



ROBONEXUS
Design. Build. Compete.

VERSION 1.0

SEPTEMBER 15

OFFICIAL COMPETITION RULEBOOK

Capture the Flag

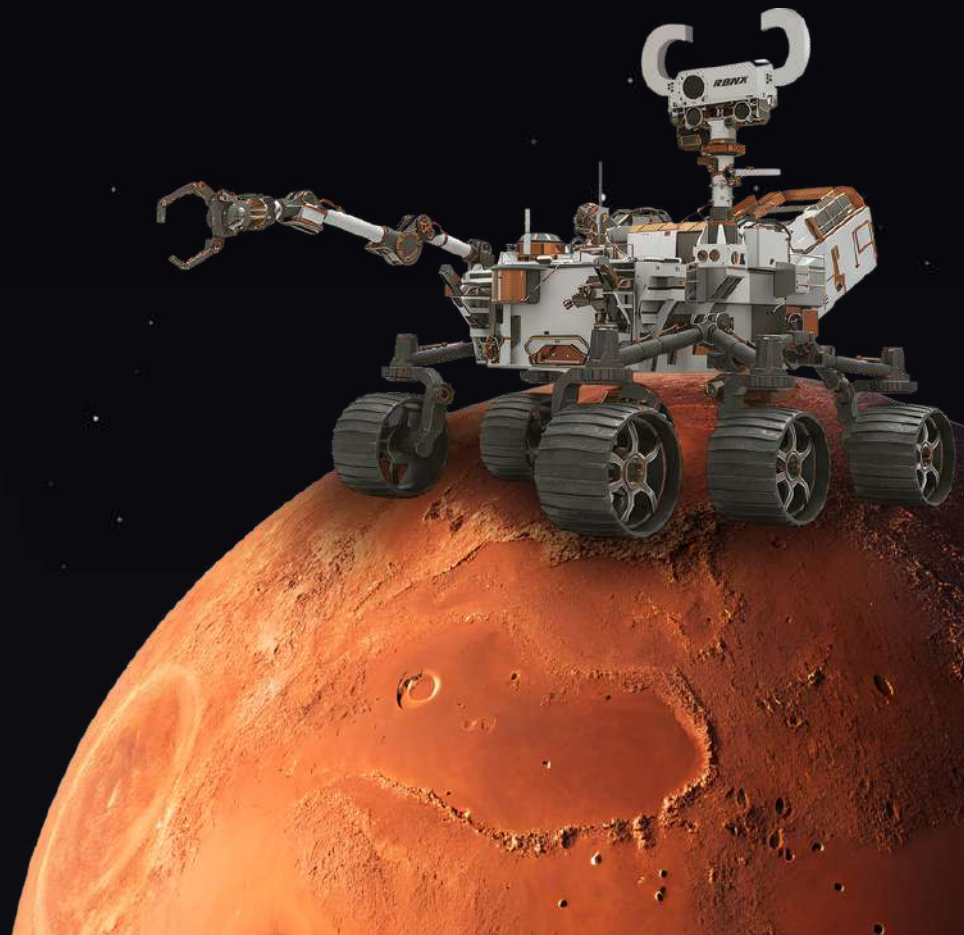
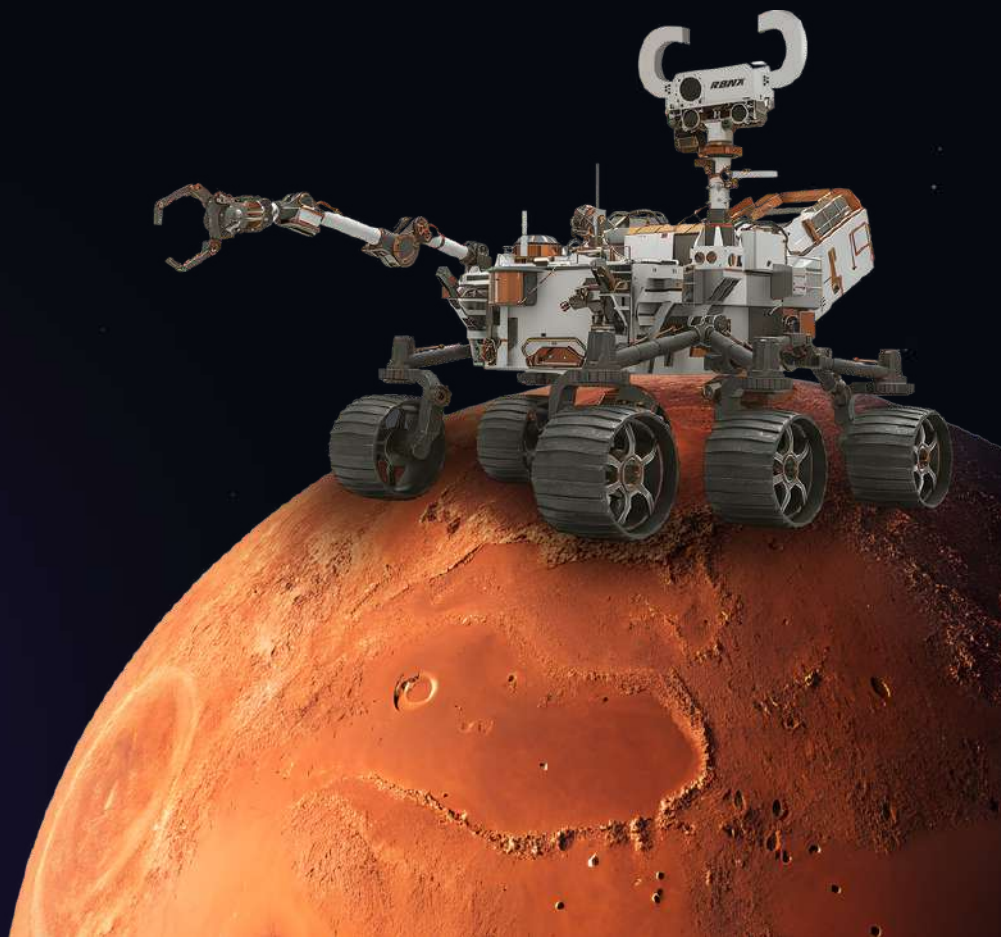


