

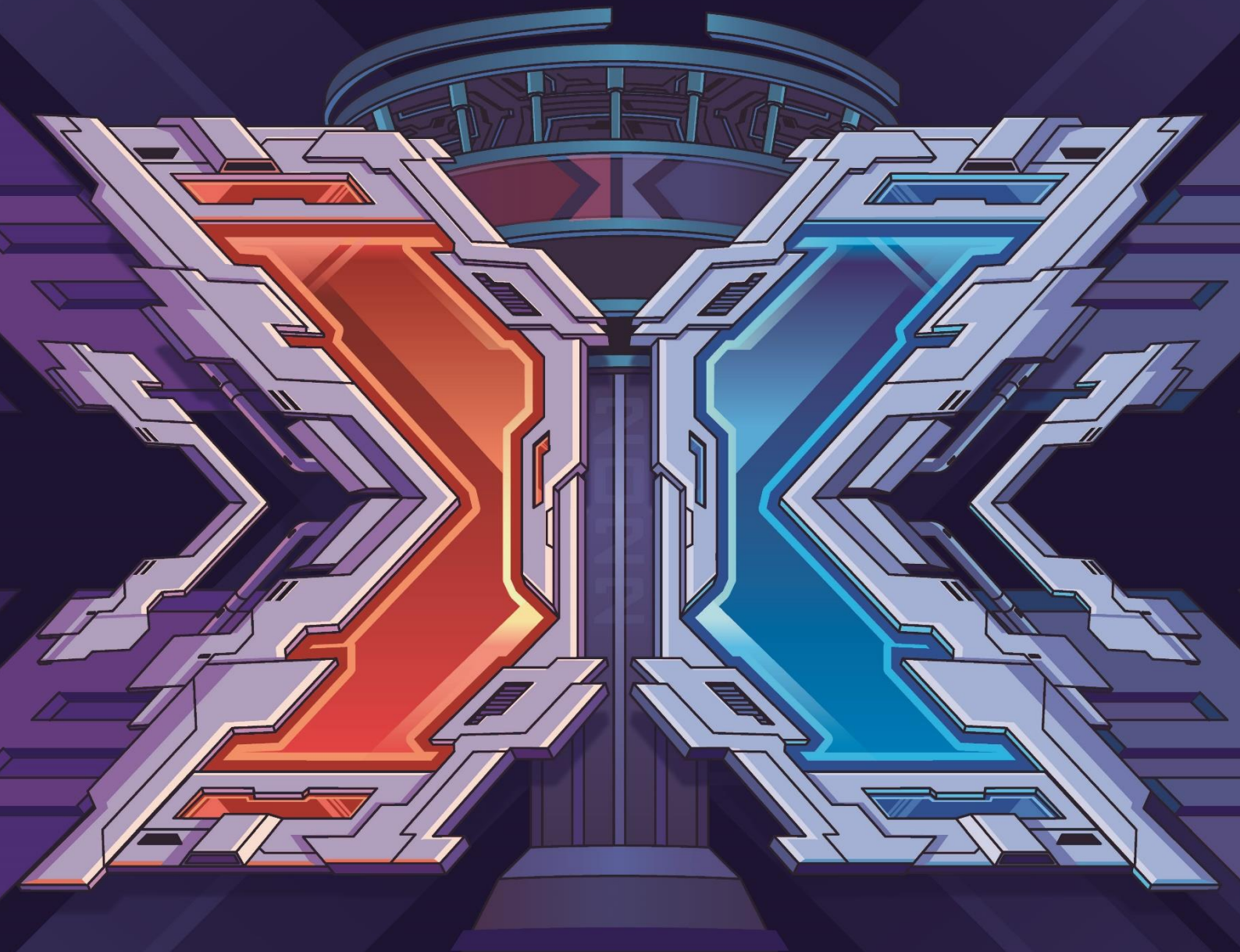
MAKEX

V1.0

2022 MakeX Robotics Competition

RULES GUIDE

MAKEX STARTER



Edited By MakeX Robotics Competition Committee

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MAKE X



CONTENTS

1. Introduction	5
1.1 About MakeX	5
1.2 MakeX Spirit	5
1.3 About MakeX Starter	6
2. Competition Application	7
2.1 Participation Requirements	7
2.2 Registration and Application	7
3. Competition Procedure	8
4. Competition Details	11
4.1 Introduction	11
4.2 Arena	12
4.3 List of Props	15
4.4 Tasks Introduction and Scoring State Judgement	20
4.5 Scoring Explanation	31
4.6 Single Match Flow	32
5. Technical Requirements	35
5.1 Robot General Requirement	35
5.2 Team's Marker Requirements	38
6. Rules of Competition	39
6.1 Penalties	39
6.2 Safety	40
6.3 Operation	41
7. Appeal and Arbitration	47
7.1 Results Confirmation	47
7.2 Appeal Procedure and Valid Appeal Period	47

7.3 Invalid Appeal	48
7.4 Arbitration Procedure	48
8. Statement	50
8.1 Rules Explanation.....	50
8.2 Disclaimer	50
8.3 Copyright Declaration	51
Appendix 1. Awards and Annual Points	52
Appendix 2. Engineering Notebook Guideline.....	54
Appendix 3. MakeX Starter Robot Self-Check List.....	56
Appendix 4. MakeX Starter Score Sheet.....	59
Appendix 5. Competition Resources	60

MAKE X

1. Introduction

1.1 About MakeX

MakeX is an international robotics competition and education platform that promotes multidisciplinary learning within the fields of science and technology. It aims at building a world where STEAM education is highly appreciated and where young people are passionate about innovation by engaging them in exciting Robotics Competition, STEAM Carnival, Tech Event, Educational Conference etc.

As the core activity of MakeX, the namesake MakeX Robotics Competition provides exciting, challenging and high-level competitions in the spirit of creativity, teamwork, fun and sharing. It is committed to inspiring young people to learn Science (S), Technology (T), Engineering (E), Art (A) and Mathematics (M) and apply such knowledge in solving real-world problems.

1.2 MakeX Spirit

Creativity: we advocate curiousness and innovation, encouraging all contestants to create unique high-tech works with their talent, and challenge themselves for continuous progress!

Teamwork: we advocate solidarity and friendship, encouraging all contestants to develop a sense of responsibility and enterprising spirit, and sincerely working with their partners for win-win development !

Fun: we encourage contestants to build a positive, healthy mindset in the competition. Enjoy the journey and grow in the process.

Sharing: we encourage contestants to have an open mind as a maker and share their knowledge, responsibility, and joy with everyone, including their teammates and competitors.

MakeX spirit is the cultural cornerstone of the MakeX Robotics Competition. We hope to provide a platform for all contestants, mentors and industry experts to exchange ideas, study and grow up, and help young people acquire new skills during creation, learn to respect others in teamwork, gain an enjoyable life experience in



the competition, take delight in sharing with the society their knowledge and responsibility, and work hard to achieve their grand aspiration of changing the world and creating the future !

1.3 About MakeX Starter

MakeX Starter is a multi-tasking competition program for elementary school students aged 6-13.

The competition integrates the automatic stage and the manual stage, which greatly enhances fun and participation experience of the competition. The concept of multiple missions and the alliance cooperation design fully exercises the abilities of critical thinking and strategic planning of contestants, as well as improve the ability of communication and cooperation between alliance teams.

MAKE X

2. Competition Application

2.1 Participation Requirements

Participants: The number of contestants is 1-2 for each team, with 1-2 mentor(s).

Age: Team members must be teenagers or children between the age of 6-13 (born between January 2, 2008 and December 31, 2016), the mentor must be at least 18 years old.

Team Number: The mentor will receive a team number after registration on MakeX official website.

Team Roles: Everyone in the team can play their respective roles as operator, observer. The operator is responsible for operating the robot, and the observer is responsible for assisting the operator to complete the game.

Identification Symbols: Each team must have a team logo, team name, and team slogan. Teams are encouraged to use uniforms, flags, posters, badges, base decorations, etc. to show the team culture.

2.2 Registration and Application

Contestants and mentors that meet participation requirements can register on MakeX official website (www.makex.cc). After registration, mentors are able to form a team and sign up for a competition by using mentor's account.

If participating team wants to change their members before competition, which leads to inconsistency with the registration information, they should inform MakeX Robotics Competition Committee in advance to finish re-registration.

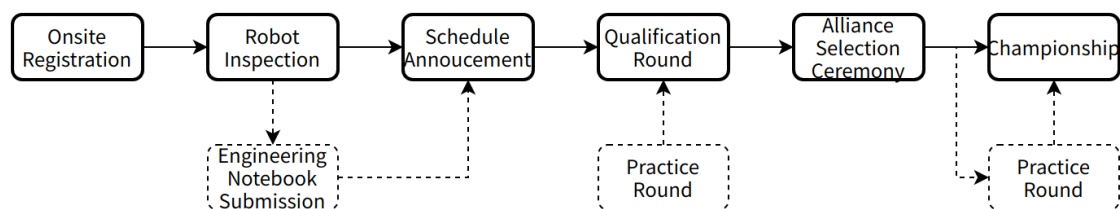
For more details about the registration and application, please refer to [MakeX](#)

[Registration & Competition Application Guide](#)

3. Competition Procedure

Participating teams shall pay close attention to related notices and Program Brochures published before each competition. If have some updates in brochures, the latest rules will be adopted for the competition. MakeX Competition Committee reserves the rights and final interpretation to amend competition rules and system based on actual situation of different competition.

The schedule for each competition is determined by actual situation, and generally includes following procedures.



* Note: The solid line frame refers to necessary procedure of each match, while the dotted line frame refers to non-essential procedure. Please keep abreast of updates.

Onsite Registration

When a team arrives at the venue, mentors and contestants should show ID cards or other valid certificates (e.g., passport) for onsite registration and to get the competition pack. It is necessary for mentors to inform team members about the fire exit, match schedule, arena, pits area, etc. Onsite registration and robot inspection will be conducted once the match schedule is generated.

Robot Inspection

The inspectors will strictly check the safety of robots on request. Teams can pre-check their robots in advance based on "**Appendix 3 MakeX Starter Robot Self-Check List**". The robot and self-customized Team's Marker will be inspected before competition. If the inspection fails, the team needs to adjust their robots and check again until they pass the inspection. Those who fail to pass the inspection are not qualified for the competition.

