



Using a 20-32mm outer shell and  
M10x1mm screws (P120), the  
RoboMaster P120 Motor can be  
mounted using screws with the same  
pitch.

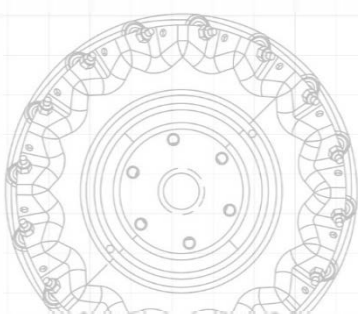
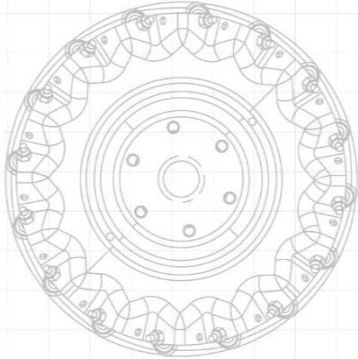
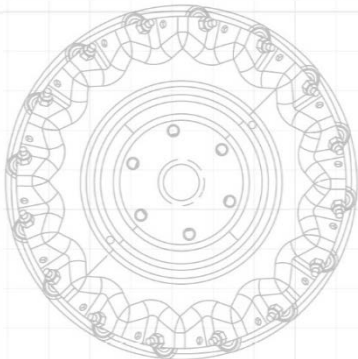
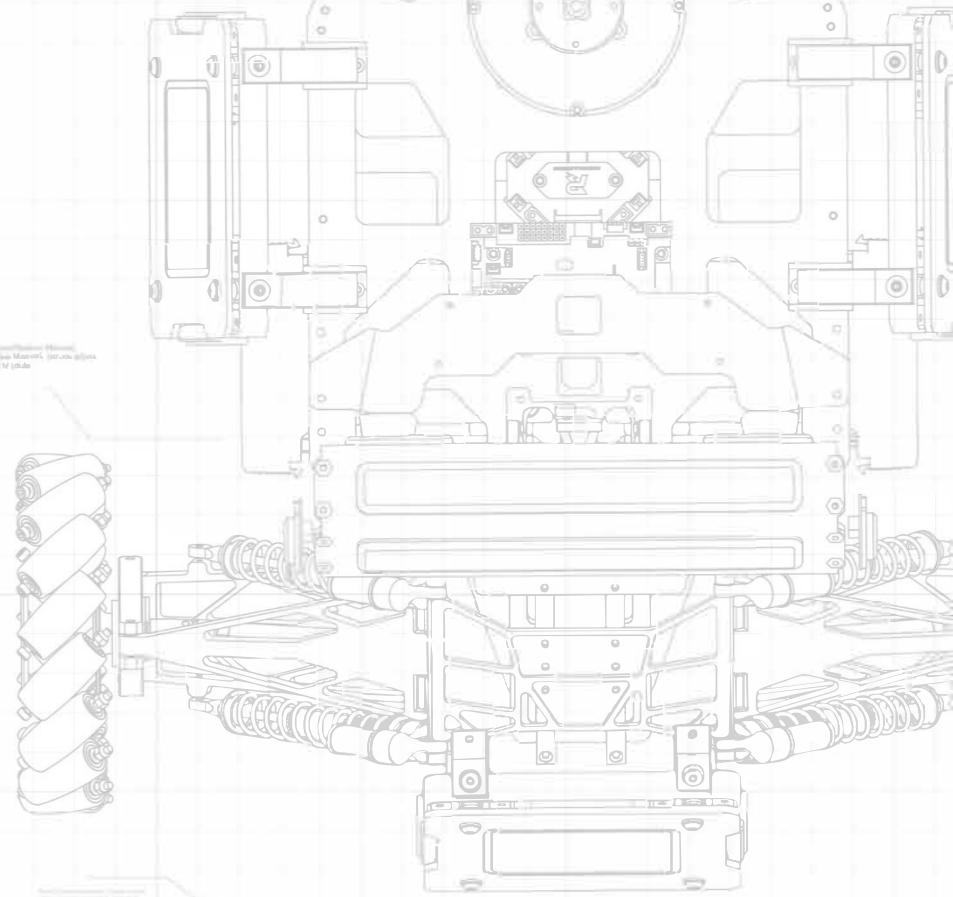
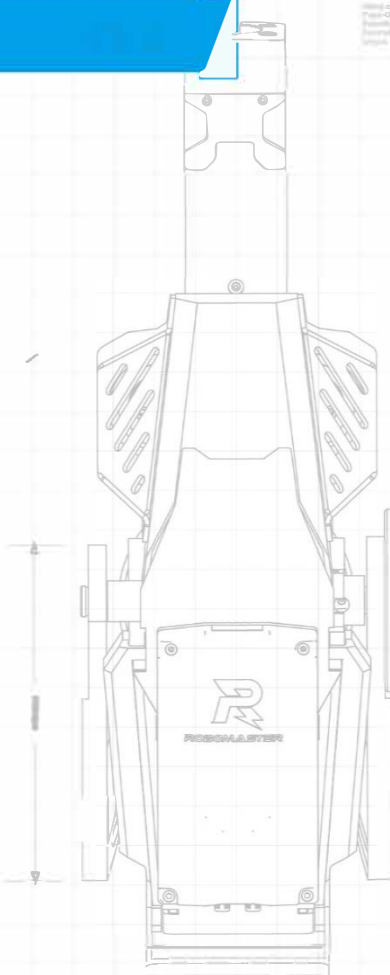