Table of Contents

Table of Contents	2
Welcome to RoboNexus	4
Competition Overview	6
Competition Snapshot	8
Core Competencies	8
Robot Specifications	10
Dimensions	10
Flag Pickup Mechanism	11
Control System	11
Electrical Requirements	12
Commercial Robotics Platforms	12
Arena	14
Field Layout	14
Field Elements	14
Start Areas	15
Safe Cylinder	16
Central Obstacle	17
Flags	18
Scoring	20
Score Calculation	21
Golden Flag (Tie-Breaker)	22
Penalties & Violations	24
Penalties During the Game	24
Safety Requirements	26
General Safety Rules	26

CHAPTER 01

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 **Capture the Flag** track, guiding teams through the rules, technical requirements, arena specifications, gameplay, scoring, inspection, and everything needed to prepare for competition.

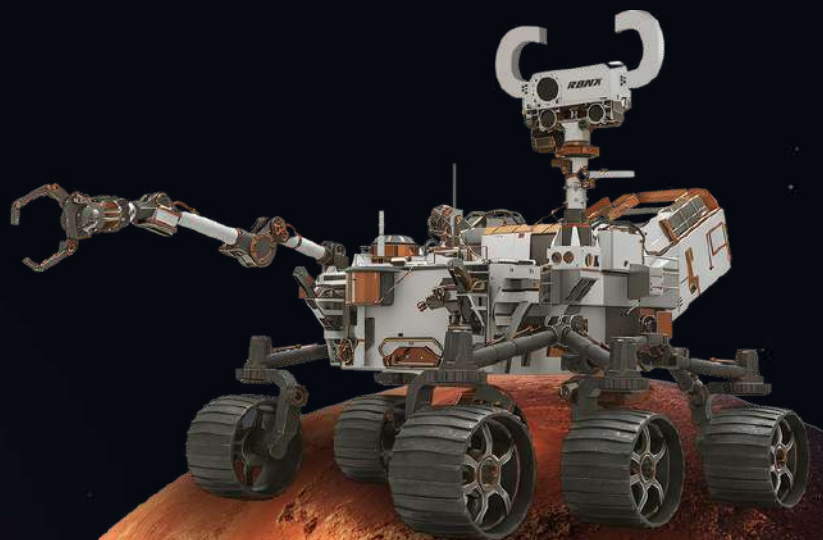
The Rulebook is organized to take you from the competition overview into the technical and gameplay details. Use the Table of Contents to quickly find any section you need throughout the season.

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

Capture the Flag is a two-alliance robotics competition in which each alliance consists of **two robots from the same team** working together. The objective is to score more points than the opposing alliance within a fixed three (3)-minute match.

Each match consists of **two** continuous periods:

- 45 seconds: Autonomous
- 2 minutes and 15 seconds: Driver-Controlled

At the start of each match, fourteen (14) team-coloured flags are placed in fixed positions on the field, with (7) flags per alliance. Teams earn points by **collecting** and scoring flags and **stealing** opponents' flags. Flags may be captured, reclaimed, or stolen throughout the match.

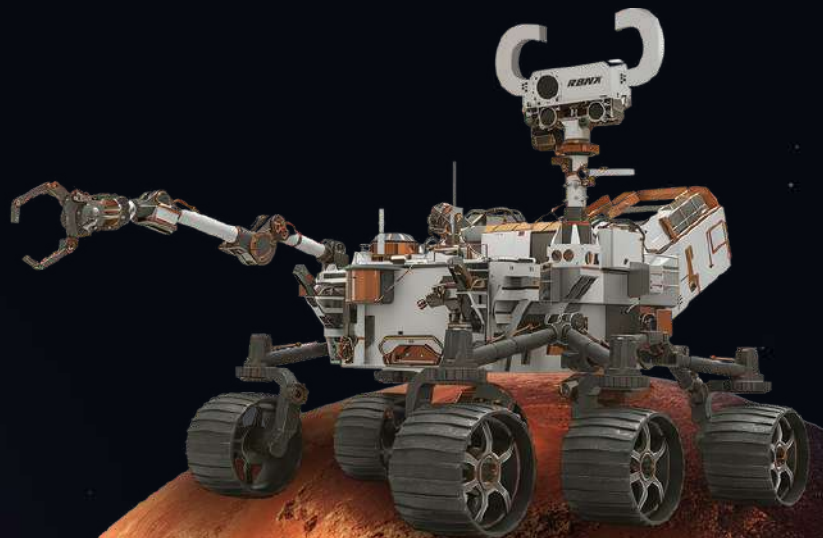
Teams may coordinate both robots to balance offensive play, flag recovery, scoring, and defense while responding to the actions of the opposing alliance.

Points are awarded based on the number of flags stored in the scoring areas at the end of the match, with additional points for successful autonomous scoring.

At the end of the three-minute match, **the alliance with the highest total score is declared the winner**. If the match ends in **a tie**, a Golden Flag tie-breaker round is used to determine the winner according to the procedure defined in this Rulebook.

