 2024

Version: 1.0

1. CERTIFICATION OVERVIEW

1. This Emergency Stop System Certification ("Certification") documents compliance of the PR-7000 Robot Series emergency stop system with applicable safety standards and regulations for autonomous mobile robots operating in temperature-controlled environments.

2. This Certification applies to all PR-7000 Series robots manufactured by Polar Dynamics Robotics, Inc. ("Company") bearing serial numbers PR7-24-00001 and higher.

2. APPLICABLE STANDARDS

1. The emergency stop system has been designed, tested, and certified to meet or exceed:

a) ISO 13850:2015 Safety of machinery - Emergency stop function

b) IEC 60204-1:2016 Safety of machinery - Electrical equipment

c) ANSI/RIA R15.06-2012 Industrial Robots and Robot Systems Safety Requirements

d) ISO/TS 15066:2016 Robots and robotic devices - Collaborative robots

e) UL 1740 Standard for Safety of Industrial Robots and Robotic Equipment

3. SYSTEM SPECIFICATIONS

1. Emergency Stop Circuit Configuration:

- Dual-channel safety architecture
- Performance Level e per ISO 13849-1
- Safety Integrity Level (SIL) 3 per IEC 61508
- Redundant monitoring systems
- Cold-environment rated components (-40 C to +50 C)

2. Physical Emergency Stop Devices:

- Four (4) emergency stop buttons positioned at 90 intervals
- One (1) wireless emergency stop pendant
- LED status indicators with cold-temperature visibility enhancement
- Impact-resistant housings rated IP65

4. TESTING AND VALIDATION

1. Each PR-7000 Series robot undergoes the following emergency stop system validation:

a) Full-load stopping distance measurement at maximum speed

b) Response time verification (<100ms)

c) Cold chamber functional testing (-30 C for 48 hours)

d) Thermal cycling durability (500 cycles)

e) Impact resistance verification

f) EMC immunity testing

g) Wireless E-stop range verification

2. Test Results Documentation:

- Individual test reports maintained for 7 years
- Results logged in secure database with serial number tracking
- Third-party validation by T V S D America

5. COMPLIANCE DECLARATIONS

1. The Company hereby certifies that:

a) All emergency stop system components are sourced from ISO 9001 certified suppliers

b) Assembly is performed by certified technicians in an ISO 9001:2015 facility

c) Each unit passes functional safety testing before shipment

d) System design has been reviewed by qualified safety engineers

e) Documentation meets requirements of 21 CFR Part 11

6. MAINTENANCE REQUIREMENTS

1. To maintain certification validity:

a) Monthly functional tests of all E-stop devices

b) Quarterly inspection of safety circuit components

c) Annual third-party safety audit

d) Immediate replacement of any damaged components

e) Documentation of all maintenance activities

7. LIMITATIONS AND CONDITIONS

1. This certification is valid only when:

a) Original components are used for repairs

b) Maintenance schedule is strictly followed

c) No unauthorized modifications are made

d) Operating environment remains within specified parameters

e) Software version remains current per Company requirements

8. WARRANTY AND LIABILITY

1. The Company warrants the emergency stop system for 24 months from commissioning date, subject to terms and conditions of the master warranty agreement.

2. This certification does not modify or supersede any liability limitations or indemnification provisions in the master purchase agreement.

9. CERTIFICATION AUTHORITY

IN WITNESS WHEREOF, the undersigned, being duly authorized representatives of Polar Dynamics Robotics, Inc., hereby certify the accuracy of this document.

Executed this 15th day of January, 2024.

Dr. James Barrett

Chief Robotics Officer

Polar Dynamics Robotics, Inc.

Sarah Nordstrom

Chief Operating Officer

Polar Dynamics Robotics, Inc.

Marcus Chen

Chief Technology Officer

Polar Dynamics Robotics, Inc.

10. REVISION HISTORY

Version 1.0 - Initial Release - January 15, 2024

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