SAFETY LIGHT CURTAIN INSTALLATION VERIFICATION

Document ID: SLC-2023-PDR-475

Effective Date: December 15, 2023

Facility: Polar Dynamics Robotics Manufacturing Center

Location: 4750 Automation Drive, Newark, Delaware 19713

1. PURPOSE AND SCOPE

1. This document certifies the proper installation, testing, and verification of Safety Light Curtain (SLC) systems installed to protect operational zones surrounding Polar Dynamics Robotics' autonomous mobile robot (AMR) testing and validation stations within the Newark Manufacturing Center.

2. The verification procedures detailed herein comply with ANSI/RIA R15.06-2012, ISO 13849-1:2015, and OSHA 29 CFR 1910.212 requirements for machine guarding and safety systems.

2. SYSTEM SPECIFICATIONS

1. Safety Light Curtain Details:

- Manufacturer: SafetyTech Industries
- Model: ColdGuard Pro X-Series
- Type: Type 4 Safety Light Curtain
- Resolution: 14mm
- Protected Height: 1600mm
- Response Time: <10ms
- Safety Category: Category 4 (EN 954-1)
- Performance Level: PLe (ISO 13849-1)
- Operating Temperature Range: -40 C to +60 C

2. Installation Locations:

- Test Cell A-1 through A-6: IceNav(TM) AMR Validation Stations
- Cold Chamber B-1 through B-4: Thermal Performance Testing Areas
- Integration Zone C-1 through C-3: Final Assembly Verification

3. INSTALLATION VERIFICATION

1. Physical Installation

- Mounting brackets secured according to manufacturer specifications
- Minimum safety distance calculation: S = (K T) + C
- Verified mounting height: 300mm from floor level
- Alignment indicators confirm proper beam synchronization
- All fasteners torqued to specified values

2. Electrical Installation

- Power supply: 24V DC 10%
- EMC protection measures implemented
- Proper grounding verified
- Safety relay integration confirmed
- Emergency stop circuit integration validated

4. FUNCTIONAL TESTING

1. Test Procedures Completed:

- Start-up alignment verification
- Object detection capability
- Response time measurement
- Muting function verification (where applicable)
- Emergency stop integration testing
- Reset function verification
- Environmental condition simulation

2. Performance Validation:

- Detection zone coverage verified using test pieces
- Cross-talk prevention confirmed between adjacent curtains
- Cold environment performance validated at -30 C
- Condensation resistance verified in thermal cycling

5. SAFETY CONTROL INTEGRATION

1. Integration with Facility Safety Systems:

- Connection to main safety PLC verified
- Zone control implementation confirmed
- Safety function programming validated
- Redundancy checks completed
- Fail-safe operation demonstrated

2. Documentation Requirements:

- Wiring diagrams updated
- Risk assessment documentation completed
- Training materials prepared
- Maintenance procedures documented
- Emergency procedures updated

6. CERTIFICATION

The undersigned hereby certify that all Safety Light Curtain installations at the specified locations have been completed in accordance with manufacturer specifications, applicable safety standards, and Polar Dynamics Robotics' safety protocols.

1. Testing conducted by:

- Lead Safety Engineer: _____

Robert Chen, CSP

Date: December 15, 2023

2. Installation verified by:

- Facility Manager: _____

Maria Thompson

Date: December 15, 2023

3. Safety compliance approved by:

- EHS Director: _____

Dr. Thomas Wright, PE

Date: December 15, 2023

7. MAINTENANCE AND INSPECTION REQUIREMENTS

1. Daily Visual Inspection:

- Physical damage check
- Alignment indicator verification
- Status indicator review

2. Monthly Testing:

- Full functional testing
- Response time verification
- Safety circuit validation

3. Annual Certification:

- Complete system recertification
- Performance level verification
- Documentation update

8. LEGAL DISCLAIMER

This verification document represents the system status as of the effective date stated above. Polar Dynamics Robotics, Inc. maintains responsibility for ensuring ongoing compliance with all applicable safety standards and regulations. This document shall be maintained as part of the facility's safety records for a minimum of five (5) years from the date of execution.

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