Schedule Announcement

The committee will announce the match schedule at least 30 minutes ahead of competition through online official website and onsite announcement. The schedule includes match-up chart, match session and specific time, red alliance and blue alliance, etc.

Engineering Notebook Submission

MakeX Robotics Competition Committee encourages teams to write engineering notes, and excellent notes will be an important basis for team's award evaluation. The submission of paper engineering notebook and award setting based on pre-match notice and program brochure. Please refer to **Appendix 2 Engineering Notebook Guideline**.

Practice Round

Teams who have finished their robot inspection can participate in practice round. The schedule will be announced at the entrance in form of notices, and teams are required to queue in line before entrance. Not all competitions have a practice round, which can be informed based on actual situation.

Qualification Round

Normally, each team will participate in 4 matches during Qualification Round in a regular competition, during which alliances teammate will be allocated randomly. The number of matches for teams to participate in may vary between different competitions, which is decided by the MakeX Committee according to the practical situation.

Teams will be ranked according to the total competition points of all single matches during Qualification Round.

If the total competition points of all single matches are the same in Qualification Round, teams with shorter total competition time of all single matches rank higher. If the above conditions are all the same, two teams who rank the same will have an additional match (only for the independent missions), until the winner is decided.

Promotion proportion for each competition

In the 2022 season, the promotion proportion for each competition is 50%. Take



down even teams to advance.

Example: the actual participating teams are 129, $129 \div 2 = 64.5$, then take an even number of teams down and promote to 66 teams.

Alliance Selection Ceremony

In alliance selection ceremony, promoted teams will select their alliance team in turn according to their ranking in qualification round. During this procedure, teams must abide by following rules (these rules only available for points race, other competitions must follow the rules unveiled before the competition. Point Race is currently limited to China, which is currently not open to many overseas regions.): When being chosen by other teams, promoted teams ranking top 50% can refuse for only once, and those teams ranking bottom 50% cannot refuse. If the team is refused by another team, they can continue to choose another team until the alliance is formed.

The promoted teams who are not present before the start of alliance selection are deemed as voluntarily giving up the right to choose alliance, and those who are not present before the end of the alliance selection are considered to be as voluntarily quitting the elimination round. If the promoted teams quit amid the alliance selection ceremony, the promotion places will be given to the following teams according to the ranking in the qualification round.

Championship Round

Normally, each alliance will participate in 1 match during Championship Round in a regular competition. The number of championship matches may be increased or decreased depending on the actual situation of different competition. Red and blue teams will be chosen by alliance teams. The red and blue teams will be ranked according to the following rules.

- 1. The alliance with the higher score of the single match will rank higher.**
- 2. If the score of the match is equal, the league with the shorter completion time ranks higher.**
- 3. If the above conditions are the same, the alliance with the same ranking will complete an extra match (finish all the tasks) until the winner is decided.**

4.Competition Details

The theme of the 2022 MakeX Starter is “Zero Carbon”.

Since the 18th century, the use of fossil fuels has brought a lot of convenience to people's life. But the consumption of energy causes lots of global climate issues. Nowadays, more and more countries have participated in the response to global warming, and have put forward the goals and policies of the net zero-carbon plan, to join "Race to Net Zero" and achieve "carbon neutrality". For the common home of humanity, we will foster changes from the cities where we live together day and night, and zero-carbon cities are our answer to global warming.

4.1 Introduction

MakeX Starter is a multi-mission-based competition and requires blue and red teams forming an alliance to participate.

The competition lasts 4 minutes and is divided into automatic stage and manual stage. The teams in alliance can decide the time for each stage. Automatic missions must be finished in automatic stage and manual missions must be finished in manual stage, after switching from automatic stage to manual stage. The referee calculates the scoring for each stage according to the status of props at scoring period.



Fig4.1 Competition Arena Isometric View

4.2 Arena

MakeX Starter Arena consists of map and frame. Internal size of frame is 2317mm*2317mm, external size of frame is 2347mm*2347mm.

Map has two parts, Automatic Mission Area and Manual Mission Area, with sizes of 1151mm*2317mm each. Starting area, marking area, recycling area, manual loading area and resource area are located on the map.

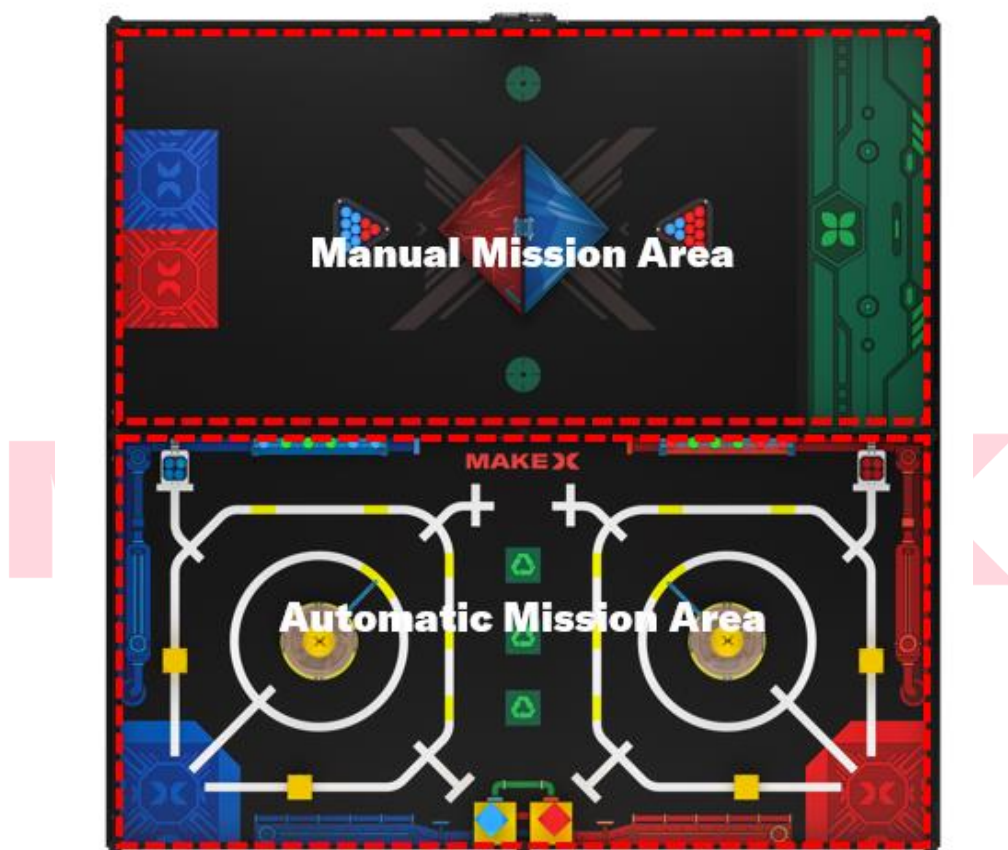


Fig 4.2-1 Areas on the Competition Arena

Areas in Detail:

Starting Area

Each alliance has one red and one blue starting area in automatic mission area. The shape of starting area in automatic mission area is irregular pentagon. Size of starting area is shown in fig 4.2-2

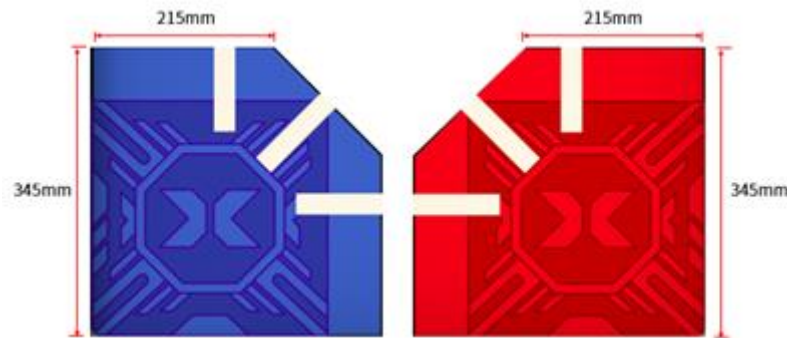


Fig 4.2-2 Starting area in Automatic Mission Area

Each alliance has one red and blue starting area in manual mission area. The shape is regular square with 280mm length. Size of starting area is shown in fig 4.2-3

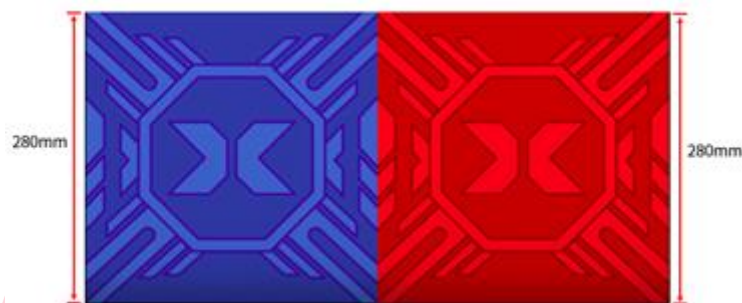


Fig 4.2-3 Starting area in Manual Mission Area

Manual Loading Area

Green area shown below is Manual Loading Area.

Size: 1151mm*345mm

Location: On one side of the Manual Mission Area

Amount: 1

A slide of hook and loop is prepared in the red dashed area in following figure.

Dimension: 1151mm (length) *20mm (width) *3mm (thickness)

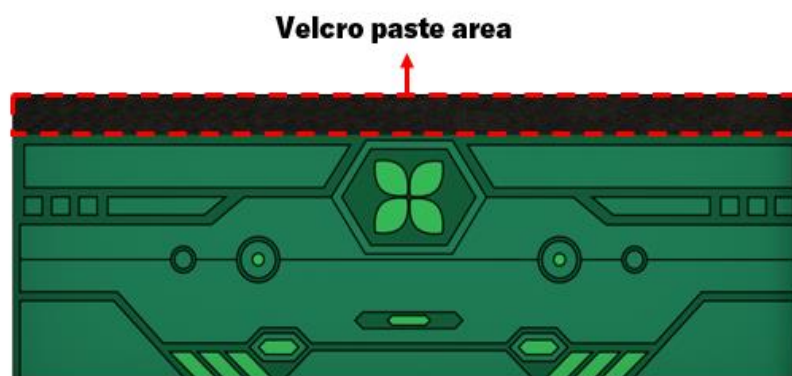


Fig 4.2-4 Manual Loading Area



Marking Area

Two circle shape areas shown in following Fig 4.2-5 are Marking Areas.

