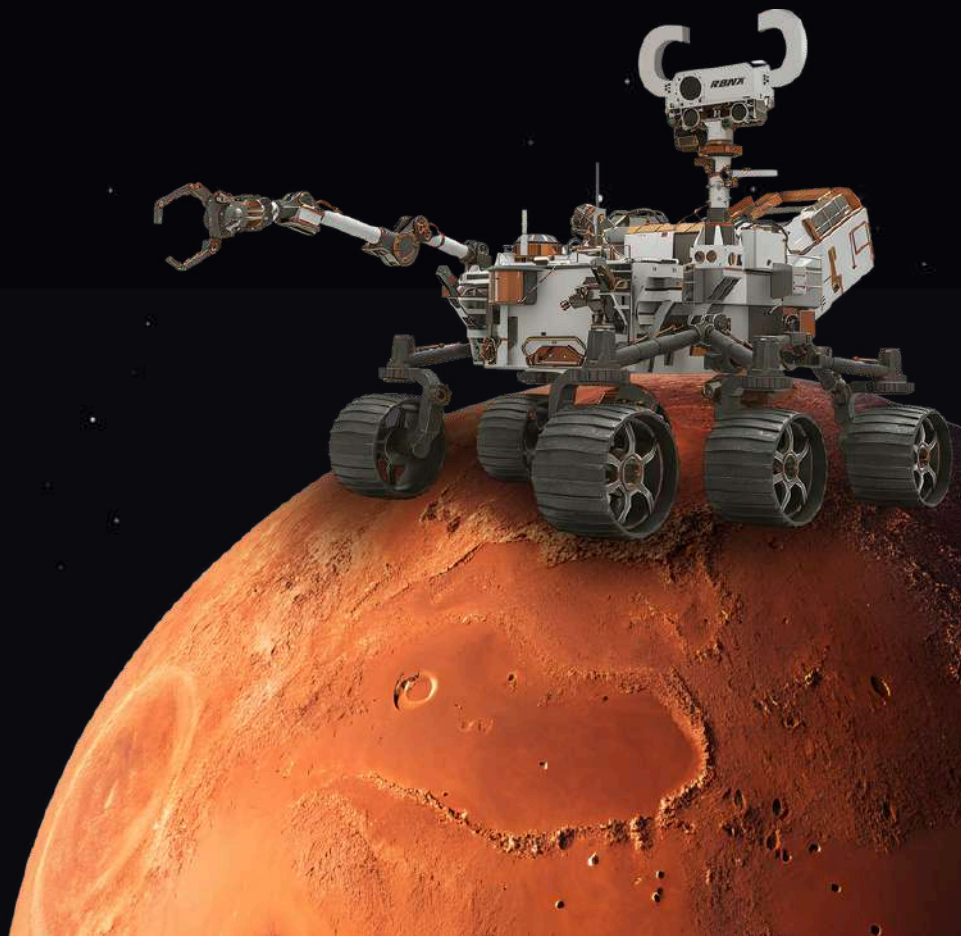
ROBONEXUS
Design. Build. Compete.

VERSION 1.0 | SEPTEMBER 15

OFFICIAL COMPETITION RULEBOOK

Advanced Sumo



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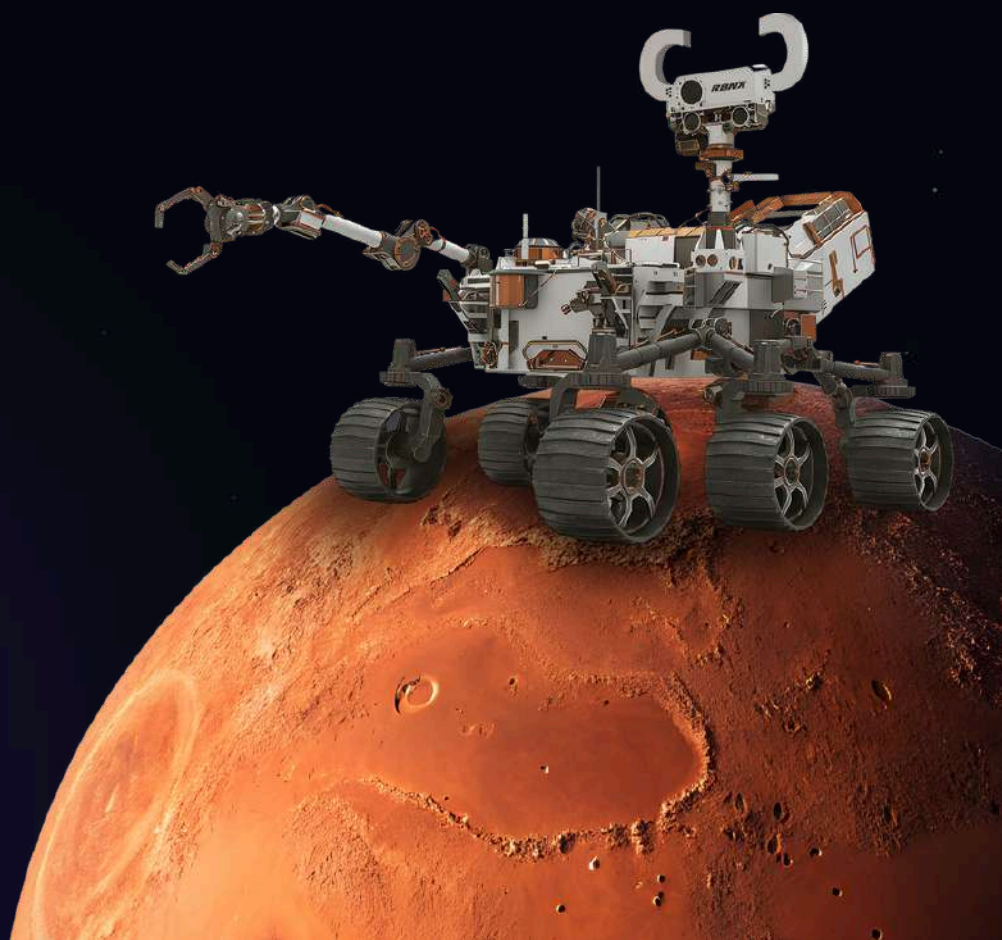
WELCOME MESSAGE



