ISO/TS 15066 COLLABORATIVE ROBOT SAFETY ASSESSMENT

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NaviFloor Robotics, Inc.

Document Reference: NFR-ISO-15066-2024-001

Date: January 11, 2024

1. EXECUTIVE SUMMARY

This safety assessment documents NaviFloor Robotics, Inc.'s ("Comp
compliance with ISO/TS 15066:2016 specifications for collaborative ro
and the working environment. This assessment covers the NaviFloor

AMR-1000 series autonomous mobile robots operating in collaborativ

2. SCOPE OF ASSESSMENT

1. This assessment evaluates:

- Power and force limiting functions
- Safety-rated monitored stop capabilities
- Speed and separation monitoring systems
- Hand guiding operations
- Collision detection and avoidance systems

Emergency stop functions

2. Applicable Robot Systems:

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AMR-750 Series (Models 751, 752, 753)

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AMR-1000 Series (Models 1001, 1002)

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NaviFloor Fleet Management System v4.2

3. RISK ASSESSMENT METHODOLOGY

1. The Company has conducted comprehensive risk assessments foll

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Hazard identification specific to collaborative operations

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Risk estimation and evaluation

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Risk reduction measures implementation

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Validation of protective measures

2. Assessment Tools and Standards:

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Force measurement system: NFR-FMS-2000

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Speed monitoring system: NaviTrack(TM) v4.2

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Separation distance calculation tool: SafeZone(TM) v3.1

4. TECHNICAL COMPLIANCE ANALYSIS

1. Power and Force Limiting

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Maximum dynamic power output: 80W

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Peak force limit: 150N

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Quasi-static force limit: 120N

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Compliant with Section 5.5.5 of ISO/TS 15066

2. Speed Monitoring

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Maximum speed in collaborative mode: 0.8 m/s

- Minimum protective separation distance: 500mm
- Dynamic speed adjustment based on human proximity
- Compliance with Section 5.5.4 of ISO/TS 15066

3. Safety-rated Monitored Stop

- Stop Category 2 per IEC 60204-1
- Response time: <100ms
- Position monitoring accuracy: 2mm
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Compliant with Section 5.5.2 of ISO/TS 15066

5. SAFETY FEATURES IMPLEMENTATION

1. Collision Avoidance System

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Multi-layer LiDAR scanning (270 field of view)

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Depth-sensing cameras with 3D mapping

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Predictive trajectory planning

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Real-time obstacle detection and classification

2. Emergency Systems

- Redundant emergency stop circuits
- Wireless emergency stop capability
- Auto-recovery protocols
- System status monitoring and logging

3. Human-Robot Interface

- Visual status indicators
- Audible warning systems
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Intuitive gesture recognition

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Touch-screen interface compliance

6. VALIDATION TESTING RESULTS

1. Force Testing

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Impact force measurements conducted at 24 body region points

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All measurements below ISO/TS 15066 Table A.1 thresholds

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Testing conducted by T V S D (Report #2023-RT-456789)

2. Speed and Separation Monitoring

Protective separation distance maintained in all test scenarios

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Response time verification completed

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System stability confirmed under maximum load conditions

7. CERTIFICATION AND DOCUMENTATION

1. The following certifications have been obtained:

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CE Marking (Certificate #CE-2023-89012)

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T V S D Safety Certification (#SC-2023-34567)

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ISO 13849-1 PL d Category 3

2. Supporting Documentation:

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Risk assessment reports

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Test protocols and results

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Technical construction file

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User manuals and training materials

8. DECLARATION OF CONFORMITY

NaviFloor Robotics, Inc. hereby declares that the above-referenced ro

comply with all relevant requirements of ISO/TS 15066:2016 when ins

operated according to provided instructions.

9. AUTHORIZATION

APPROVED AND CERTIFIED BY:

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Dr. Elena Kovacs

Chief Research Officer

NaviFloor Robotics, Inc.

Date: January 11, 2024

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Marcus Depth

Chief Technology Officer

NaviFloor Robotics, Inc.

Date: January 11, 2024

10. LEGAL DISCLAIMER

This assessment represents the safety status as of the date of this do
Continued compliance requires adherence to all specified operational
and maintenance procedures. NaviFloor Robotics, Inc. reserves the ri
modify safety features and specifications as required by technological
or regulatory requirements.