Exclusively designed for the RoboMaster  
M3508 P120 Brushless DC Motor, the  
P120 Brushless DC Motor is available  
from the M3508 Accessories Kit (includes screws,  
shells and a terminal board).

RoboMaster P120 Motor  
Reference: RoboMaster M3508 P120  
Reference: P120 Motor



**ROBOMASTER**



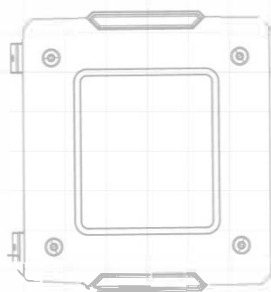
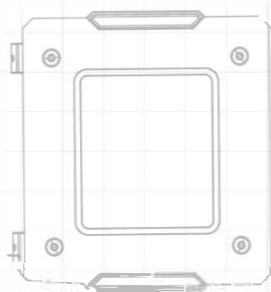
# **ROBOMASTER 2019**

## ROBOTICS COMPETITION

# **RULES MANUAL**

## Key Changes Overview

Prepared by the RoboMaster Organizing Committee  
Released in June 2019



## Reading Tips

In order to ensure that the participants successfully prepare for the RM2019 RoboMaster, the organizing committee will sort out some key rule changes and compile the 'Overview of the key changes in the RM2019 RoboMaster Competition Rules Manual V1.0' (hereinafter referred to as 'Overview').

When interpreting the rules by all participants, Overview takes precedence over the latest version of the Rules Manual that is released earlier. Rules and regulations that are not mentioned in the Overview should be interpreted based on the latest version of the Rules Manual. Changes to the rules involved in the Overview will be updated into the Rules Manual, after which the Overview will be void and the rules and regulations involved will be subject to the latest version of the Rules Manual. After the update, the version number of the Rules Manual will also be upgraded.

# Chapter 1 – Introduction

Season Schedule:

Offline Match Schedule

Schedule	Item	Eligible Competitions	Permissions
<b>July 31, 2019- August 4, 2019</b>	International Regional Competition	Teams from Hong Kong, Macau, Taiwan and overseas	Teams that pass the Referee System Exam qualify for International Regional Competition.

# Chapter 3 Technical Specification

1. Except for Sentry, the total energy of all supercapacitors of a single robot at the maximum withstand voltage does not exceed 10000J. The energy calculation formula for a single capacitor is  $E = \frac{1}{2} * C * U^2$  (U is the withstand voltage value of the capacitor and C is the capacitance).

2. Hero:

Hero Level up Parameter

Hero Level	42mm Barrel Heat Limit
Level 1	200
Level 2	300
Level 3	400

3. Aerial:

- A. If the Launching Mechanism is powered on, the energy is cleared and 30 seconds of attack time is obtained.
- B. Energy Gain = Value of Experience Points of the defeated robot of the own side \* 4.
- C. Each time the energy is exhausted, a chance to resupply the projectile can be obtained.
- D. The role of the projectile supplier is cancelled, and the corresponding duties and requirements of the original projectile supplier are borne and followed by the drone operator.