Size: Diameter 100mm Circle

Location: On both side of the Manual Mission Area's middle line

Amount: 1 for each red and blue teams



Fig. 4.2-5 Marking Area

Recycling Area

Green square areas shown in Fig 4.2-6 are Recycling Area.

Size: 100mm*100mm

Location: At the center of Automatic Mission Area

Amount: 3



Fig 4.2-6 Recycling Area

Resource Area

Square areas with dash line are Resource Areas.

Size: 70mm*70mm

Location: At both red and blue Independent Mission Area.

Amount: 2 for each red and blue teams.

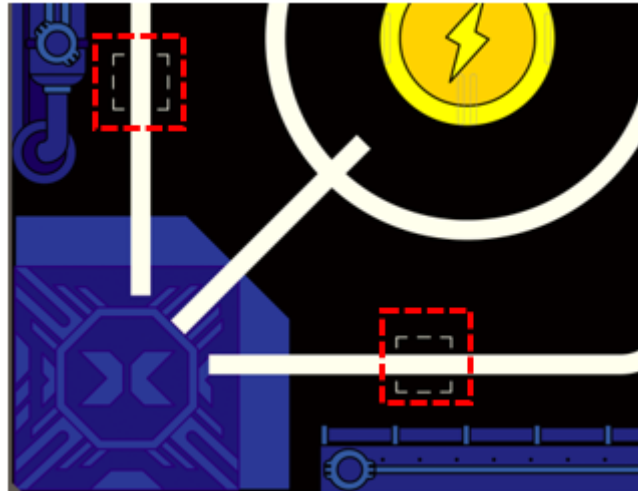


Fig 4.2-7 Resource Area

4.3 List of Props

Name: Renewable Resource Cube

Introduction: 70mm Cube with round corner

Size: 70mm length

Color and Material: Yellow, EVA



Fig 4.3-1 Renewable Resource

Name: Automatic Irrigation Device

Introduction: 70mm Cube with round corner



Size: 70mm length

Color and Material: Red and Blue, EVA

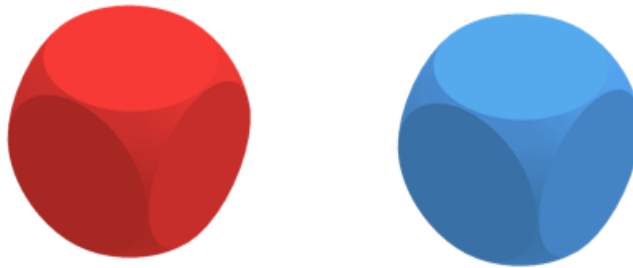


Fig 4.3-2 Automatic Irrigation Device

Name: Drought Tolerant Sapling, Cold Tolerant Sapling, Evergreen Sapling

Introduction: 32mm Diameter Sphere

Size: 32mm Diameter

Color and Material: Red - Drought Tolerant Sapling, Blue - Cold Tolerant Sapling, Green - Evergreen Sapling, EVA

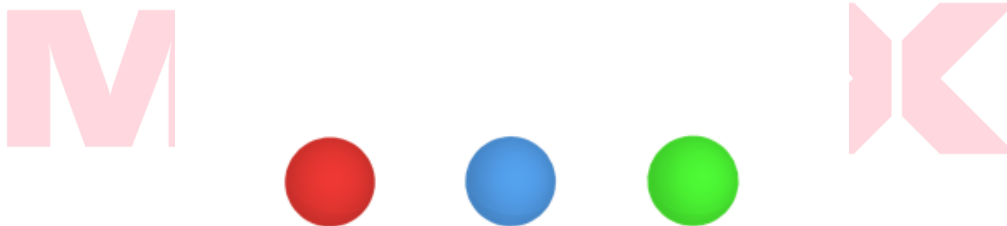


Fig 4.3-3 Saplings

Name: Energy Storage

Introduction: 90mm Diameter Sphere

Size: 90mm Diameter

Color and Material: Yellow, PU



Fig 4.3-4 Energy Storage



Name: Manufacturing Station

Introduction: 120mm Length Cube

Size: 120mm Length

Color and Material: Yellow, EVA

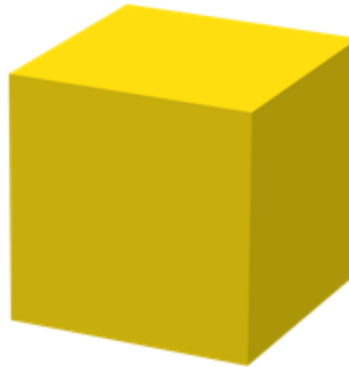


Fig 4.3-5 Manufacturing Station

Name: Energy Storage Power Station

Introduction: Irregular Circular Shape Structure

Size: 215mm Diameter Disc, 140mm Long Metal Bar

Color and Material: Multi-color Acrylic Disk and Metal Frame



Fig 4.3-6 Energy Storage Power Station

Name: Seed Breeding Frame

Introduction: Frame-like Irregular Shape Structure

Size: Internal Long 376mm, Internal Height 70mm



Color and Material: Blue Metal, Black Plastic Pivot

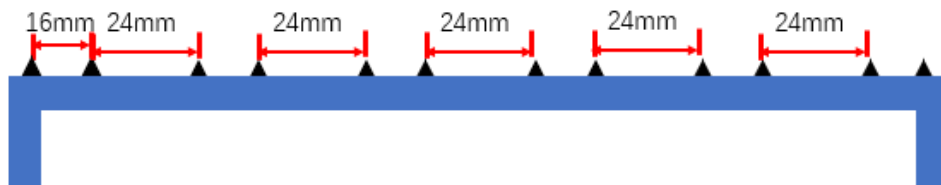


Fig 4.3-7 Seed Breeding Frame

Name: Warehouse

Introduction: Blister Ball Rack with Metal Structure

Size: Internal Diameter of Ball Rack, 65mm*65mm*56mm(height), blue metal frame height 90mm

Color and Material: White plastic, blue metal



Fig 4.3-8 Warehouse



Name: Forest Farm Fence

Introduction: Black fence of forest farm edge

Size: Fence, 500mm(length)*500mm(width)*65mm (height), thickness of board 4mm

Color and Material: Black, Triamine

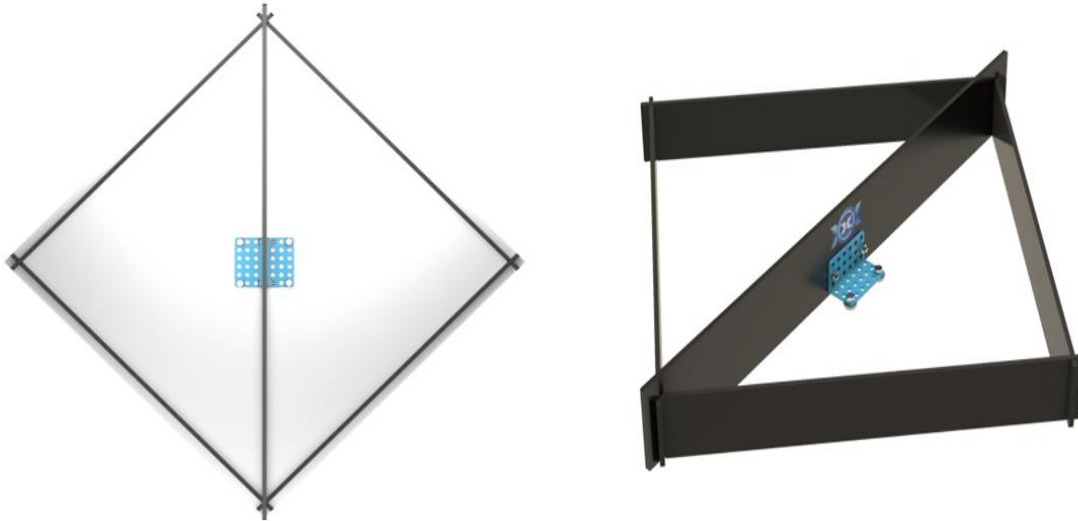


Fig 4.3-9 Forest Farm Fence

Name: Triangle-Pool Ball Rack

Introduction: Black triangle plate

Size: Internal length 116mm

Color and Material: Black, Acrylic



Fig 4.3-10 Triangle-Pool Ball Rack

Name: Team Marker

Introduction: Team self-made prop

Size: Minimal height 120mm, vertical projection of the prop should be within

100mm*100mm square area

Color and Material: No limitation, detailed info in '5.2 Team Marker Requirements'

*Note: All arena and props have reasonable deviation or error, please refer to '2022 MakeX Starter Zero Carbon Arena Construction Manual'. Contestant can request for replacement if props are available.

4.4 Tasks Introduction and Scoring State Judgement

Competition missions include Independent Mission, Alliance Mission, and possible Special Mission.

Independent Mission: M01-M05, independent mission scoring only for respective team.

Alliance Mission: M06-M08, alliance mission scoring for two alliance teams.

Special Mission: The special mission will be announced at the scene in National Competition or World Championship.