Welcome to RoboNexus

RoboNexus World Championship brings together future engineers to design, build, and compete through hands-on robotics challenges. It is a journey of engineering, teamwork, problem-solving, and turning ideas into systems that perform in the arena.

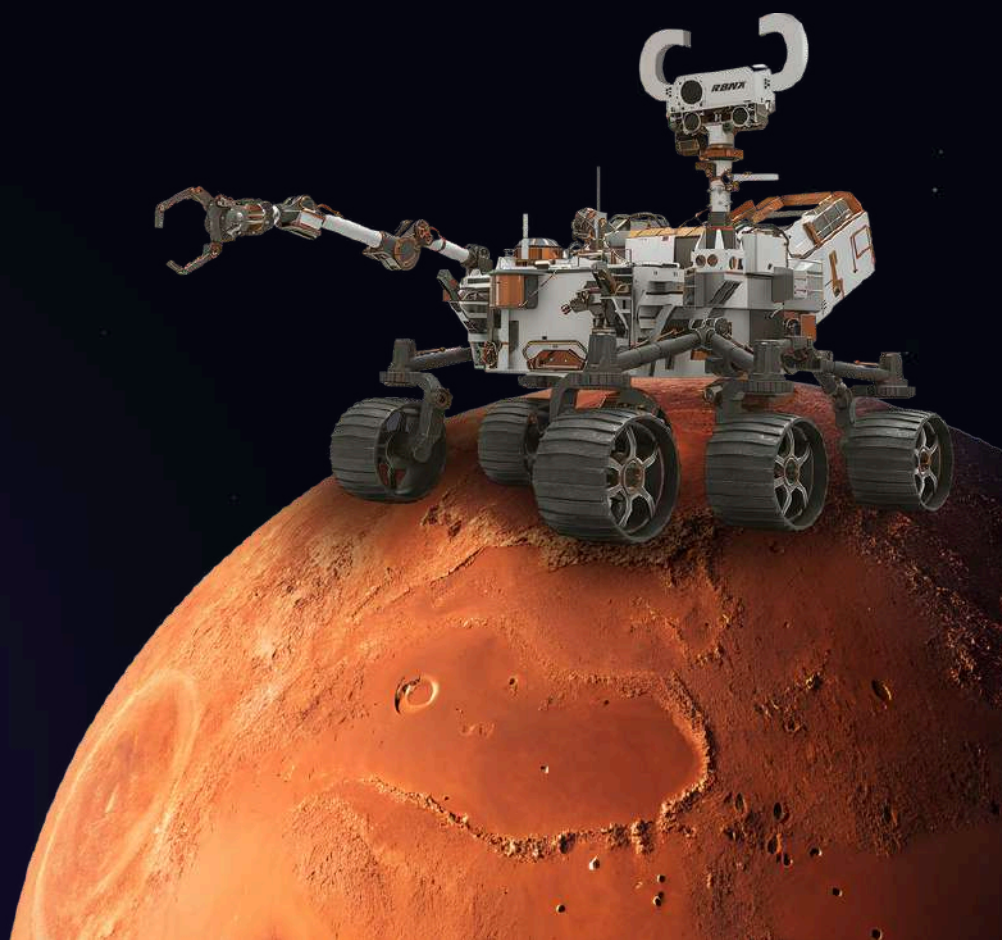
Welcome to the RoboNexus competition family! This Rulebook is the official reference for the **Advanced Sumo** track, guiding teams through the rules, technical requirements, arena specifications, gameplay, scoring, inspection, and everything needed to prepare for competition.

The Rulebook is organized to take you from the competition overview into the technical and gameplay details. Use the Table of Contents to quickly find any section you need throughout the season.

But the challenge is about more than meeting specifications. Build thoughtfully, test constantly, learn from every attempt, and enjoy the process.
Your challenge starts here.