4. The Initial HP and Maximum HP of Engineer is 500.

5. Sentry:

A. Sentry Parameter Specifications Table

Item	Limit	Penalty	Notes
Initial Projectile Quantity	500	-	<ul style="list-style-type: none"> <li>● During the first round of each match, projectiles must be emptied</li> <li>● The projectiles can be not emptied before the start of each round after the first round</li> <li>● During the setup period of each round, the team will pre-load the initial projectiles</li> </ul>

Item	Limit	Penalty	Notes
			<ul style="list-style-type: none"> <li>● When 500 shoots of 17mm projectiles have been launched, the Launching Mechanism will be powered off</li> </ul>

**B. The relationship of Sentry and Base Shield:**

- The 100% invincible state of the Base at the start of the match and the 50% defense status after the first robot death are cancelled.
- After the start of the match, the Virtual Shield of the Base will take effect.
- If the Sentry is playing: When the Sentry is destroyed, all defenses on the base are automatically eliminated, the Base Shield is opened, and the Virtual Shield is disabled.

If the Sentry is not playing: Two minutes after the start of the match (i.e., 5:00 countdown), all the defenses of the Base are eliminated, the Base Shield is opened, and the Virtual Shield is disabled.



For the Virtual Shield of the Base, please refer to [Chapter 5, Match Venue](#), Point 7.

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# Chapter 4 Referee System

## 1. First Blood Mechanism:

At the beginning of the match, if the first robot is killed, the killer will receive 5 Experience Points; if no killer is detected, the 5 Experience Points will be evenly distributed to the surviving Hero and Standard of the enemy side. The average will be rounded off.

## 2. Level Up Mechanism:

- Robot from one side can obtain the corresponding Experience Points of the defeated robot by defeating the robot from the enemy side (based on the calculation result of the referee system server). For example, the robot will directly gain 2.5 Experience Points when defeating a Level 1 Standard.
- If the robot from one side is killed and no killer is detected, the corresponding Experience Points of the defeated robot (based on the calculation result of the referee system server) will be evenly distributed to the surviving Hero and Standard of the enemy side. The average will be rounded off.

## 3. Chassis power overrun:

The official defines a buffer energy  $W$  on the referee system server. There are two scenarios of  $W$  values for Infantry or Hero:

- When the Standard or Hero does not fly over the Launch Ramp of Road, its  $W$  value is equal to 60 joules.
- After the Standard or Hero flies over the Launch Ramp of Road, its  $W$  value increases from the current value to 250 joules. After subsequent consumption, the  $W$  value is up to 60 joules.

## 4. HP Recovery and Revival:

- Revival Mechanism: Engineer can be automatically revived.
- Time required for revival: In case of the first killed, Engineer needs to wait for  $T$  seconds for revival; then, after each revival following killed, the waiting time of the Engineer increases by 10 seconds.

Time table of Engineer's first revival after being killed

Type	T seconds
Engineer	20

# Chapter 5: Competition Area

## 1. Battlefield:

- For the Battlefield, some of the dimensions will be fine-tuned, but this adjustment does not affect the participating team's design work for the robot.
- The orange and cyan colors in Figures 1 and 2 are lighting effects.