CHAPTER 03

COMPETITION SNAPSHOT



Competition Snapshot

The Competition Snapshot provides **a quick reference** to the key specifications and defining features of the RoboNexus Capture the Flag Track before moving into the detailed rules.

Quick Reference

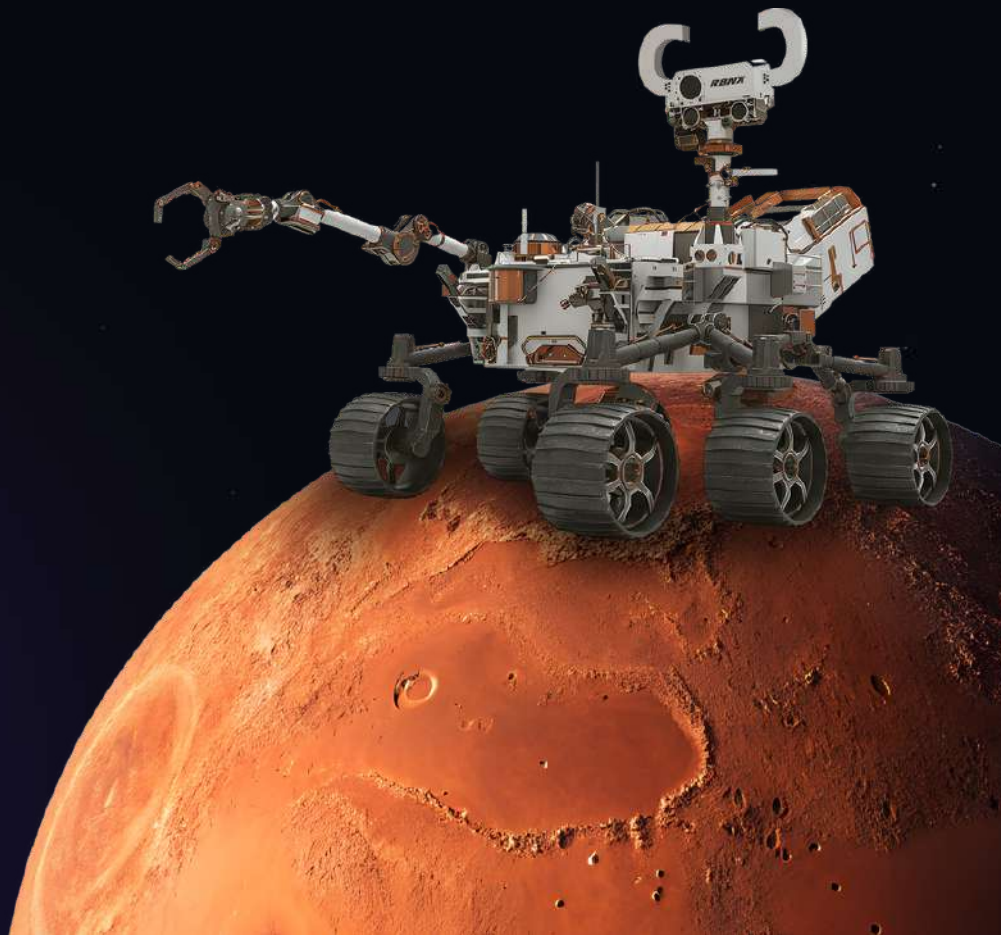
MATCH DURATION 3 MIN 45s Auto- 2m 15s Driver-Controlled	COMPETITION FORMAT 2v2 2 Robots per Alliance	FLAGS IN PLAY 14 Flags 7 flags per Alliance
--	---	--

Extended Reference

STARTING ROBOT SIZE 50 × 50 × 50 cm Must fit at match start FLAG PICKUP MECHANISM Gripper/ Electromagnet	MAXIMUM ROBOT HEIGHT 93 cm Height may expand after start TIE-BREAKER Golden Flag	FIELD SIZE [4 × 4 m] ALLIANCE SCALE 2 Robots
--	--	---

CHAPTER 04

ROBOT SPECIFICATIONS



Robot Specifications

All robots competing in **Capture the Flag** must meet the technical requirements defined in this chapter. Robots that do not comply will not pass Robot Inspection.



1. Dimensions

At the start of the match, the entire robot must fit within a **maximum** bounding volume of: **50 × 50 × 50 cm (Length × Width × Height)**.

After the match begins:

- Width may not expand beyond the starting width, including arms, grippers, or other mechanisms.
- Length expansion **is permitted** when required for functional purposes such as retrieving or scoring flags.
- Vertical expansion **is permitted after** the match begins.
- The robot's maximum height at any time during the match must **not exceed 93 cm from the arena floor**.

Table 1: Robot Specifications

Parameter	Specification Limit	Compliance Verification
Starting Dimensions	50 × 50 × 50 cm	Measurement tool
Width Expansion	No expansion permitted	Measurement tool
Length Expansion	Permitted after match start	Visual inspection
Maximum Height	93 cm from the ground	Measurement tool

Robot Specifications



2.Flag Pickup Mechanism

Robots may use one or more of the following approved methods to collect and manipulate flags:

- A **controllable electromagnet**, mounted vertically and facing downward, with the **South pole facing the flag**.
- A **mechanical gripper** or **arm attachment**.

The pickup mechanism **must**:

- Securely hold and release the flag.
- Operate without damaging the flag or other field elements.



3.Control System

Robots must support the control modes required during the match:

- Fully autonomous operation during the Autonomous Period.
- Manual operation during the Driver-Control Period.

During manual operation:

- Robots may be controlled using a remote controller, joystick, or mobile application.
- Control must be wireless.
- Maintaining a stable wireless connection is the team's responsibility.
- A live video feed from an onboard camera is optional.