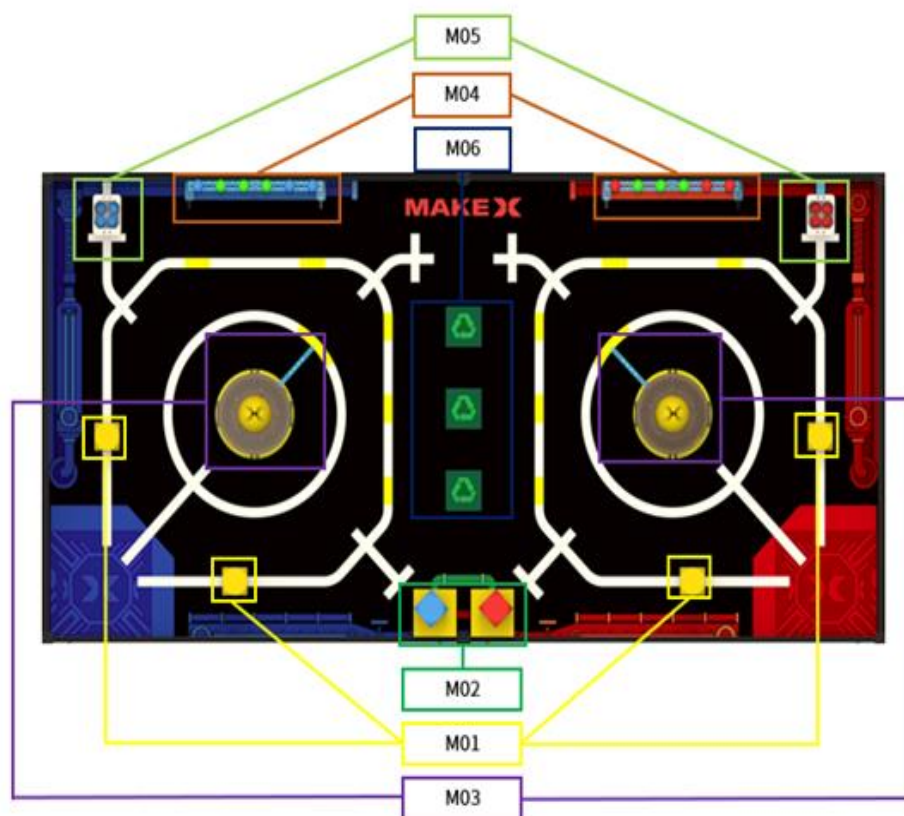


Fig 4.4-1 Mission in Automatic Mission Area

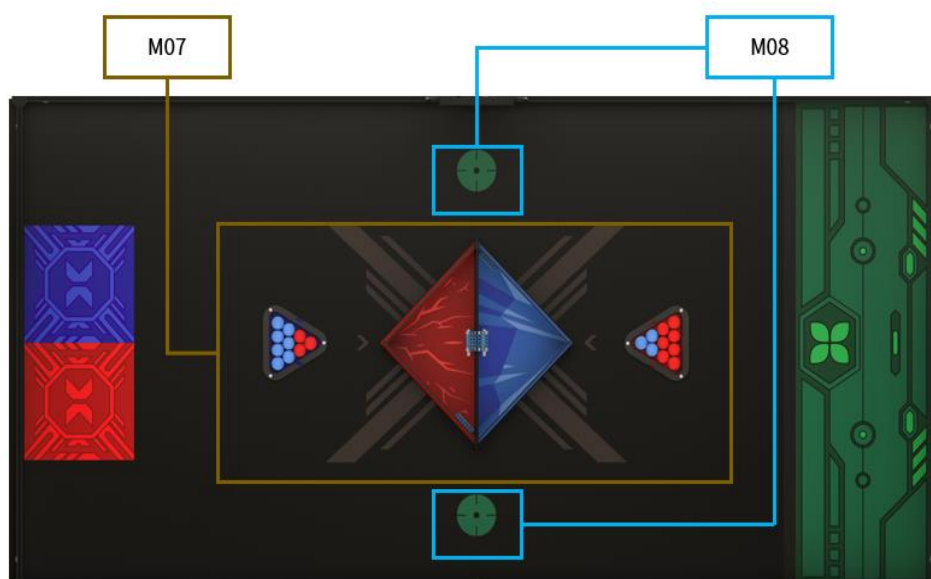


Fig 4.4-2 Mission in Manual Mission Area

In a single match, each team is required to complete 5 independent missions, 3 alliance missions:

Stage and period	Mission Type	Mission Name
Automatic Stage (x seconds, $0 < x \leq 240$)	Independent Mission	M01 Taking Out Renewable Resources Cube
		M02 Obtaining Automatic Irrigation Device
		M03 Power-On Energy Storage Power Station
		M04 Sorting Sapling
		M05 Transporting Sapling
	Alliance Mission	M06 Recycling Renewable Resources
Preparation (30 Seconds)	Contestants are allowed to modify their robots, switch positions and complete other necessary operations (Not included in the competition time)	
Manual Stage (240-x Seconds)	Alliance Mission	M07 Plants Research
		M08 Placing Marker

M01 Taking Out Renewable Resources Cube

Mission Type: Independent Mission

Mission Background: As the earth's resources become increasingly scarce, it is

essential to achieve reuse of resources. Robot needs to take out these renewable resource cubes from the resource area to lay an important foundation for resource regeneration.

Mission Target: Robot takes the yellow cube completely out from the initial area.

Starting Condition: Each team has 3 yellow cubes which are not stuck on the map.

The position will be drawn randomly before each match, following figure shows one possible option.

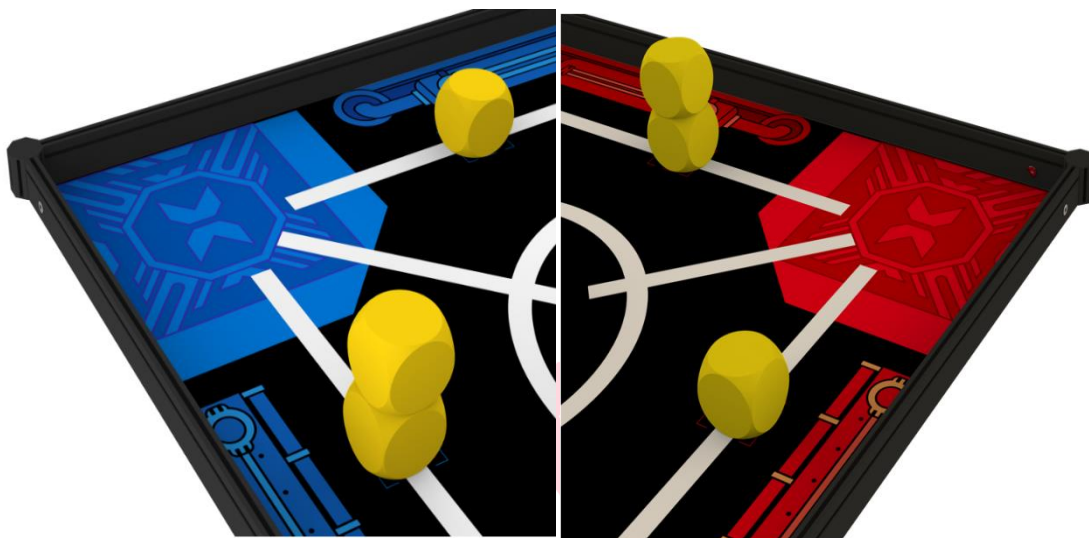


Fig 4.4-3 M01 Location

Mission Score: Each completely removal of yellow cube from initial area counts for 30 points.

Scoring Judging: At the end of automatic stage, the projection of yellow cube should completely out of the initial area.

- a. At the scoring time, the yellow cube must be completely located in the Area.
- b. At the scoring time, the yellow cube must not contact robot directly.
- C. To be notice, a and b must be fulfilled at the same time for scoring.

Arena: Include the map, upper surface, and internal edge of frame. Not include the external surface of frame, table, ground and other.

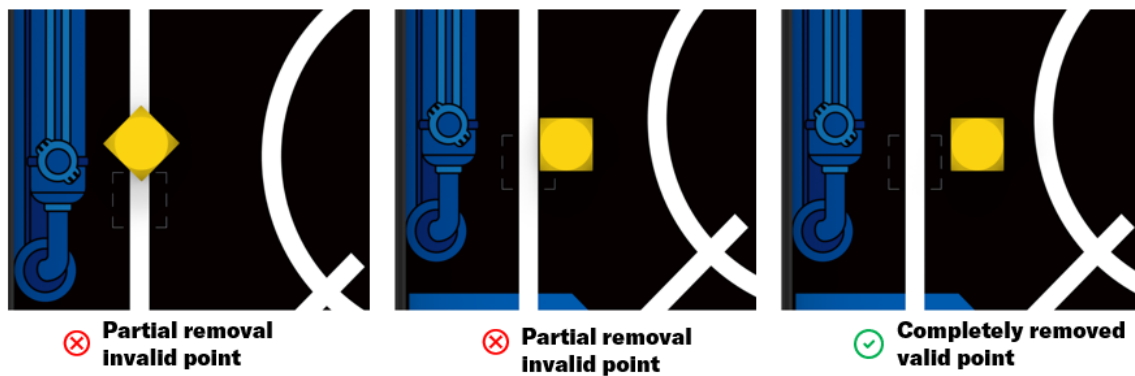


Fig 4.4-4 M01 Scoring Judging Condition

M02 Obtaining Automatic Irrigation Device

Mission Type: Independent Mission

Mission Background: The smart manufacturing factory is designing a new version of automatic irrigation device. Robots need to assist and obtain the device.

Mission Target: Robot is required to move the red or blue cube from the yellow cube to the arena.

Starting Condition: Each big yellow cube has a red or blue cube on top of it. All cubes are not stuck to other prop or arena.

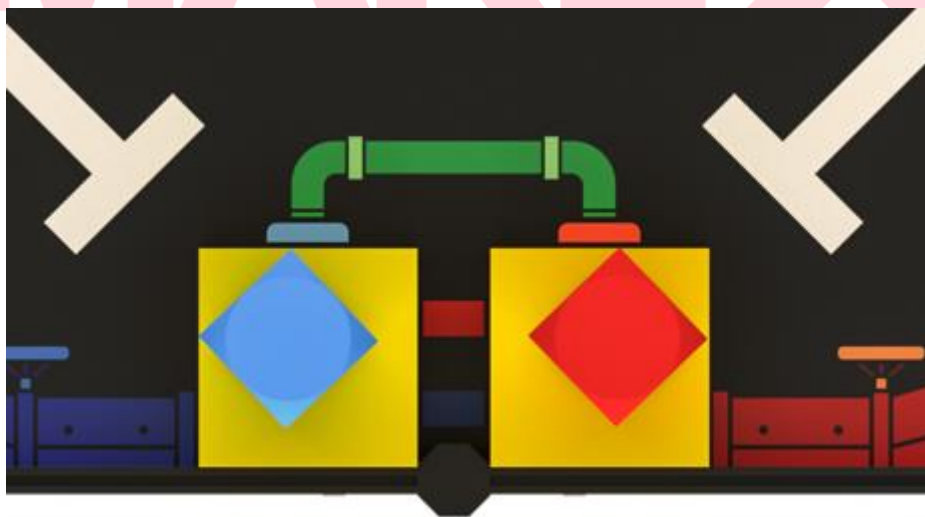


Fig 4.4-5 M02 Location

Mission Score: Each successful removal of red or blue cube counts for 30 points.