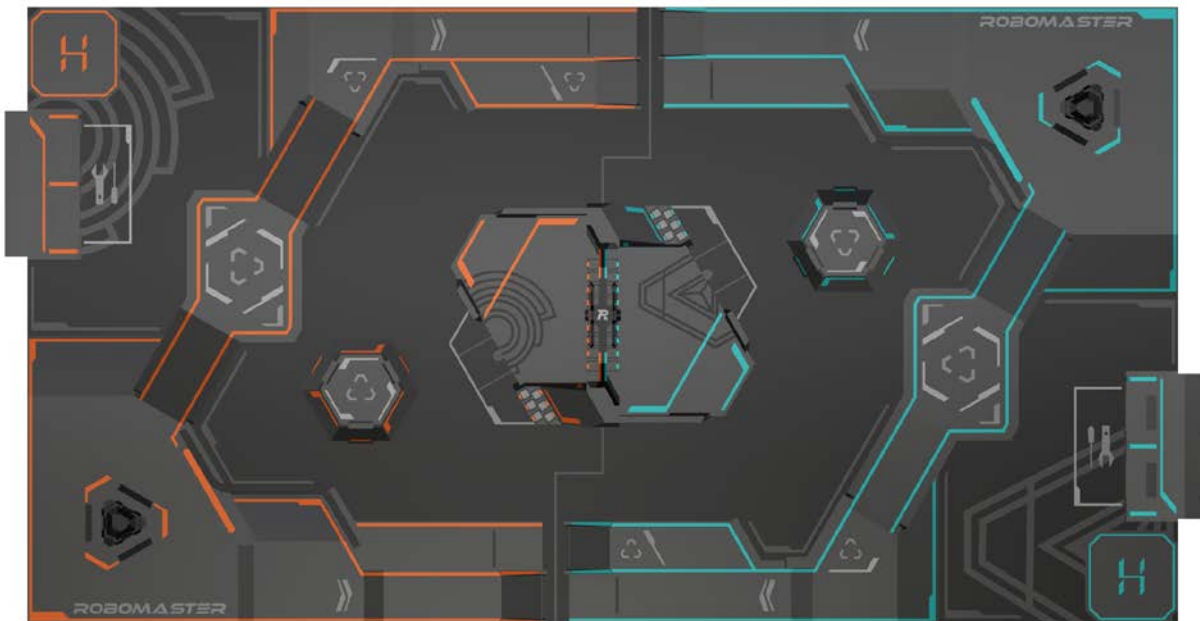


Figure 1 Battlefield Bird View

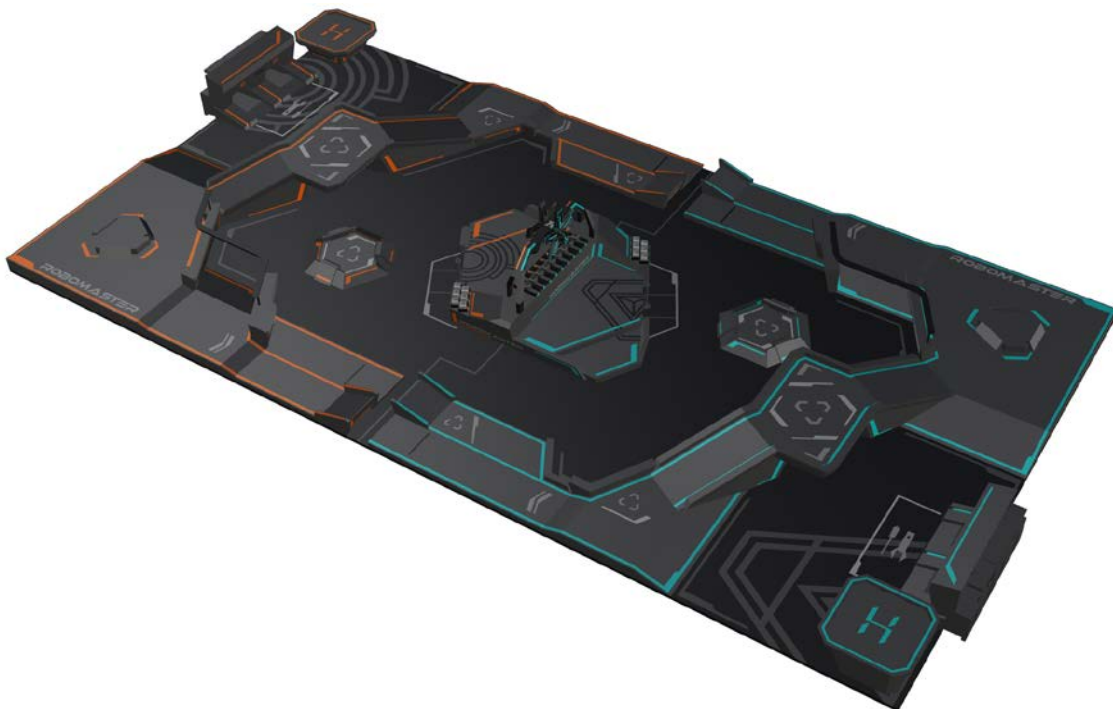


Figure 2 Battlefield Axonometric View

## 2. Supplier Zone:

The appearance of the Supplier Zone will change, and a digital tube display will be installed on the outside to display the number of remaining projectiles currently available to the team.