CHAPTER 02

COMPETITION OVERVIEW



Competition Overview

Competition Objective

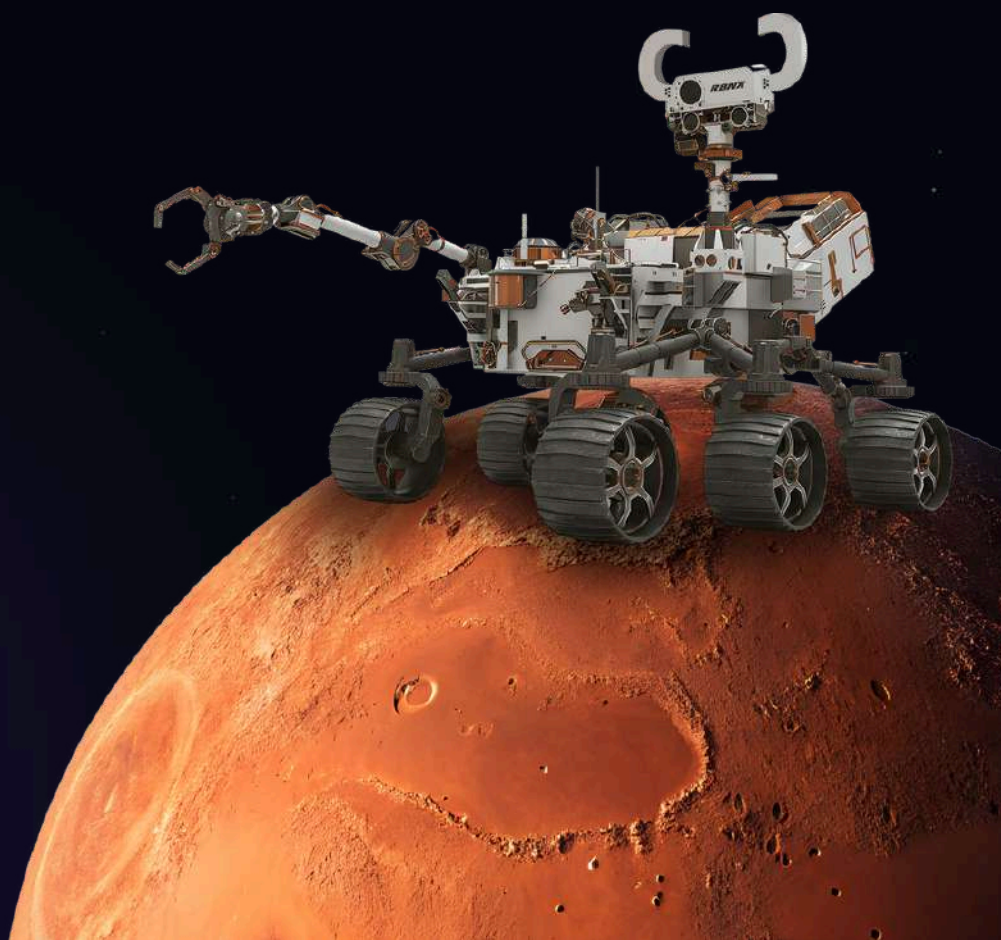
The RoboNexus Advanced Sumo Challenge tests mechanical design, programming intelligence, strategic thinking, and driver skill. Competitors aim to outperform their opponent across three progressive phases, with points accumulated to determine the match winner.

Format Summary

Each match consists of **three phases**: **Autonomous Sumo Clash**, **Disk Placement & Tactical Control**, and **Power Cube Challenge**. **Phase 1** is fully autonomous, while **Phases 2 and 3** allow manual control. **Active gameplay lasts** 5 minutes 30 seconds, and the team with the highest accumulated score wins the match.

CHAPTER 03

COMPETITION SNAPSHOT



Competition Snapshot

The Competition Snapshot gives a fast, at-a-glance summary of the numbers that matter most. Full detail for each value appears in later chapters.

Quick Reference

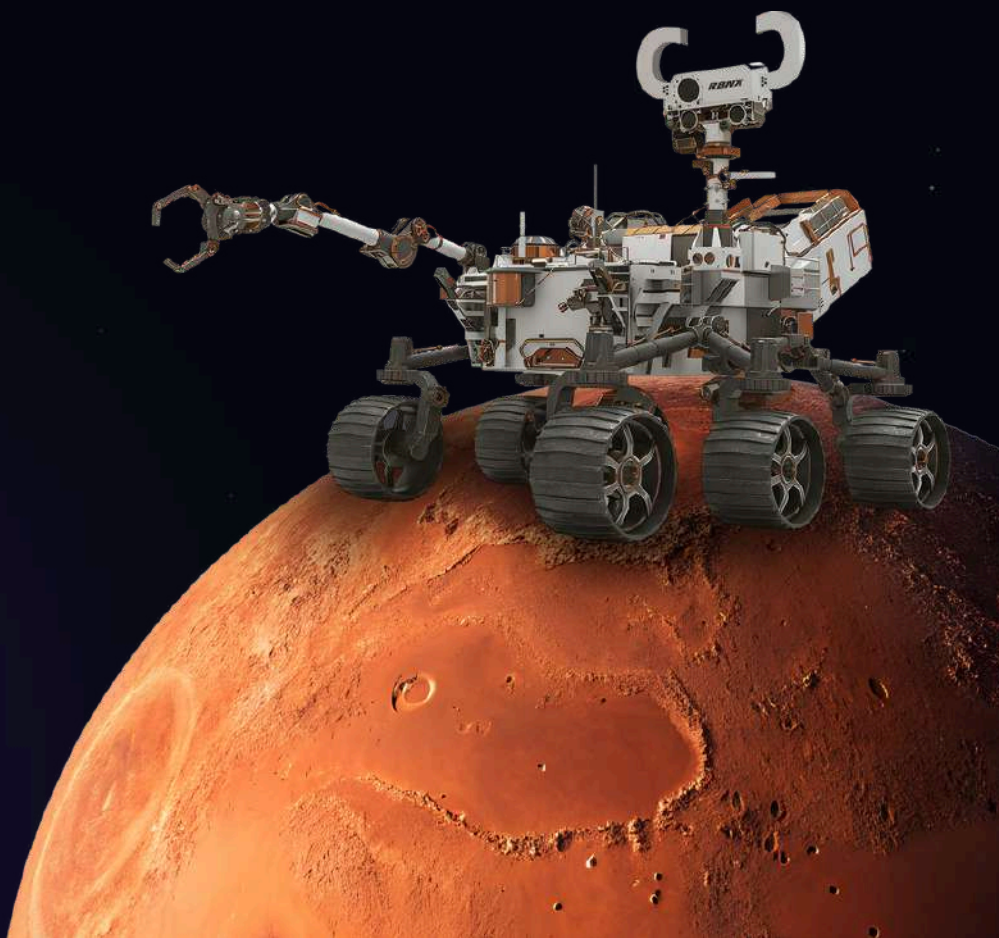
MATCH DURATION	ROBOT COUNT	MAX ROBOT WEIGHT
5:30 MIN Active Gameplay	**Note:** there is no limit on the number of robots as long as they have a combined weight of 20 kg or less and fit in a 50x50x50 cm box	**20 KG**