Scoring Judging: At the end of automatic stage, the red or blue cube is in contact with arena directly.

a. At the scoring time, the red or blue cube has no direct contact with robot.

b. At the scoring time, the red or blue cube has no direct contact with upper surface of yellow cube.

a and b must be fulfilled at the same time for scoring.

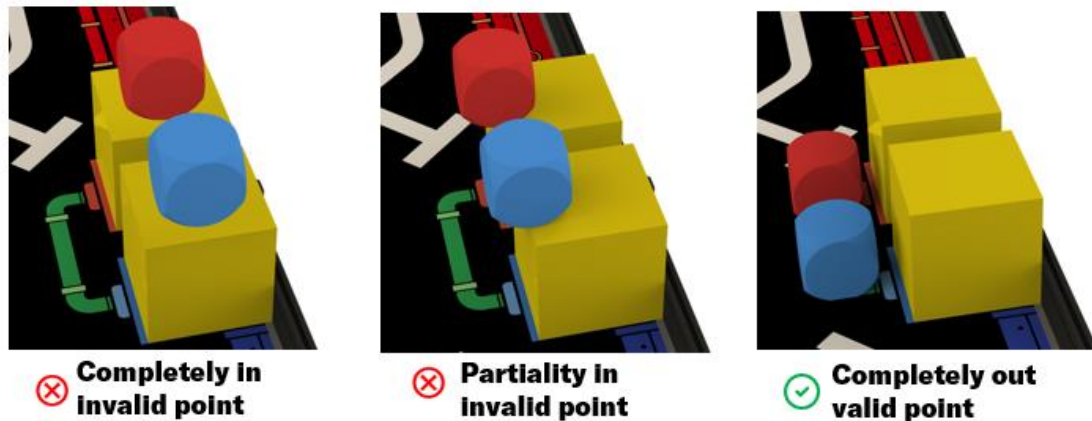


Fig 4.4-6 M02 Scoring Judging Condition

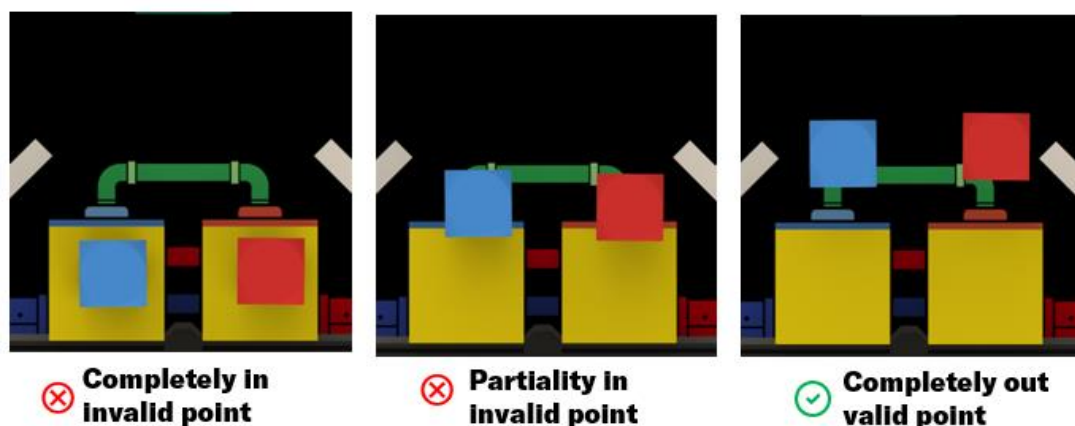


Fig 4.4-7 M02 Scoring Judging Condition

M03 Power-On Energy Storage Power Station

Mission Type: Independent Mission

Mission Background: Smart manufacturing factory is producing an automatic irrigation device. Robot is required to turn on the storage power station, release the energy to support the production.

Mission Target: Robot pushes the blue metal bar and let the yellow ball drop to the yellow area below.

Starting Condition: Energy storage power station in the center of the gear in the

closed state, the blue metal bar beside the disk device raised wooden shim (clockwise) on one side, and a raised wooden shim patrol logo in the middle of the position to yellow, yellow ball in central energy storage power station, energy storage power station in the four blue metal stents paste on the map.

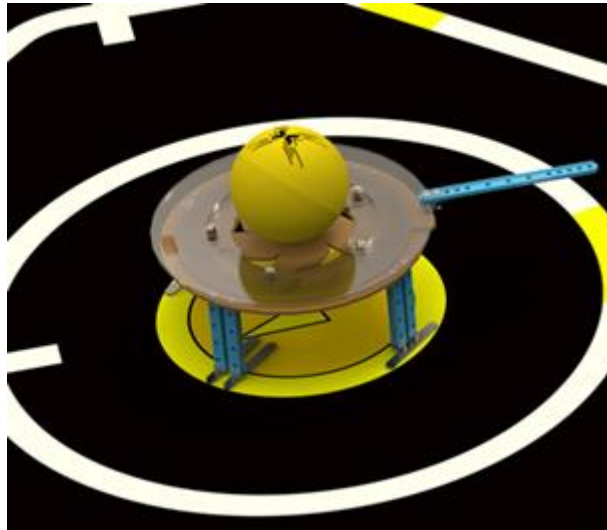


Fig 4.4-8 M03 Location

Mission Score: The yellow ball drops into the yellow area counts 50 points.

Scoring Judging: At the end of automatic stage, the yellow ball is in contact with arena directly.

- a. At the scoring time, yellow ball has no direct contact with robot.
 - b. At the scoring time, yellow ball is completely inside the yellow area below.
- a and b must be fulfilled at the same time for scoring.

M04 Sorting Sapling

Mission Type: Independent Mission

Mission Background: Plant research center developed a new species of tree which can absorb carbon effectively and tolerate coldness and drought. Robot needs to go in the breeding frame and obtain appropriate new saplings.

Mission Target: Robot is required to remove the red or blue ball (represent sapling) and keep green balls on the frame.

Starting Condition: Each breeding frame has 6 balls (green, red or blue). The sequence is determined by the draw randomly. The breeding frame is fixed on the map by magnet.

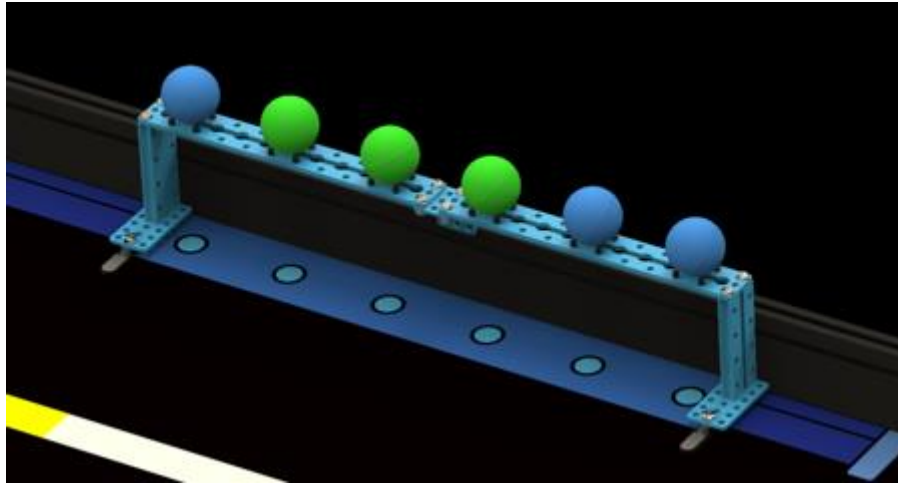


Fig 4.4-9 M04 Location

Mission Score: Each removal of red or blue ball, is worth 30 points. Each green ball stays on the frame, counts 30 points.

Scoring Judging: At the end of automatic stage, red or blue ball drops on the arena and green ball stays on the breeding frame.

- At the scoring time, the red or blue ball is in contact with arena directly.
- At the scoring time, the green ball should stay on the original breeding frame
- At the scoring time, all the balls does not in contact the robot directly.

If any of above points is not satisfied, the corresponded ball is not valid for scoring.

M05 Transporting Sapling

Mission Type: Independent Mission

Mission Background: In the warehouse of plant research center, sorted saplings are stored in the warehouse. Robot needs to take the sapling out.

Mission Target: In the automatic mission area, red and blue team each has warehouse with 4 cold or drought tolerant sapling (red or blue ball). Robot is required to flip over the warehouse and release the sapling by own structures.

Starting Condition: There are 4 red or blue balls in the warehouse. The warehouse is fixed on the arena by magnet.

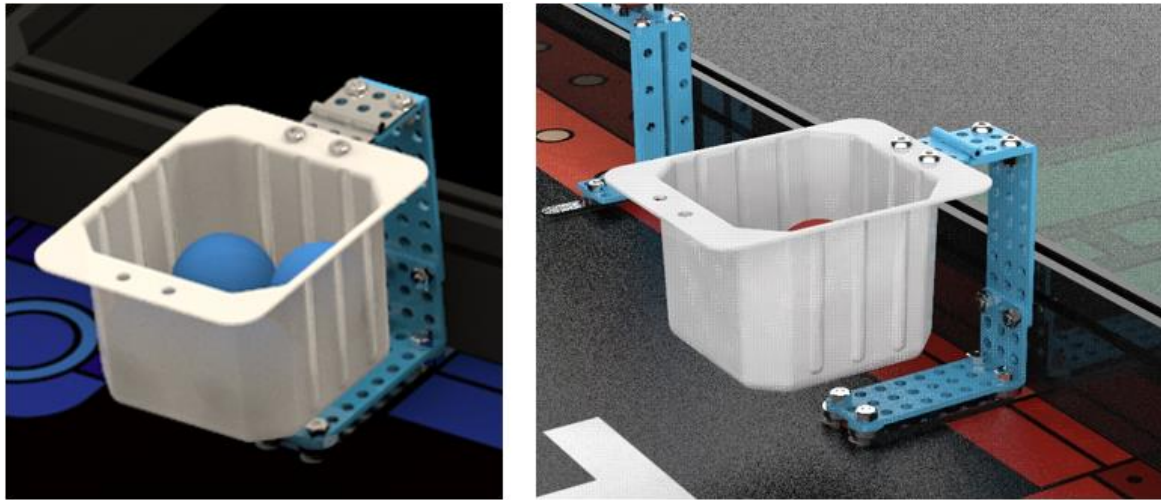


Fig 4.4-10 M05 Location

Mission Score: Each removed red or blue ball counts 30 points.