Robot Specifications



4. Electrical Requirements

All electrical systems must be installed and maintained safely.

- All wiring must be properly insulated.
- Exposed copper or damaged wiring is not permitted.
- Batteries must be securely mounted using straps, brackets, or an equivalent securing method.
- Loose batteries are **not permitted**.
- Robots must not generate electrical noise, jamming signals, or wireless interference that could affect another robot's control system.



5. Commercial Robotics Platforms

Commercially available robotics platforms, including DJI RoboMaster EP or similar systems, are permitted.

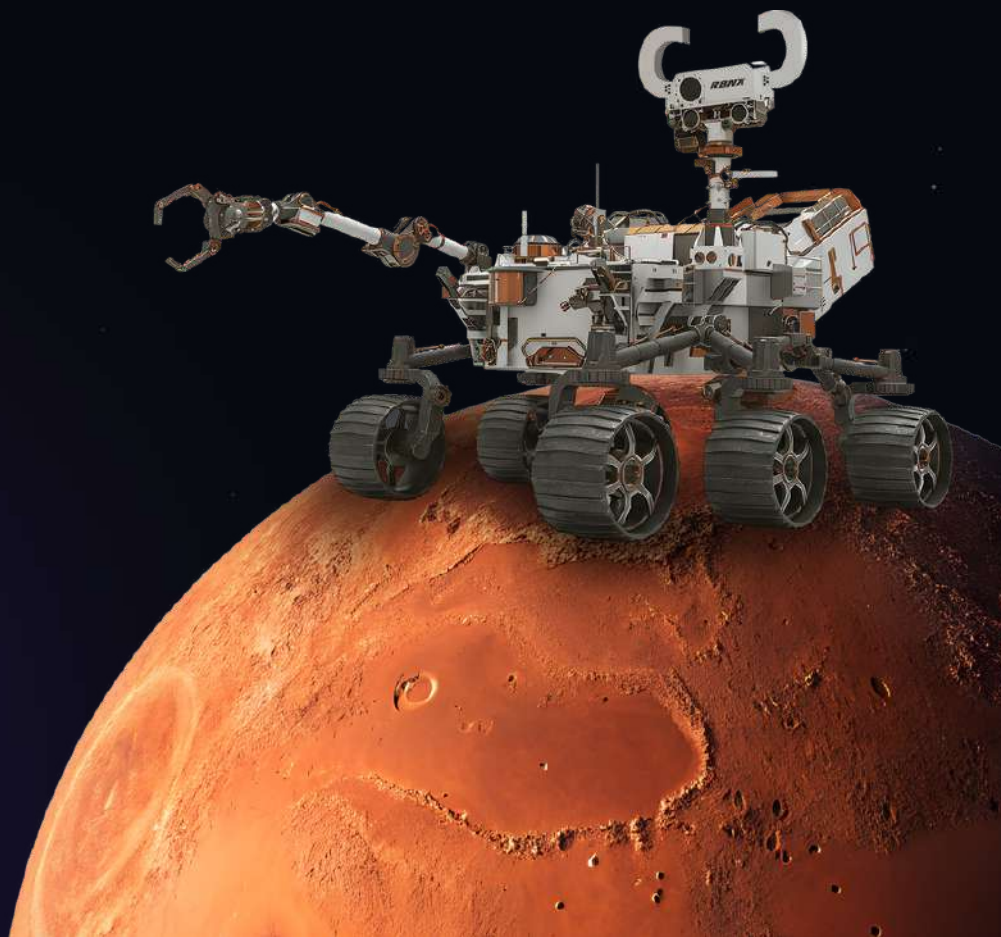
Commercial platforms must comply with all applicable:

- Dimensional requirements.
- Safety requirements.
- Control requirements.
- Flag pickup mechanism requirements.

Teams may modify commercial platforms as required to integrate an approved flag pickup mechanism.

CHAPTER 05

ARENA



Arena

Arena Layout:

The Capture the Flag arena is a 4 × 4 m playing field enclosed by 40 cm walls, with a floor of interlocking anti-static foam tiles.

Field Layout



Figure 1 — Capture the Flag Arena Layout

Table 2: Field Elements

Parameter	Specification Limit	Compliance Verification
Start Areas	Left and right sides of each alliance half	Two per alliance; 70 × 70 cm; valid scoring locations
Safe Cylinder	Corner of each alliance half	50 cm radius; 65 cm high; maximum 3 flags; not protected from stealing
Central Obstacle	Center of the field	10 cm PVC pipe; 60 cm passage gaps; 50 cm total height

Arena

Field Elements:



1. Start Areas

- Each team has two Start Areas, located on the right and left sides of the field. Each Start Area measures 70 × 70 cm and is marked with white borders on the floor surface only. **The borders have no physical height or elevation and do not obstruct robot movement**
- **Start Areas are valid scoring and storage locations.** Flags placed upright inside a Start Area count toward the team's total score.



Figure 2 — Start Area Locations showing the two designated scoring and storage zones on each alliance side.

Arena



2. Safe Cylinder

- Each team also has one Safe Cylinder zone located at a corner of the field. The Safe Cylinder is a hollow quarter circle with a radius of 50 cm and a vertical boundary **height of 65 cm**. It is a valid scoring and storage location and may **hold a maximum of 3 flags**. The Safe Cylinder provides a structural defensive advantage and a safer scoring zone, but it is not intended to function as an untouchable scoring vault (**flags stored in the Cylinder are not protected from theft**).