Extended Reference

COMPETITION FORMAT	CONTROL MODE	MAX FOOTPRINT
3 Phases PRIMARY OBJECTIVE **Maximize Score**	**Auto + Manual** ARENA TYPE **Circular**	**50 x 50 CM** FIELD SIZE **4.0 M x 30 CM** Diameter x Height

CHAPTER 04

ROBOT SPECIFICATIONS



Robot Specifications

All robots competing in Advanced Sumo must meet the technical requirements defined in this chapter. Robots that do not comply will not pass Robot Inspection (Chapter 8).

General Requirements

Table 1: Robot Specifications

Parameter	Specification Limit	Compliance Verification
Maximum Weight (The robot's total mass must remain constant throughout the match.)	**20 kg**	Inspection scale
Starting Footprint (Measured at match start, excluding movable or deployable elements)	**50 x 50 cm**	Sizing Box Test
Max System Voltage (All power systems must be safely fused.)	**24 V**	Electrical Inspection

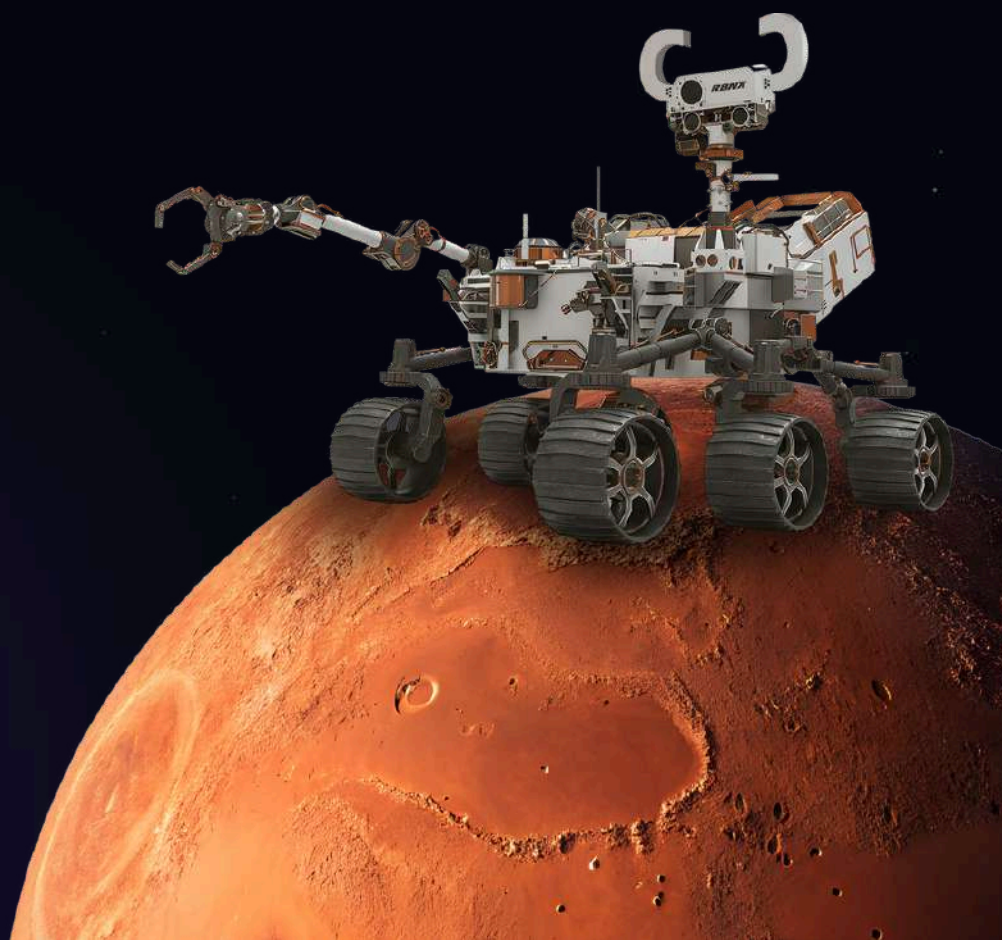
No part of the robot may extend outside the footprint before the match begins.

Prohibited Components

- Entangling mechanisms
- Sticky substances
- Liquids
- Flames
- Explosives
- Projectiles

CHAPTER 05

ARENA



Arena

This chapter describes the physical playing field for the Advanced Sumo track, including dimensions, zones, and field elements.