Figure 3 Schematic Diagram of Supplier Zone

## 3. Bunker:

Except Engineer, other robots on both sides can obtain 50% defense bonus after occupying the bunker, and the barrel heat cooling value is increased to 5 times before the bunker is occupied.





Figure 4 Schematic Diagram of Bunker

4. Resource Island Area:

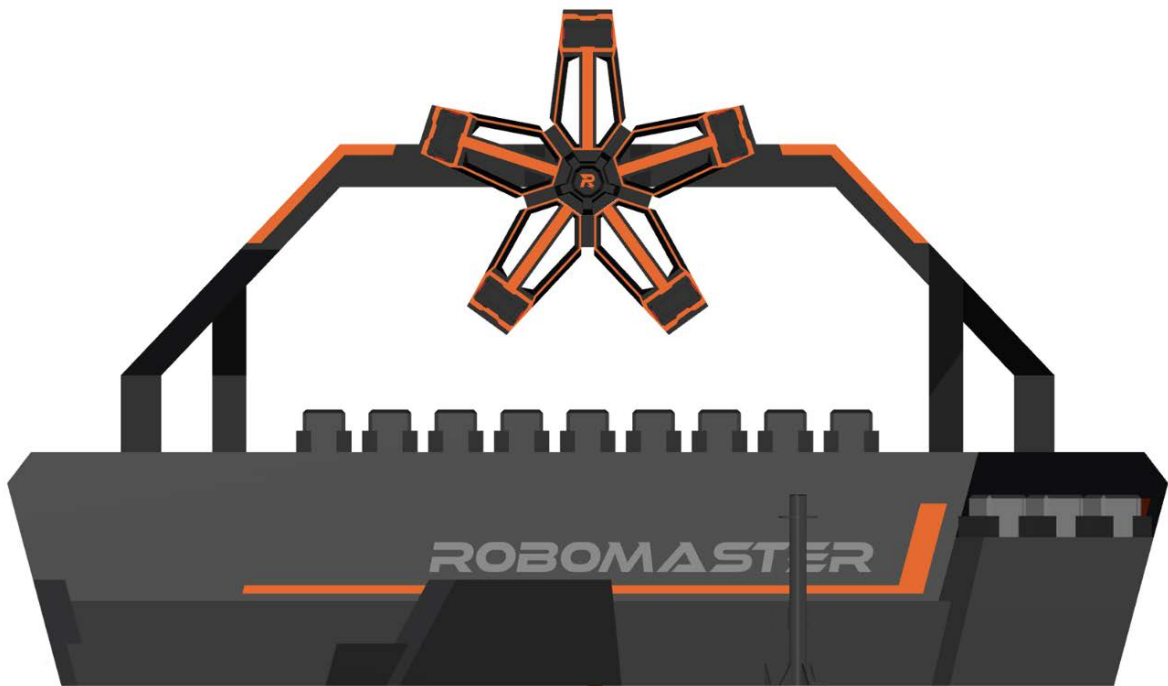


Figure 5 Resource Island Area Main View



Figure 6 Resource Island Axonometric View

5. Projectile Depot:

- There are 6 Projectile Containers with three 42mm projectiles in each of projectile depot on blue and red sides of the Resource Island. There are 9 Projectile Containers in the central area projectile depot, and each Projectile Container is equipped with fifteen 42mm projectiles.
- The central area Projectile Containers will be raised twice, the first time is the start of the match, and the second time is three minutes after the start of the match (i.e., 4:00 countdown). Three Projectile Containers will be raised for the first time. One minute after the start of the match (i.e., 6:00 countdown), the Projectile Containers that have not been moved or removed will fall back to the central area projectile depot. At the second time, all Projectile Containers in the current central area projectile depot will be raised.

6. Landing Pad:



Figure 7 Schematic Diagram of Landing Pad

7. Base Virtual Shield:

At the beginning of the match, the Base has a Virtual Shield with 50 points of HP. When the robot attacks the Base, the HP of the Virtual Shield is first deducted. When the Virtual Shield's HP is zero, if the Base is attacked again, the Base's HP is started to be deducted. If the Base is not attacked within 10 seconds, the Virtual Shield will return to 50 points of HP.