Scoring Judging: At the end of automatic stage, the red or blue ball has contact directly with the arena.

- a. At the scoring time, the red or blue ball is not in contact with robot directly.
- b. At the scoring time, the red or blue ball is not in contact with the blister basket of the warehouse directly.

a and b must be fulfilled at the same time for scoring.

M06 Recycling Renewable Resources

Mission Type: Alliance Mission

Mission Background: The recycle and refine of resources is done in recycle area.

Renewable resource can be reused in city construction.

Mission Target: In the middle of automatic mission area, 3 green square areas are recycled areas. Robots need to move the yellow cubes (renewable resources) to the recycle area.

Starting Condition: The yellow cubes are from M01 and the location is determined by result of M01.

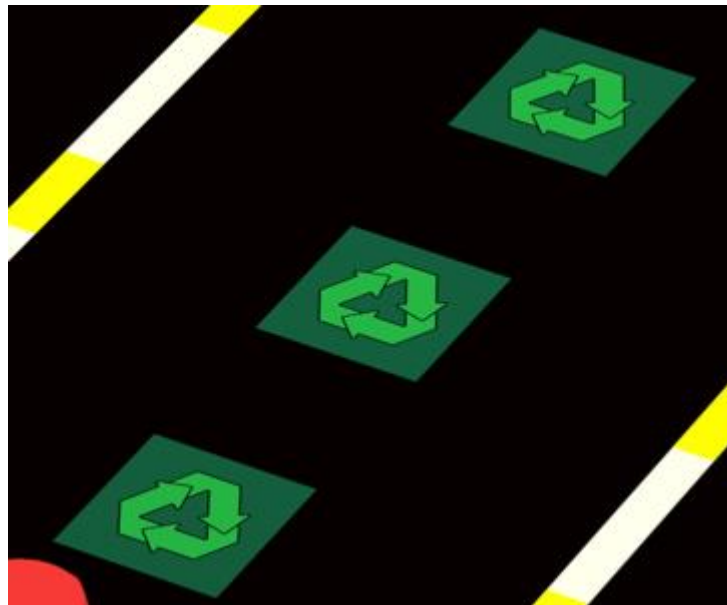


Fig 4.4-11 M06 Location

Mission Score: Each recycle area being filled with yellow cube counts 30 points. (3 recycle areas in total, full score 90 points)

Scoring Judging: At the end of automatic stage, if the yellow cube is moved in the recycle area, the recycle is valid for scoring.

a. At the scoring time, the yellow cube is partially in the recycle area and contact with the arena directly.

b. At the scoring time, the yellow cube is not in contact with robot directly.

a and b must be fulfilled at the same time for scoring.



Fig 4.4-12 M06 Scoring Judging Condition

M07 Plants Research

Mission Type: Alliance Mission

Mission Background: The new sapling can grow in various climate; therefore, the

plant research center sets up a tropical forest farm and frigid forest farm. The robot will be tasked with the cultivation of saplings and the study of new plant varieties with high carbon sequestration capacity that can adapt to different climates.

Mission Target: In the manual mission area, operator is required to control the robot to collect balls, cubes on the arena. According to the color, sort the ball and cube to correct forest area. The Triangle-Pool Ball Rack is on the manual mission area.

Starting Condition: The triangle-pool ball rack has 10 red and blue balls as initial usage. Extra cubes and balls are determined whether the teams move the props from automatic mission area to manual mission area.

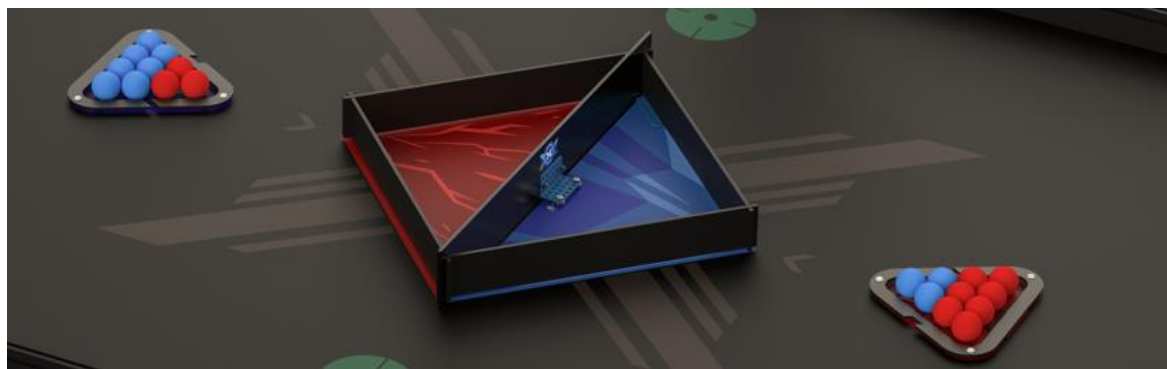


Fig 4.4-13 M07 Location

Mission Score: Each correctly sorted red or blue ball counts 10 points. Each successfully sorted red or blue cube counts 30 points.

Scoring Judging: At the end of manual mission stage, it is valid for scoring if the red or blue balls and cubes are completely in correct area.

- At the scoring time, the red or blue ball and cube is not in contact with robot directly.
- At the scoring time, if the ball or cube is located on the upper surface of forest frame, the scoring will not be affected. As long as the vertical projection is inside the red or blue forest farm.

a and b must be fulfilled at the same time for scoring.

Manual Loading: Observer can manually load the ball which is completely inside the loading area.

- The vertical projection of robot and ball are completely in the manual loading area.

b. Observer can use hand to move the ball. Observer can touch and move the robot if robot's vertical projection is completely in the loading area.

c. red and blue cube cannot manual loaded. Observer must not directly or indirectly contact the red and blue cube.

M08 Placing Marker

Mission Type: Alliance Mission

Mission Background: The marker can help researcher find the research area. Robot is required to move the marker to marking area.

Mission Target: Observer can manually load the marker to robot which is completely in the manual loading area. There are two marking areas on the two sides of manual mission area. Each area can be placed with maximum 1 marker.

Starting Condition: Team is required to prepare self-made marker in the manual loading area. Marker is a self-made prop, should comply with '5.2 Team's Marker Requirements'.

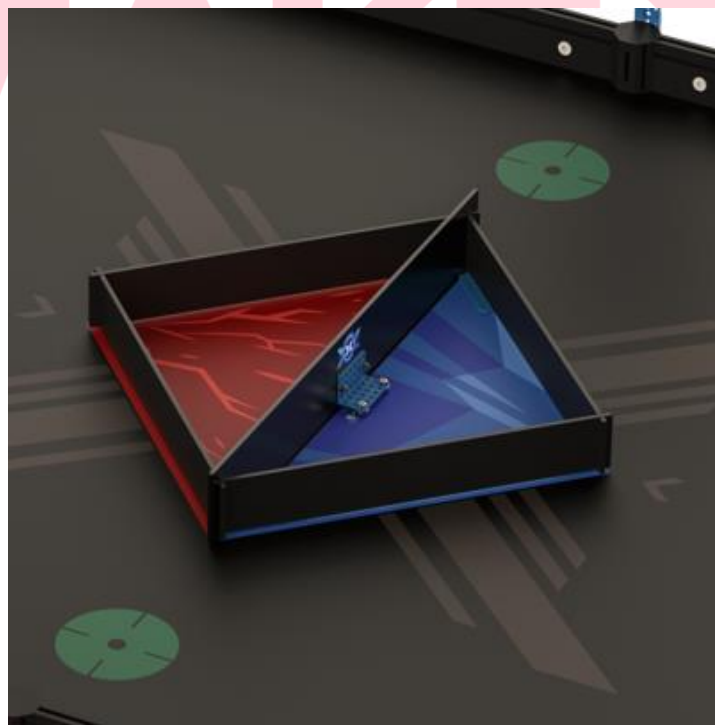


Fig 4.4-14 M08 Location

Mission Score: Each successful placing counts 30 points.

Scoring Judging: At the end of manual mission area, the marker is partially in the marking area.

- a. At the scoring time, the marker is not in contact with robot directly.
 - b. At the scoring time, the marker is in contact with arena directly.
- a and b must be fulfilled at the same time for scoring.

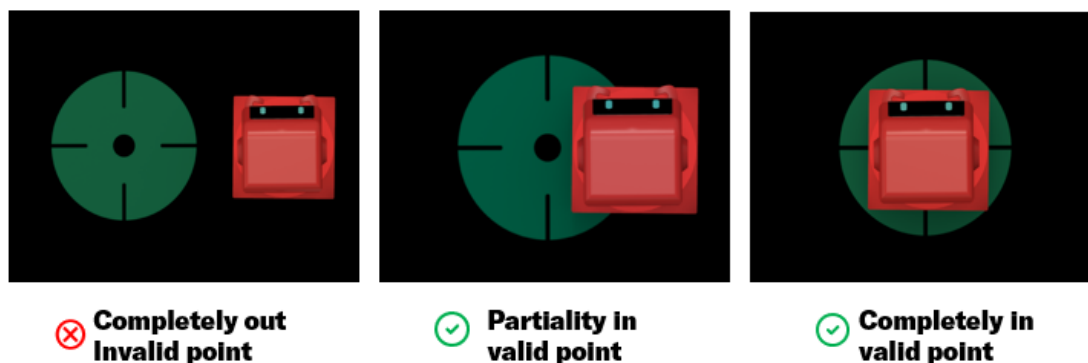


Fig 4.4-15 M08 Scoring Judging Condition



Fig 4.4-16 M08 Scoring Judging Condition

4.5 Scoring Explanation

Referee is counting the scores only in two scoring times, after automatic stage and after manual stage. During the match, referee is monitoring the process and record warning and violation.