General Arena Layout

- **Arena Type**: Custom-designed circular arena built specifically for the Advanced Sumo Challenge
- **Shape:** Circular
- **Diameter: 4.0 meters**
- **Surface Finish:** Matte black surface to reduce glare and minimize sensor interference
- **Arena Platform Height:** 30 cm

Boundary & Edge Design

Boundary Marking:

- A continuous **white boundary ring** around the arena perimeter
- Boundary width: **12 cm**

Edge Geometry:

The arena perimeter consists of:

- 4 flat (straight) edge segments
- 8 sloped edge segments
- Slope angle: **30 degrees**

> **A robot is considered out only when the entire robot has left the flat playing surface. Touching the white boundary ring or a sloped edge segment alone does not count as a ring-out.**

Arena

Structural Construction

The arena uses a layered structural design:

- **Top Layer Thickness:** 5 cm
- **Bottom Layer Thickness:** 5 cm
- **Internal Reinforcement:**

Cylindrical supports placed between layers:

- 1 central cylinder
- 4 additional cylinders arranged in a "+" configuration

Phase-Based Arena Elements

The arena includes multiple elements that are activated or covered **depending on the match phase.**

Table 2: Disk Placement System (Phase 2)

System	Location	Notes
Disks	**Arena - Phase 2**	Diameter: 20 cm · Height: 5 cm Weight: 200~250 g
Visual Feedback	**Arena - Phase 2**	An LED strip runs around the arena perimeter · Lights up in the team's color once all three disks are correctly placed
Placement Cavities	**Arena - Phase 2**	• Total cavities: 6 (3 per team) • Cavity diameter: 25 cm • Cavity depth: 3 cm • Color-coded internally for each team
Detection System	**Arena - Phase 2**	• Each cavity includes a 4 cm central opening • Infrared (IR) sensors detect correct disk placement • Sensors are wired internally to a central control box

Arena

Dead Zone Design

- **Shape:** Circular
- **Diameter:** 50 cm
- **Depth:** Recessed 2.5 cm into the arena surface
- **Phase Usage:**
  - Covered during Phase 1 and Phase 2
  - Active during Phase 3 only
- The Dead Zone cover is **removable and reversible**
- When active, the Dead Zone is visually distinct and clearly marked as a restricted area

Phase-Based Covers & Transitions

- **During Phase 1:**
  All disk cavities, cube goals, and Dead Zone are fully covered
- **During Phase 2:**
  Disk cavities are uncovered
  Cube goal cavities are uncovered to increase arena difficulty
- **During Phase 3:**
  Disk cavities are covered again
  Cube goal cavities remain active
  Dead Zone cover is removed and activated

> **All covers are designed to sit flush with the arena surface when installed.**

Arena Branding & Visibility

- Competition branding is applied to the arena side surfaces
- LED lighting and markings are designed to be clearly visible to:
  Teams
  Referees
  Spectators

Arena

Field Layout

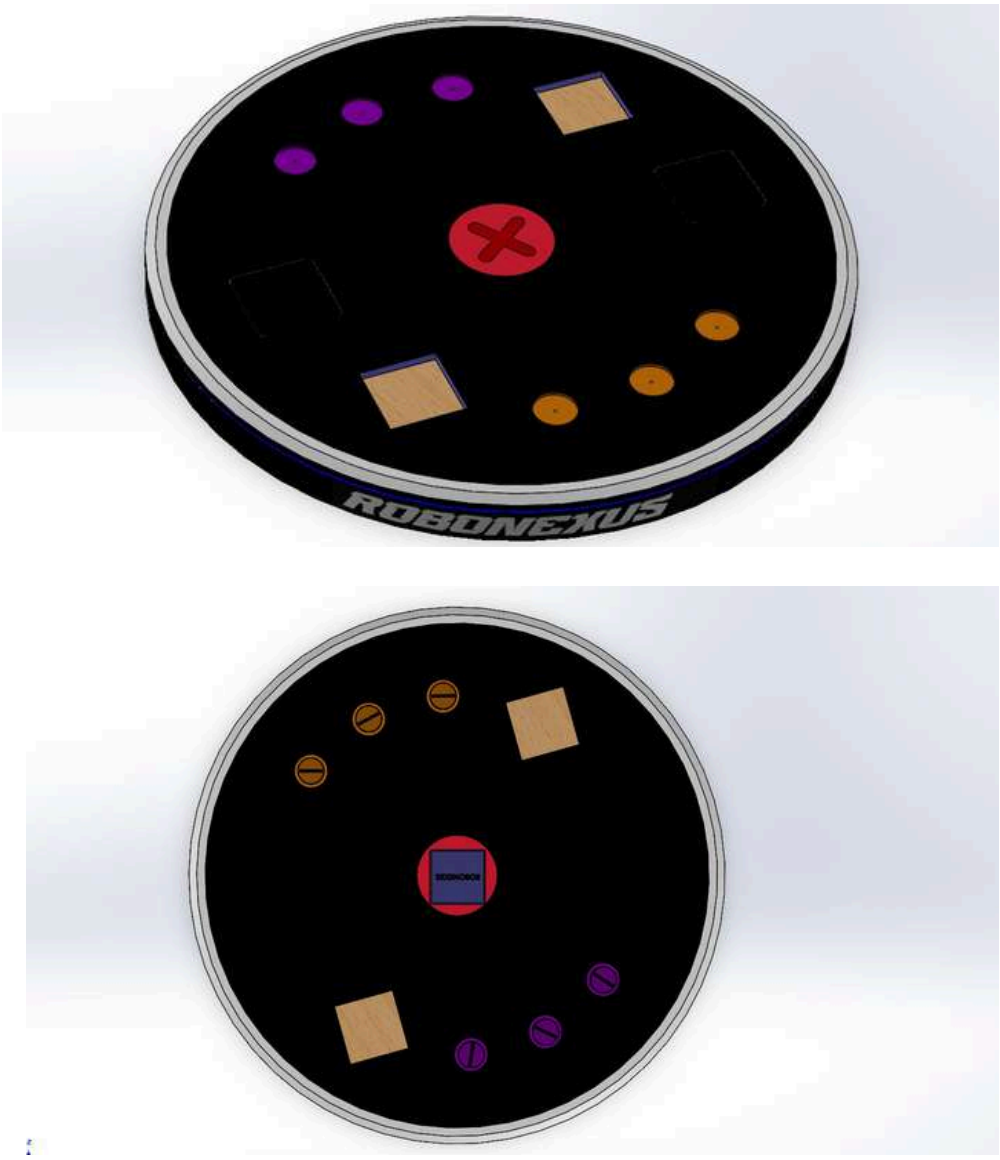


***Figure** 1 — SUMO Track Arena Layout During Phase 1 (top view)*

Arena

Figure *2— SUMO Track Arena Layout During Phase 2*

Figure *3— SUMO Track Arena Layout During Phase 3*

Arena

Field Elements

Table 3: Arena Reference		
Element	**Location**	**Notes**
Team-Colored Scoring Disk	**Arena - Phase 2**	Diameter: 20 cm · Height: 5 cm Weight: 200-250 g
Power Cube	**Arena surface - Phase 3**	Dimensions: 40 × 40 × 40 cm Weight: 1.3-1.5 kg