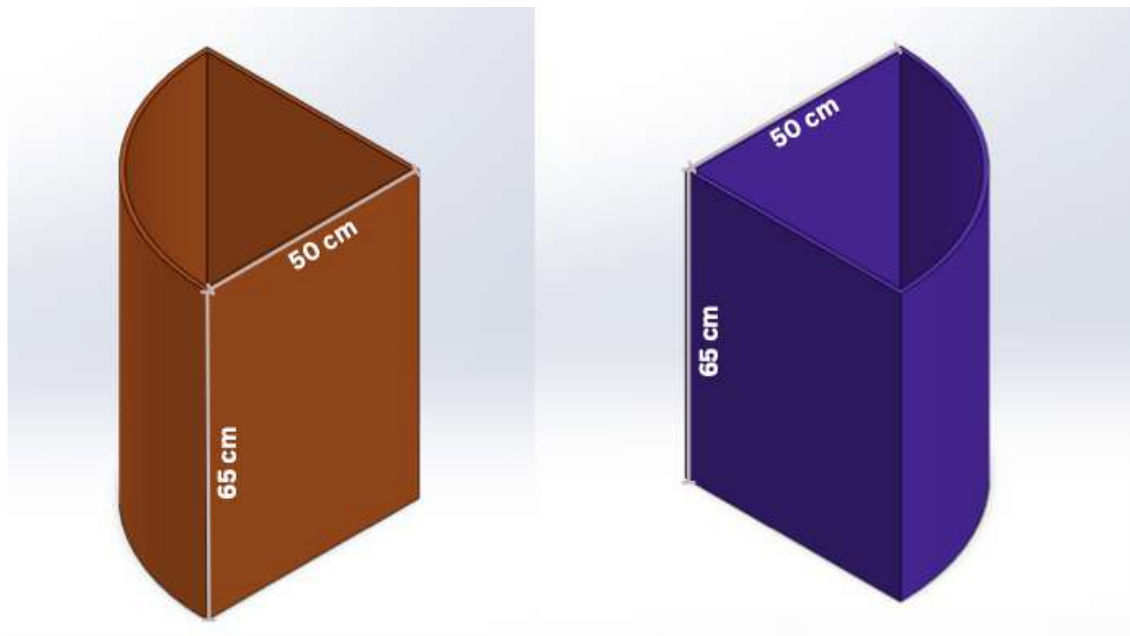


Figure 3 — Safe Cylinder Design showing the quarter-circle scoring zone dimensions and configuration for each alliance.

Arena



3. Central Obstacle

- The central obstacle consists of a 10 cm-diameter PVC pipe attached to the arena walls, extending from each side wall toward the center, leaving **60 cm-wide passage gaps on both sides** for robot movement. It is supported by Y-shaped mounts attached to the arena walls with an additional 10 cm bracket above the wall, for a total height of 50 cm from the floor (**Robots taller than 50 cm cannot pass under the side corridors**). The Golden Flag is placed separately at the center of the arena at a height of 26 cm above the floor.

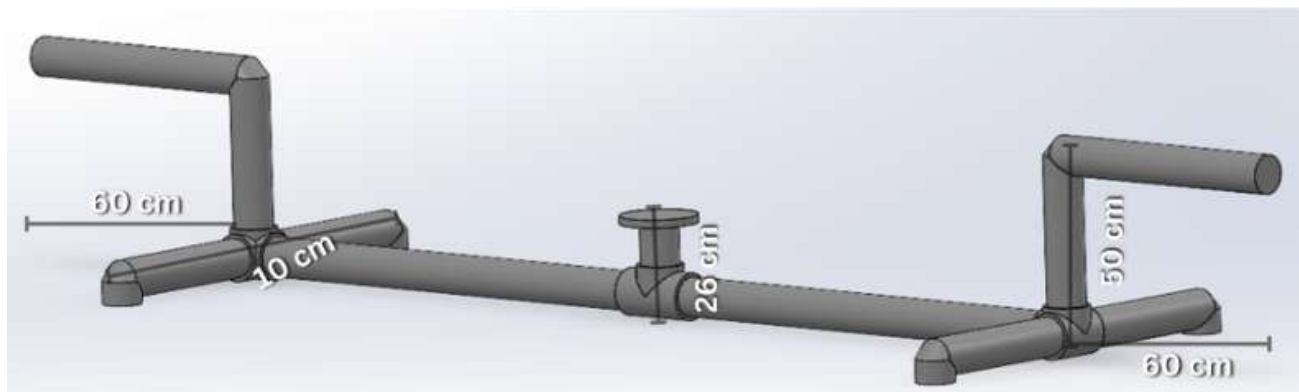


Figure 4 — Central Obstacle Structure showing the side passage clearances and obstacle dimensions.

Arena



4. Flags

- Each flag is a freestanding cylinder with a circular base weighing around 500g. The total height is 23 cm, and the base has a diameter of 15 cm. The central cylindrical body has a 6 cm diameter with 9 cm of usable vertical gripping length for mechanical pickup. A 28 mm diameter × 5 mm NdFeB (neodymium) disc magnet is installed at the top of each flag, with the north pole facing upward.
- Fourteen team-coloured flags (7 Orange and 7 Purple) are placed directly on the arena floor before the start of the round. In addition, one Golden Flag is placed at the center of the arena in case of a tie. The Golden Flag is mounted on a stand with a height of 26 cm and serves a special role in gameplay, as defined in the competition rules.