Independent Mission Score

Mission	Scoring Prop	Single Prop Score	Maximum Score
M01 Taking Out Renewable Resources Cube	Yellow Cube	30 points/each	90
M02 Obtaining Automatic Irrigation Device	Red/blue cube	30 points/each	30

M03 Powering on Energy Storage Power Station	Yellow big ball	50 points/each	50
M04 Sorting Sapling	Red/blue/green ball	30 points/each	180
M05 Transporting Sapling	Red/blue ball	30 points/each	120

Alliance Mission Score

Mission	Scoring Prop	Single Prop Score	Maximum Score
M06 Recycling Renewable Resources	Valid Green Area	30 points/area	90
M07 Plants Research	Red/blue ball and cube	10 or 30 points/each	340 for balls and 60 for cubes
M08 Placing Marker	Valid self-made prop	30 points/each	60

After single match, referee will confirm the scoring with team. Score contains three parts: independent mission, alliance mission and violation deduction. Single match score will be recorded for the ranking of qualification and championship.

Qualification Match:

Single match score: self-team independent mission score + alliance mission score – violation deduction

Maximum score= $470+550-0=1020$

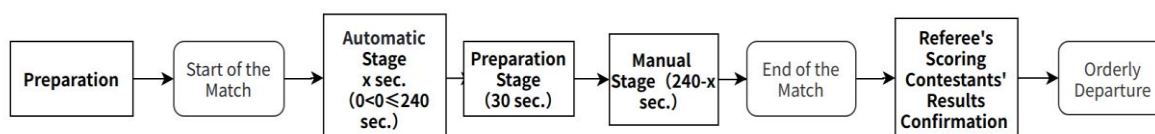
Championship:

Single match score: red team independent mission score + blue team independent mission score + alliance mission score – violation deduction

Maximum score = $470+470+550-0=1490$

4.6 Single Match Flow

The single match lasts for 240 seconds. For any team, the match stages and switching time are as follows:



Preparation

Before the single match, contestants should arrive to the competition area ahead of schedule, and make preparations under the guidance of referee.

1. Power on the robot and place it in the starting area, with Bluetooth controller powering on and placing outside the arena.
2. One representative will be appointed by their team to draw a prop card and then place the cube accordingly;
3. Check the standard of camp and props placement.
4. Waiting for the referee's order.

Automatic Stage

The automatic stage begins after referee's five-second counting down.

1. After automatic stage starts, the robot completes the automatic missions in the automatic mission area by running the automatic program. During this period, the contestant can send a restart request to the referee.
2. After the alliance both agree to proceed to the Manual stage, they shall apply for switching the stage to manual mission area from referees.
3. The duration of this stage is 0 ~ 240 seconds, and the specific duration depends on the stage shifting application initiated by the alliance.

Preparation stage

With the consent of the referee, the match will stop timing and enter the preparation stage of 30s (not included in the overall match duration). The alliance needs to complete in the preparation stage:

1. Position adjustment: the contestants shall stand according to the position requirements in "6.3 operation".
2. Robot modification and test: the contestants can modify the robot to make it more suitable for the missions in the manual stage, test and confirm that the remote-control function of the Bluetooth handle is normal.
3. Start and place the robot: the contestants shall completely place the robot in the start-up area of the manual mission area to ensure that it is turned on and runs on the appropriate program. Players can pick up the handle, but it should be noted that the robot must not completely leave the starting area in the preparation stage.



If the contestants fail to complete relevant operations in the 30s preparation stage, the referee will directly issue the instruction to start the manual stage, and the match will directly enter the manual stage. The contestants who fail to complete the modification preparation can continue, and the excess time will be included in the match time.

Manual stage

After the referee issues the "start" command, the manual stage begins:

1. During the manual stage, the contestants shall divide the missions of the observer and the operator, and stand in the designated station area to complete the relevant missions. For specific station requirements, please refer to the correct position of the contestants in "6.3 operation". In the manual control stage, the observer and operator can apply to the referee for transposition. For specific transposition requirements, please refer to the correct transposition of contestants in "6.3 operating".
2. If the alliance applies to the referee to end the match, before the match time, referee gives the instruction of "over" and stops the timing after the permission of the referee, the match will end ahead of schedule; Or when the 4 minutes run out, the referee will take the initiative to issue the command of "end of match".

During the whole competition, the contestants can repair and refit the robot according to the specifications, and the match time will not stop during this period. Except for safety issues, the contestants shall not apply to the referee for suspension of the match.

Referee's Scoring and Contestant's Results Confirmation

The referee will count the scores after the competition. If there is no objection to the competition, the captains of both alliances must confirm the match's result. If there is any doubt about the result, the captain of the alliance may appeal to the referee without signing the score sheet.

After results confirmation, contestants shall actively assist the referee to restore the props, and leave the arena with their robots and Bluetooth controller in an orderly manner.

5. Technical Requirements

5.1 Robot General Requirement

The Robot General Requirements are prepared for better preparation for teams and ensures a fair and safe competition standard. We suggest team to code and construct the robot under a fully comprehensive understanding of this guidebook. All robots must follow the Robot General Requirements strictly and any against of the requirement will be asked to rectify. The robot can be disqualified if seriously against the requirements.

Robot Mechanical Requirements

T01. Each team can use only one robot for inspection. After inspection, the team can only use the specific robot for the match. The team should not replace the robot or use a robot which is not inspected.

T02. During single match, the parts can be replaced except, mainboard, chassis, wheel or belt.

T03. During the single match, the size of robot should be the size of: length 280mm, width 280mm, height 300mm.

a. Size of robot is defined at the maximum extension state. Robot should be inspected when all movable structured is at extreme state (including after modification)

b. When robot is at extreme state, any structure should not exceed the size of 280mm(width)*280mm(length)*300mm(height).

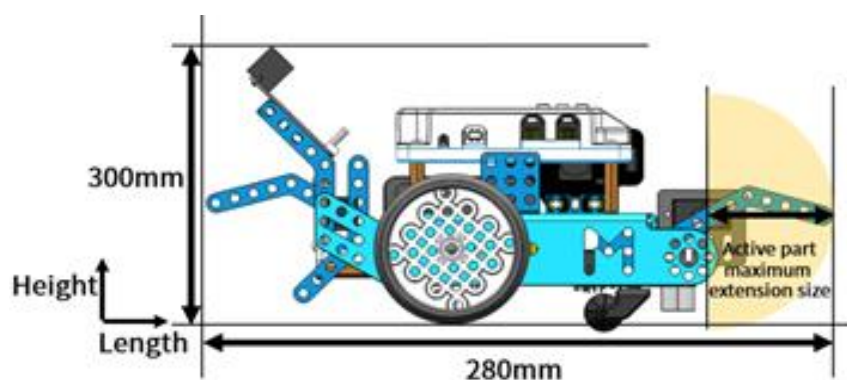


Figure 5.1-1 Maximum extension state (Top View)

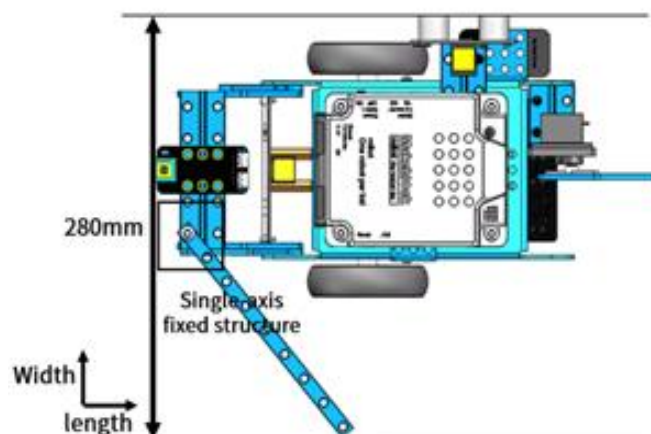


Figure 5.2-2 Maximum extension state (Side View)

T04. During the whole competition, robot weight should not exceed 2.5kg at any time, including weight of battery but not team marker.

T05. Teams can use self-made mechanical parts by 3D printing or laser cutting. Teams must not use commercial structures with mature design, including but not limit to multi-DOF robotic arms or hands.

Robot Electronic Requirements

T06. To ensure the fairness of competition and prevent from team use high performance devices, team should use device which performance is under the following given specifications:

Device Type	Parts Name	Specs	Remark
Mainboard & Extension Board	ESP32-WROVER-B	Processor: Xtensa® 32-bit LX6 Dual-Core Communication Mode: Console Mainboard to Extension Board: Digital Signal: Smart Servo Input PWM: DC Motor Input	
Sensor	Vison Sensor	Computer Vision Sensor: View angel: 65 degrees, Valid focus: 4.65 ±5% mm, Refresh rate: 60fps Working distance: best in	



		0.25-1.2m Power Source: 3.7v lithium battery or 5v mBuild Power module Power range: 0.9w-1.3w	
	Ultrasonic Sensor	Voltage: DC 5v Working distance: 5-300cm Error: $\pm 5\%$	
	Line Follower	Voltage: DC 5V Working height: 5mm-15mm	
Motor & Servo Motor	Encoder Motor	180 Optical Encoder Motor Voltage: 12V Zero Load RPM: 350 $\pm 5\%$ Gear Ratio: 39:6	<ul style="list-style-type: none"> • Must not modify any motor or servo internal mechanical and electrical design. • Maximum total amount 6.
	DC Motor	Dual-shaft TT motor Voltage: DC 6V Zero Load RPM: 200 $\pm 10\%$ Gear Ratio: 1:48	
		Highspeed TT motor Voltage: DC 6V Zero Load RPM: 312 $\pm 10\%$ Gear Ratio: 1:48	
	Smart Servo	MS-1.5A smart servo motor Voltage :4.8-6V DC Torque: 1.5kg/CM 9g small servo Voltage: 4.8-6V DC Torque: 1.3 -1.7kg/cm	
Wireless Communication	Bluetooth Controller	Frequency:2402-2480MHz, Antenna Gain: 1.5dBi, Working Current 15ma, Bluetooth Version: BT4.0	
	Bluetooth Module	Frequency:2402-2480MHz, Antenna Gain: 1.5dBi, Power: $\leq 4\text{dBm}$, Working Current: 15mA	<ul style="list-style-type: none"> • Must not connect with any device other than Official Bluetooth Controller. Including but not limited to manually trigger sensor.
Battery	18650 Battery	18650 Lithium-ion batteries, Configuration:	<ul style="list-style-type: none"> • Must not be modified. Team

		3.7V 2500mAh Output: 5V 6A	should be responsible for any violation.
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Robots should comply with technical requirements. Any violate will be disqualified from the competition and team must modify the design until match the requirements.