Figure *4 — Team-Colored Scoring Disk Element During Phase 2*

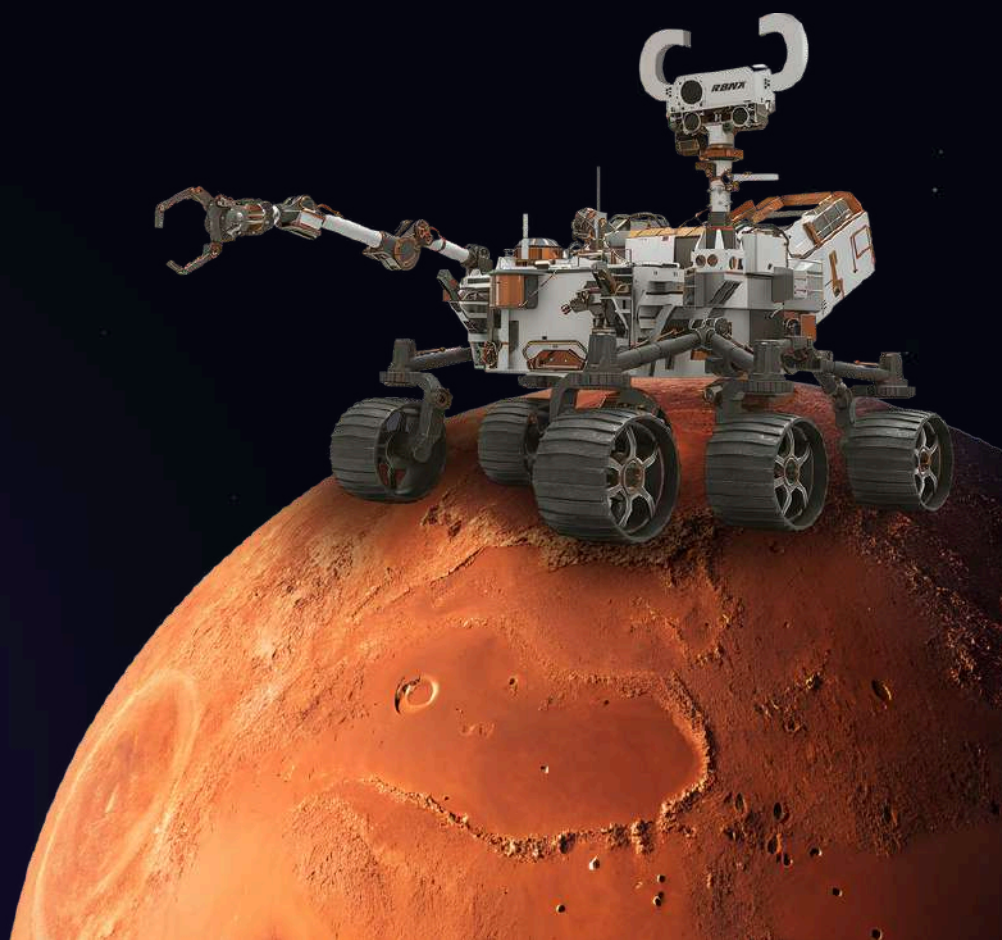
Arena

Field Elements

***Figure** 5 — Power Cube Primary Scoring Element During Phase 3*

CHAPTER 06

SCORING



Scoring

Points are awarded for the actions listed below. Referees are the final authority on scoring during a live match.

Scoring Table

Table 4: Match Scoring Reference Phase 1

Action / Milestone	Point Value	Conditions	Phase
Push opponent robot out of the arena	**+12**	**Fully autonomous**	Phase 1: Autonomous Sumo Clash
No robot exits before time expires	**+6 each**	**Phase declared draw**	Phase 1

> **Example: If neither robot is completely out when 2:00 expires, each team earns 6 points.**

Scoring

Table 5: Match Scoring Reference — Phase 2

Action / Milestone	Point Value	Conditions	Phase
Correct disk placement	**+4 per disk**	**Disk placed in correct team cavity**	Phase 2: Disk Placement & Tactical Control
First team to place all 3 disks	**+2 bonus**	**Triggers contact activation + LED**	Phase 2
Push opponent out after contact is enabled	**+6 bonus**	**Only after disk placement completed**	Phase 2

Example: Team A places three disks for 12 points, finishes first for a 2-point bonus, and completes a valid push-out for 6 points: 20 points total.