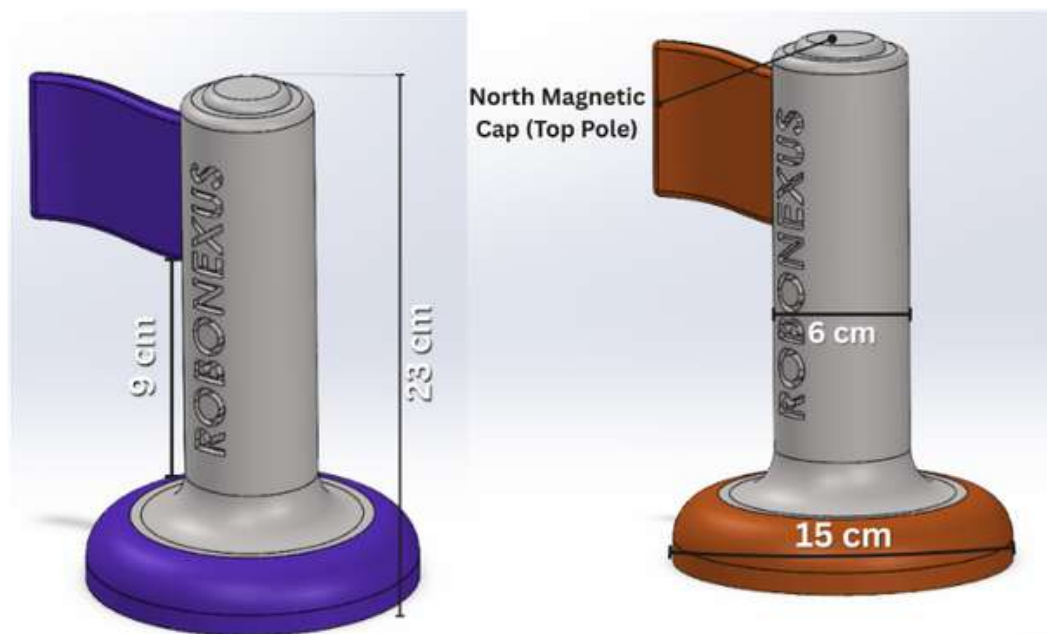
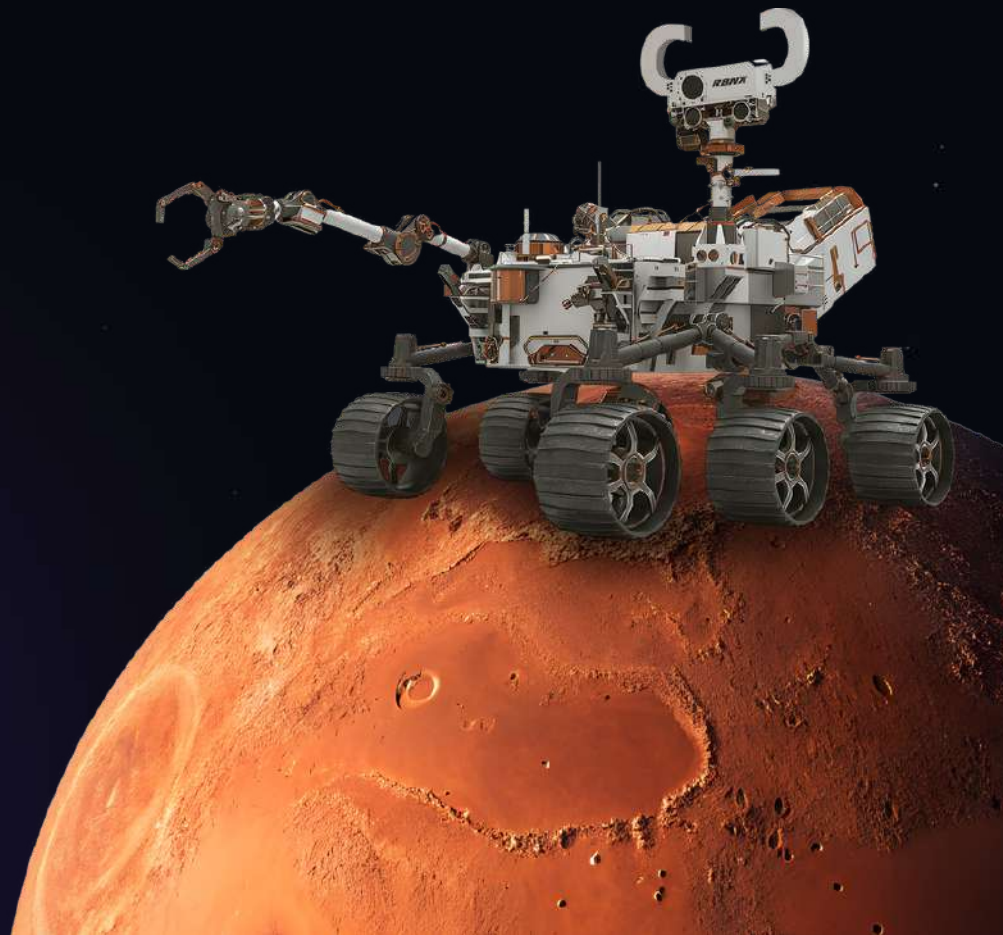


Figure 5 — Competition Flag Design showing the flag dimensions, gripping section, base, and magnetic pickup point.

CHAPTER 06

SCORING



Scoring System

Teams score points by retrieving and placing flags in valid scoring areas. Additional points are awarded for successful scoring during the autonomous period and for capturing an opponent's flag.

Table 3: Match Scoring Matrix

Action / Milestone	Point Value	Evaluation Method
Own team flag placed in a valid scoring area	+2	Flag is upright, fully inside a valid scoring area, and not held by a robot at match end
Opponent flag placed in your valid scoring area (Steal)	+4	Flag is upright, fully inside your valid scoring area, and not held by a robot at match end
Flag successfully scored during the 45-second autonomous period	+1 bonus per flag	Awarded once when valid autonomous placement is achieved; remains awarded even if the flag is later moved

- Own team flag scored during autonomous = **3 points** (2 base + 1 bonus)
- Opponent flag (steal) scored during autonomous = **5 points** (4 base + 1 bonus)

Scoring

Scoring Location Rules:

Valid scoring areas consist of the two Start Areas and the Safe Cylinder.