8. Launch Ramp of Road:

- The slope of the Launch Ramp is  $17^\circ$ ; the height drop is 300mm, that is, the distance between the highest point of the Launch Ramp and the ground of the Road is 300mm.
- RFID Interaction Module Card is placed in front of the Road entrance and exit and one side of the Launch Ramp. The robot needs to detect the RFID Interaction Module Card (the yellow box area as shown below) in the Road entrance and exit within 10 seconds to obtain 50% defense bonus and buffer energy bonus (for buffer energy bonus, see [Chapter 4 Referee System](#) Point 3), where the defense bonus time lasts 10 seconds. After the robot occupies the area where the RFID Interaction Module Card is placed in front of the Launch Ramp (the green box area as shown below), the barrel heat cooling value is increased to 5 times before the occupation.



Figure 8 Schematic Diagram of Road

9. Power Rune:

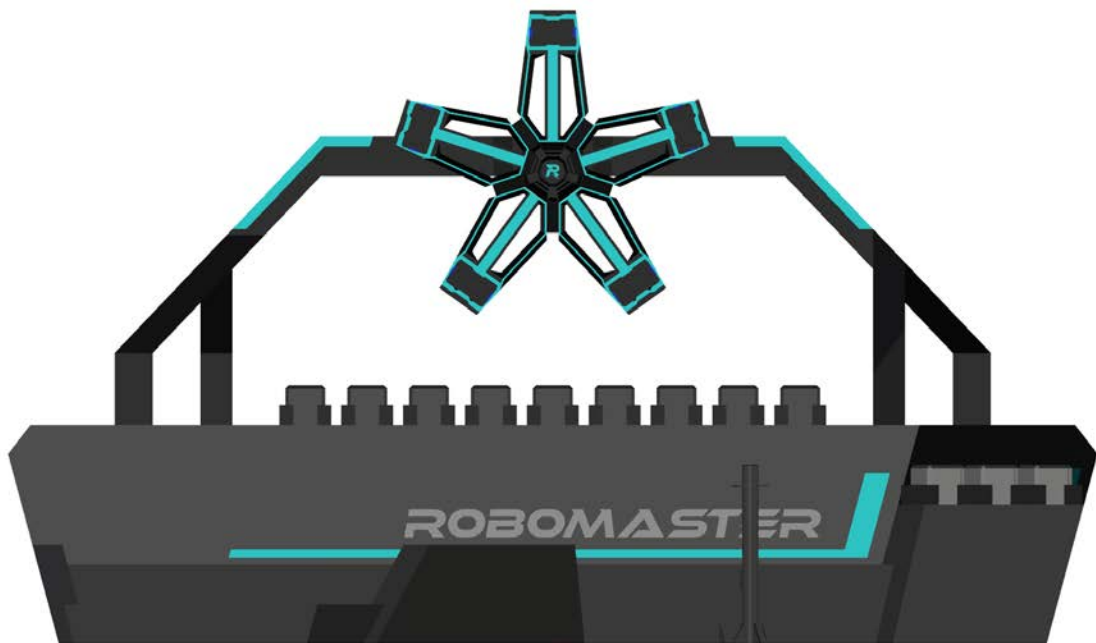
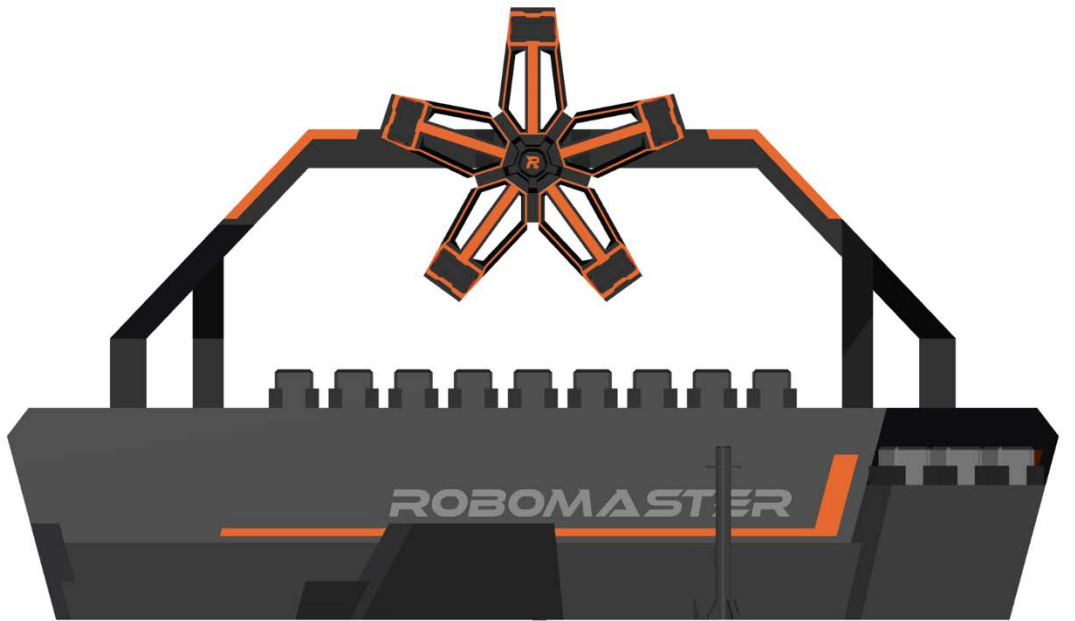