Scoring

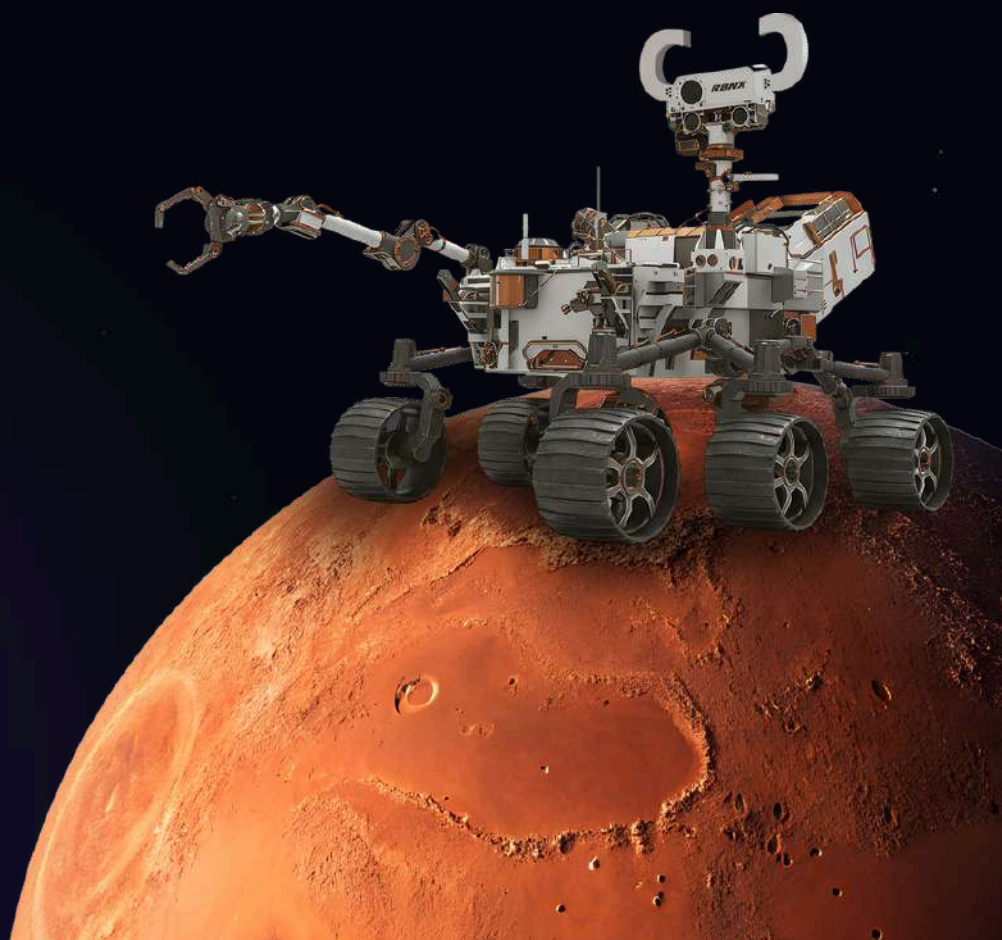
Table 6: Match Scoring Reference Phase 3

Action / Milestone	Point Value	Conditions	Phase
First team to place the Power Cube	+12	Correct placement in home goal	Phase 3: Power Cube Challenge
Opponent robot pushed out while cube remains inside	+1	Cube still in arena	Phase 3
Both robot and cube exit arena	+1	Remaining robot stayed inside	Phase 3
Power Cube exits arena alone	0	Cube reset to center	Phase 3

Example: The first team to place the Power Cube correctly earns 12 points and immediately ends Phase 3.

CHAPTER 07

PENALTIES & VIOLATIONS



Penalties & Violations

Violations of these rules result in the penalties described below. Repeated violations may result in escalated consequences, including match disqualification.