- A maximum of three (3) flags may score in any single scoring location. Flags placed beyond this limit do not score.
- A flag counts only if it is upright, fully inside the scoring area, and not being held by a robot.

Final Score Calculation

Base flag points are determined by the valid final position of each flag at the end of the match. Autonomous bonuses are awarded when successfully achieved during the first 45 seconds and remain valid even if the flag is later moved.

Scoring

Golden Flag (Tie-Breaker)

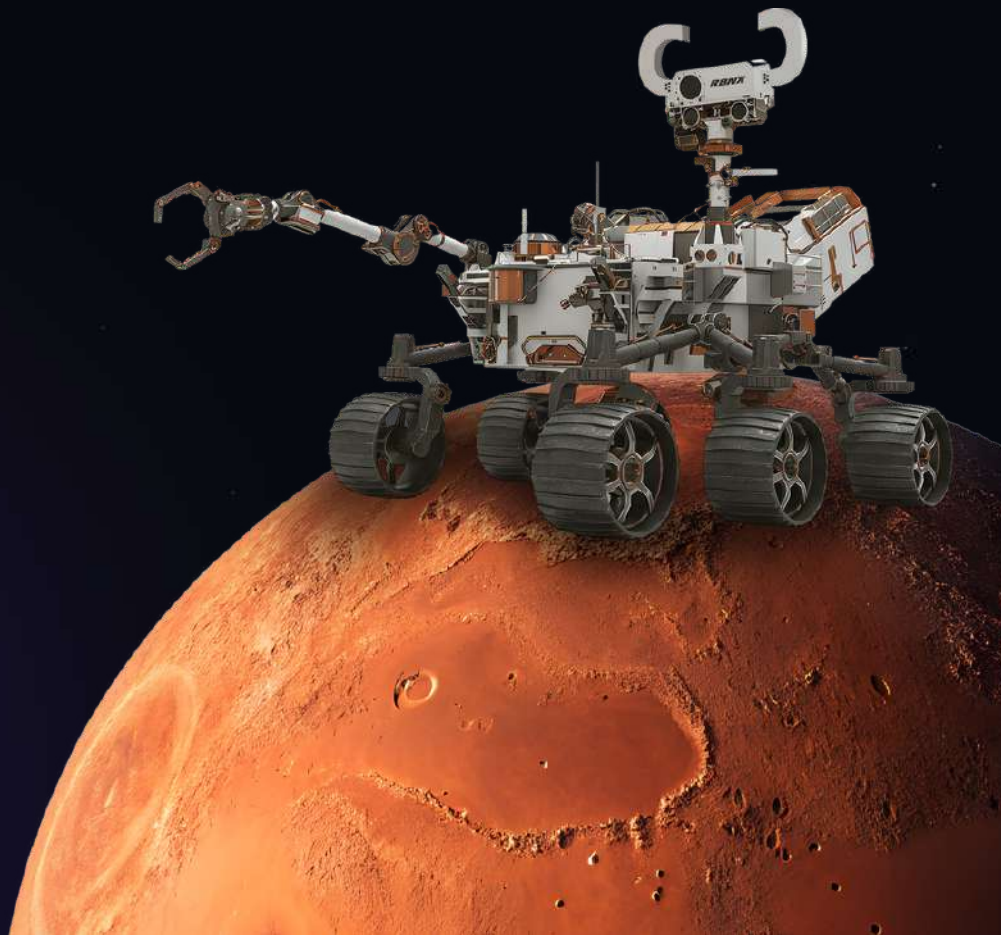
If a match ends with both alliances having the same total score (including penalties and bonus points), **a Golden Flag tie-breaker** will be played to determine the winner. All regular flags are removed from the field, and one special Golden Flag (mounted on a 26 cm stand) is placed at the exact center of the arena.

Each alliance selects one robot to participate, with robots starting from their original starting positions. The Golden Flag round is driver-controlled only, with no autonomous period.

The first alliance to capture the Golden Flag and place it inside its own Safe Cylinder zone, fully released and not held by the robot, wins the match immediately.

CHAPTER 07

PENALTIES & VIOLATIONS



Penalties & Violations

General Penalty Rules:

Violations may result in point penalties, warnings, match-related actions, or disqualification depending on the nature and severity of the violation. Repeated violations may result in escalated consequences. Referees have the authority to apply penalties during live matches in accordance with this Rulebook.

- Penalties that award points are added to the opposing alliance's score.

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

Table 4: Match Infraction Penalties		
Infraction Code	Violation Description	Penalty Consequence
R-01	FLag Damage: Intentionally damaging, crushing, or breaking a flag or flag stand	+2 points to the opposing alliance. Severe or repeated violations may result in disqualification.
R-02	Excessive Robot Contact: Ramming, striking, or applying excessive force to another robot beyond normal defensive pushing.	+2 points to the opposing alliance. Referee may escalate for severe/repeated contact.
R-03	Opponent Flag Interference: Knocking over a flag inside the opponent's flag zone.	+2 points to the opposing alliance.
R-04	Extended Pinning: Pinning an opponent against a wall, obstacle, or boundary for more than 5 seconds without disengaging.	+1 point to the opposing alliance. Robot must disengage immediately.
R-05	Field Obstruction: Sealing or fully obstructing an entrance, side gap, or scoring area in a manner that prevents normal gameplay.	Referee warning/penalty based on severity. Repeated violations may result in additional penalties.
R-06	Excessive Defensive Guarding: Guarding two scoring areas simultaneously in a manner that prevents fair gameplay.	Referee warning/penalty based on severity
S-01	Unsafe Robot Behavior: Any robot operation or action that creates an immediate safety risk to participants, officials, robots, or the arena.	Immediate match stop if required. Re-inspection may be required; severe violations may result in disqualification.
C-01	Failure to Follow Official Instructions: Refusing or repeatedly failing to comply with reasonable referee, inspector, or competition official instructions.	Warning → escalation for repeated violations; may result in disqualification.