Figure 9 Schematic Diagram of Power Rune

- Power Rune can be divided into two phases: Small Power Rune and Large Power Rune.
  - Small Power Rune: One minute after the start of the match until the fourth minute (i.e., the countdown 6:00-3:01), the Small Power Rune will be in an active state, but remain still. After the robot from one side successfully activates the Small Power Rune, the robots of this side gain 1.5 times attack power bonus for one minute.
  - Large Power Rune: Four minute after the start of the match (i.e., the countdown 3:00), the Large Power Rune will be in an active state, and start rotating. After the robot from one side activates the Large Power Runes, the robots of this side gain 2 times attack power bonus and 50% defense bonus for one minute.
- The red team can only activate the red team’s power rune and the blue team can only activate the blue team’s power rune. Both sides can strike the Power Rune at the same time. If one side’s Power Rune preferentially enters the activated state, the other side’s Power Rune cannot continue to be activated.
- Inactive State: In the first minute after the start of the match (i.e., the countdown 7:00-6:01), the Power Rune will be in an inactive state and remain still.
- Activation Failure: During the shooting, if any of the following conditions occurs, the activation will fail and the Power Rune will return to the active state. Conditions of Activation Failure:
  - Failure to hit a randomly lit Armor Module within 2.5 seconds
  - Hit a non-randomly lit armor module
- The overall lighting effect of the Power Rune is orange and cyan, and the color of the Armor Module is red and blue.

10. Projectile:

Projectile Parameters and Usage Schedule

Type	Version	Appearance	Color	Size	Weight	Shore Hardness	Material	Usage Schedule
<b>42mm Luminous Projectile</b>	2018	Similar to the shape and size of a golf ball	Semitransparent	42.5mm±0.5mm	41g±1g	90A	Plastic (TPE)	Wild Card Competition, International Regional Competition, Final Tournament Group Stage

Type	Version	Appearance	Color	Size	Weight	Shore Hardness	Material	Usage Schedule
	2019				43g± 1g			Final Tournament Knock-out Stage
<b>17mm Fluorescent Projectile</b>	2019	Round	Yellow- green	16.9mm± 0.1mm	3.2g± 0.1g	90A	Plastic (TPU)	Full course of RoboMaster

# Chapter 6 – Competition Procedure and Rules

Three-minute Setup Period:

Specification	Penalty
<p>Sentries and Aerials must empty their projectiles in the first round of the match until they can no longer fire projectiles. The robots can keep the projectiles in other rounds of the same match. The Ground must empty the projectiles during the three-minute setup phase of each round. The Hero and the Infantry must empty the projectiles until the projectiles can no longer be launched.</p>	<ul style="list-style-type: none"><li>● The Aerial and Sentry that do not empty the projectiles as required, cannot participate in the match.</li><li>● The Ground that do not empty the projectiles as required will be sent off before the match officially begins. If the robot is found to have failed to empty the projectiles after the start of the match, the referee will give the violating robot a level 4 warning. The actual situation is judged by the Chief Referee and the Head Referee.</li></ul>



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