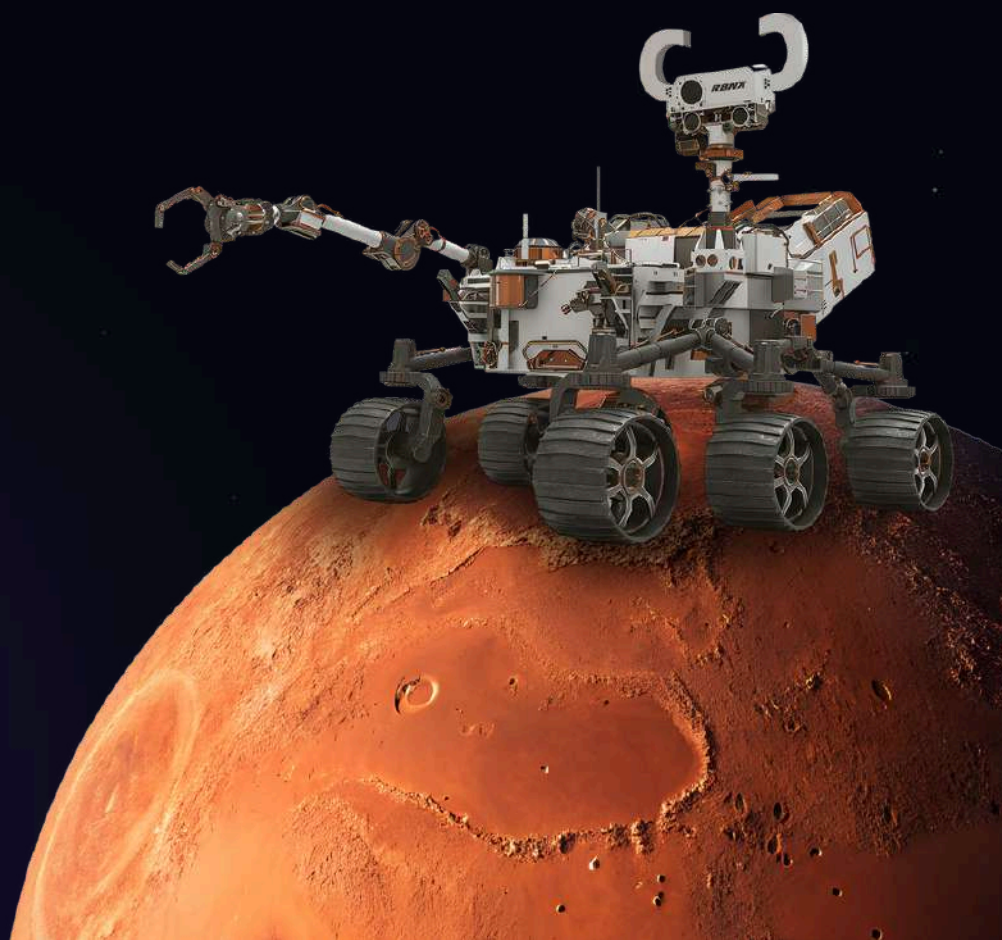
Table 7: Penalty Reference

Infraction Code	Violation Description	**Penalty**	Penalty Consequence
R-01	Dead Zone Violation (Phase 3 only) Robot stationary in Dead Zone for more than 3 seconds	Minor	**-3 points** **Referee counts aloud**
R-02	Illegal Contact(Phase 2) Robot-to-robot contact before disk placement completion	Major	**–6 points**
R-03	Disk Interference (Phase 2) Touching or disturbing opponent's disks	Major	**–6 points**

Safety (S), Rules (R), Conduct (C), and Match Operations (M)

CHAPTER 08

ROBOT INSPECTION



Robot Inspection

Every robot must pass inspection before competing in any match. Inspection confirms compliance with Chapter 4 — Robot Specifications and Chapter 9 — Safety Requirements.

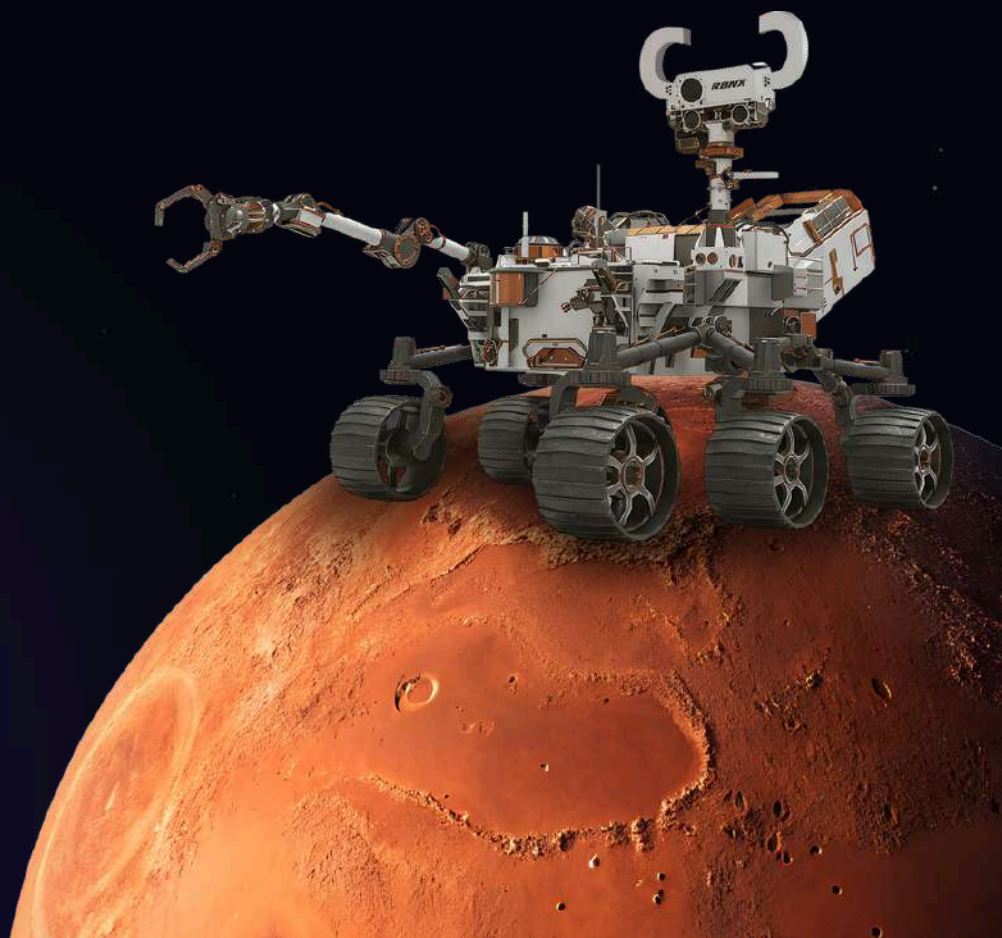
Inspection Checklist

1. Confirm robot weight is within the published limit.
2. Confirm starting footprint fits the sizing box.
3. Confirm battery voltage and wiring meet safety requirements.
4. Confirm no prohibited components are present.
5. Record inspection result and issue an inspection sticker/tag.

> **Best Practice**
> **Bring spare fasteners, a multimeter, and your robot's spec sheet to inspection to resolve minor issues on the spot.**

CHAPTER 09

SAFETY REQUIREMENTS



Safety Requirements

Safety requirements apply to every team, robot, and individual present at a RoboNexus event. Safety rules take precedence over competitive advantage.

General Safety Rules

- All robots must pass inspection before their first match.
- Post-inspection modifications require re-approval.
- Failing re-inspection = disqualification.
- Safety equipment, including E-Stop and protective guards or covers, must be fully operational.

> ⚠ **Warning**
> **Any robot behavior judged unsafe by a referee or inspector may be stopped immediately, regardless of match state.**