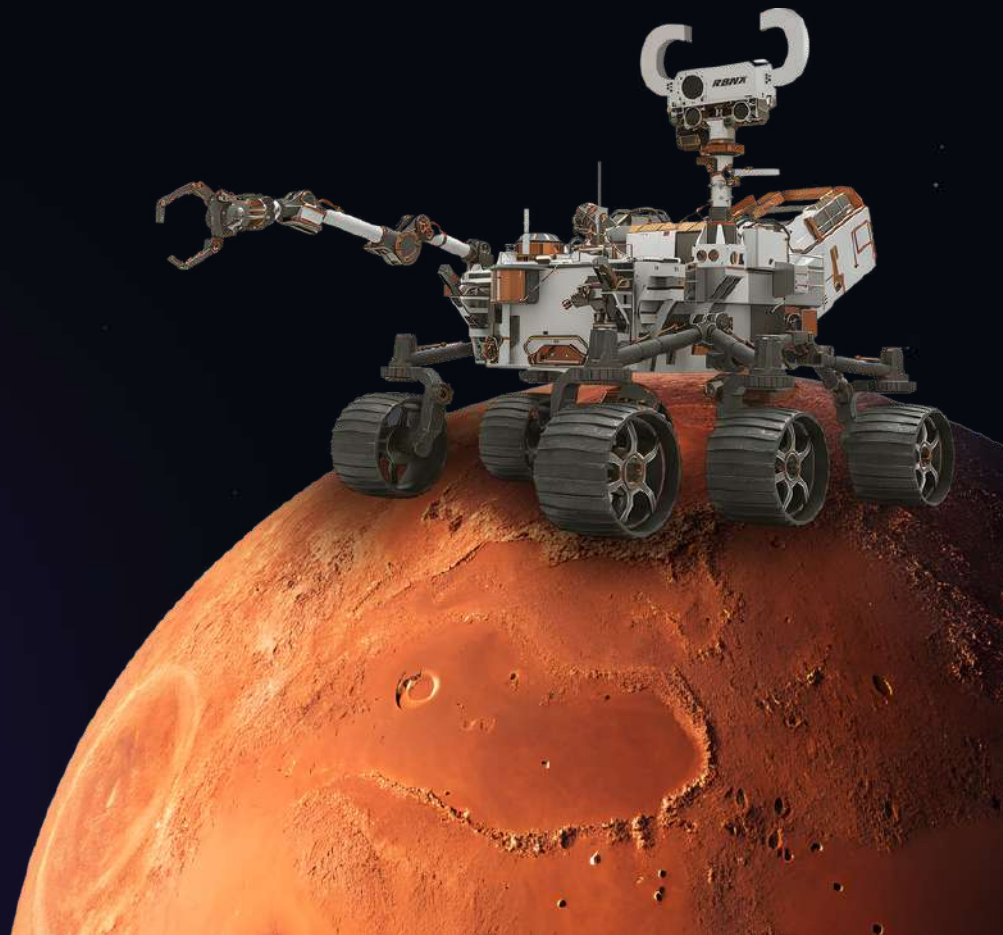
Penalties & Violations

Table 4: Match Infraction Penalties

Infraction Code	Violation Description	Penalty Consequence
C-02	Unsportsmanlike Conduct: Abusive behavior, threats, deliberate misconduct, or inappropriate conduct toward competitors or officials.	Warning or disqualification depending on severity. Severe cases may result in removal from the competition.
M-01	Unauthorized Transmitter / Control Operation: Operating a robot or transmitter when not authorized by competition officials.	Warning or match penalty. Repeated or intentional violations may result in disqualification.
M-02	Failure to Stop: Failure to stop or disable the robot when instructed by a referee or competition official.	Immediate stop required. May result in match penalty or disqualification depending on severity.
M-03	Unapproved Post-Inspection Modification: Competing after a modification affecting compliance or safety without completing required re-inspection.	Robot may not compete until re-inspection is passed. Match forfeiture/disqualification may apply if discovered after competing.
M-04	Match Procedure Violation: Failure to follow required start, reset, re-entry, or match procedure instructions.	Warning, reset, or match penalty depending on the violation.

CHAPTER 08

SAFETY REQUIREMENTS



Safety Requirements

Safety requirements apply to all teams and robots participating in the Capture the Flag competition. All robots must be designed, constructed, and operated in a manner that protects participants, field elements, and other robots.



General Safety Rules:

All robots must:

- Have a structurally secure construction suitable for operation during a match.
- Have all sharp edges, exposed points, and hazardous surfaces covered or otherwise made safe.
- Maintain continuous contact with the arena floor during operation. **Flying or fully aerial robots are not permitted.**
- Be designed and operated so that they do not intentionally damage the arena, field elements, flags, or opposing robots.
- Use a flag pickup mechanism that can securely capture, transport, and release a flag without damaging it.
- Remain under the team's control and be operated in a manner that does not pose a hazard to participants or officials.

RoboNexus officials and referees may require a robot to be modified, disabled, or removed from competition if its construction or operation is considered unsafe.