

COLD-ENVIRONMENT ROBOT CHASSIS DESIGN SPECIFICATIONS

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Classification: CONFIDENTIAL - PROPRIETARY INFORMATION

1. INTRODUCTION

1 This document contains proprietary design specifications for cold-en

2 These specifications detail the required engineering standards, materials, and manufacturing processes.

2. DEFINITIONS

1 "BlueCore(TM) Platform" means the Company's proprietary cold-resistant chassis architecture.

2 "Critical Operating Temperature" means the minimum temperature at which the chassis must maintain structural integrity.

3 "Thermal Stress Points" means designated areas of the chassis subject to maximum thermal expansion/contraction.

3. CHASSIS STRUCTURAL SPECIFICATIONS

1 Base Frame Construction

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Primary frame: 6061-T6 aluminum alloy with proprietary cold-hardening treatment.

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Wall thickness: 4.2mm ± 0.1mm

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Maximum dimensional variance: 0.05mm at -40 C

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Structural integrity rating: 2.5x safety factor at maximum payload

2 Thermal Management System

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Integrated heating channels: 12 primary circuits

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Temperature sensor array: 24 distributed monitoring points

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Active thermal regulation range: -45 C to +5 C

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Maximum thermal gradient: 8 C/meter

3 Load-Bearing Specifications

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Maximum payload capacity: 750kg at -40 C

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Dynamic load rating: 1000kg at 1.5m/s

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Impact resistance: 25J at critical points

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Torsional rigidity: 45,000 Nm/degree

4. MATERIAL REQUIREMENTS

1 Primary Materials

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Frame components: Cold-rated aluminum alloy (spec: PD-AL-2023)

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Thermal barriers: Proprietary composite (spec: PD-TB-2023)

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Fasteners: Cryogenic-rated steel alloy (spec: PD-FR-2023)

2 Surface Treatments

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External surfaces: Cold-resistant polymer coating (spec: PD-CT-2023)

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Internal surfaces: Thermal management coating (spec: PD-TM-2023)

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Critical joints: Anti-seize compound rated to -50 C

5. ASSEMBLY PROTOCOLS

1 Environmental Controls

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Assembly area temperature: 20 C ± 2 C

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Humidity: 45% ± 5%

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Cleanliness: ISO Class 7 equivalent

2 Torque Specifications

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Primary structural bolts: 45 Nm ± 2 Nm

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Secondary fasteners: 25 Nm ± 1 Nm

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Thermal system components: 15 Nm 0.5 Nm

6. QUALITY CONTROL REQUIREMENTS

1 Testing Protocols

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Thermal cycling: 500 cycles (-40 C to +20 C)

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Load testing: 120% rated capacity for 24 hours

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Vibration testing: 10-2000 Hz sweep at -40 C

2 Inspection Requirements

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Full dimensional inspection at room temperature

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Thermal imaging analysis at -40 C

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NDT of critical joints post-thermal cycling

7. INTELLECTUAL PROPERTY NOTICE

1 These specifications contain trade secrets and confidential information

2 Protected under U.S. Patents 11,234,567; 11,234,568; 11,234,569 and 11,234,570

8. REVISION HISTORY

Version 3.2 - January 11, 2024

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Updated thermal management specifications

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Added new quality control requirements

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Revised material specifications

Version 3.1 - July 15, 2023

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Enhanced load-bearing specifications

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Updated assembly protocols

9. APPROVAL

APPROVED BY:

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