5.2 Team's Marker Requirements

The requirements of Team's Marker are below:

T07. The self-made prop should be a 3D structure without material limit. It is suggested to be fabric with laser cutting machine or 3D printer. The height should be at least 120mm and the vertical projection of the prop should within a 100mm*100mm square area.

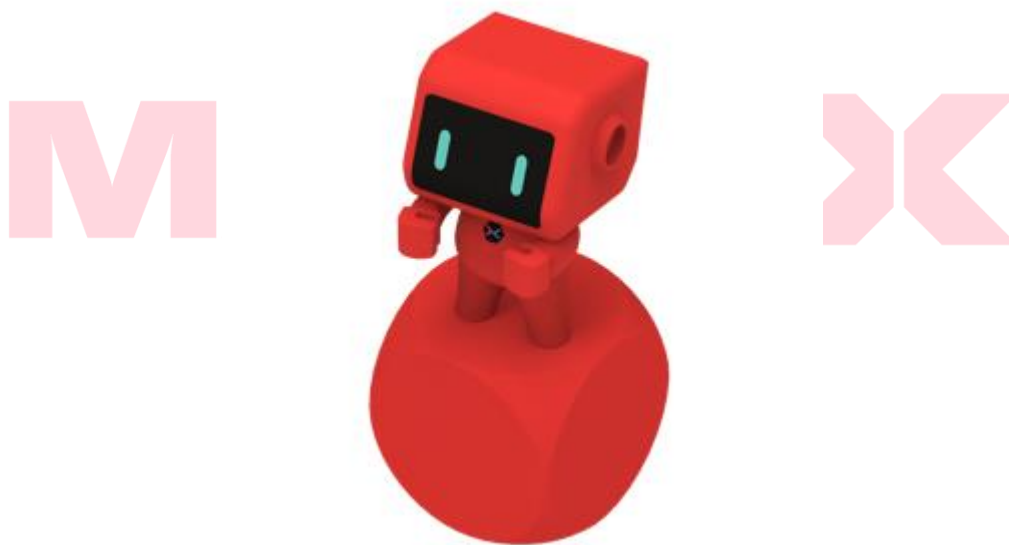


Fig 5.2-1 Example of Team's Marker

T08. The prop is aiming to show the spirit of the team. MakeX Robotic Competition Committee encourages teams to use personalized or designed patterns, letters, characters but must be in a positive manner, in overall, representing the team culture, theme or competition. The content must follow the local law or regulations and referee has the right to reject the prop during the inspection.

The team's marker must pass the inspection and pre-match check before bringing to the arena.

6. Rules of Competition

6.1 Penalties

Explanations and categorization of rules are defined in following sections:

Warning

E01. The Referee gives the Team an oral notice of the first violation and asked the Team to stop the violation and obey the Referee's instructions. During the Warning, the competition will be timed normally.

E02. Every Team in qualification round has and has only one chance to be warned. Alliance in a single match of championship round has and only has one chance to be warned. If a Team or Alliance are violating some rules and also being warned once before in this single match, the Referee will be directly convicted of the violation.

Violation

E03. The Referee immediately announced the violation to the Team and deducted 20 points from the Team as soon as it found a violation (the Team had been warned once before in this single match). During the Violation, the competition will be timed normally. During the competition, if any scoring advantages are obtained because of the violation, the scoring advantages are invalid, and the Scoring Props will become Invalid Prop.

Invalid Prop

E04. From the moment the conditions for Invalid Prop are reached, it will trigger the Invalid Prop and the Referee will announce the specific invalid props. The Invalid Props will be removed from the Arena by the Referee and cannot continue to get points. The Referee has the right to determine whether the Final State of the prop before invalid can be scored or not according to the contents of this Guide. At the scoring time, if the prop is contact with robot directly, the prop cannot be scored.

Disqualify Single Match

E05. During the match, the Team violated the rules, resulting in invalidate of the

score of the match, but did not affect another match.

Disqualify Entire Competition

E06. The team will lose the opportunity to continue to participate in the competition and the right to award.

Suspend

E07. After the referee sends suspend instruction to robot, the robot should stop any operations. The referee has the right to determine if the robot needs to be removed from the arena.

The contestant can apply for suspend to referee when the robot is damaged or lost control.

6.2 Safety

Robot Safety

R01. The team's design and construction for robot should follow the technical requirements.

R02. The robot's parts should be used safely under instructor supervise.

R03. The robot should not behave any active behavior of parts separation (bouncing or shooting a parts).

R04. During the competition, the robot should not use any sticky material (including but not limited to double-side tape or glue).

R05. Referee has the right to reject a dangerous robot for competition. Referee has the right to withdraw a team from rest of the competition depending on the dangerous level of the robot.

Team's Safety

R06. Under the guide of the Mentor and after reading this Technical Guide, Contestants can proceed to prepare for the competition and to design and construct their robot.

R07. In the preparation process, the Team must follow the instructions of the Mentor and should not perform any dangerous action without Mentor's authorization.

R08. The Team should pay attention to safety when using dangerous tools



(screwdrivers, sharp knives) and must use under the guide of their Mentors.

R09. During the competition, Teams should wear goggles; long hair should be tied up; Teams are prohibited from wearing slippers into the competition arena.

R10. During the competition, Teams should not press the table heavily or perform other dangerous actions (e.g., damage the arena or props).

The Referee has the right to reject the Teams that do not conform the safety rules to enter the competition arena. The Referee has the right to disqualify a Team for all Single Match according to the level of danger.

6.3 Operation

Late Arrival

R11. Teams should arrive on time, and the Referee has the right to disqualify Teams for one Single Match who are not present if 5 minutes late.

Wrong Operation Position

R12. During the automatic stage, the Contestants can stand in the designated area. In the manual stage, an Operator and an Observer for each Team are required to stand in the area shown in figure 6.3-1. If a team only has one contestant, the contestant can choose only one role. The contestant cannot act in two roles at same time. (eg. Operator cannot use controller in observation area and control robot) The dimension of area may vary according to the actual size of the competition venue.

Penalty for this behavior: Violation.

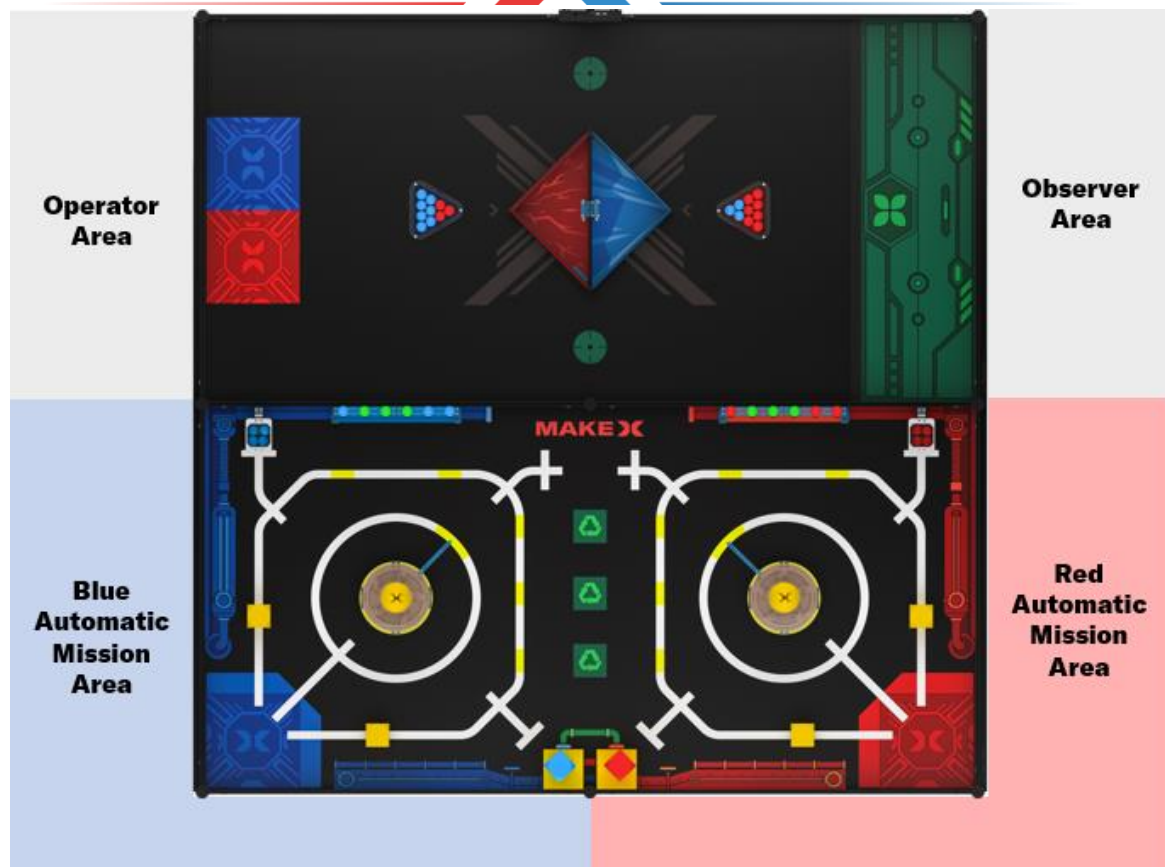


Fig 6.3-1 Contestant Operation Area

Wrong Operation Position Switching

R13. In the manual stage, if the Operator and the Observer need to exchange their roles, they should apply to the Referee and announce, “Red/Blue Team exchange role”. After the Referee responds, “Agree Red/Blue Team Exchange”, the current operation should be stopped, and the Contestants go to the correspondent operation area to continue the competition. During the change of roles, the competition will be timed normally. Contestant should not exchange the role without permission. Contestant should not exchange the role when operator is holding Bluetooth controller.

Penalty for this behavior: Violation.

Robot Start in Advance

R14. Contestants must start the Robot after the Referee announces the start of the competition. If the Robot is moved in advance, the robot is start in advance.

Penalty for this behavior: Violation.

Robot Restart & Modification



R15. During the competition, the Contestants can restart and modify the Robot at any time by applying to referee. Operation can continue when referee approve, competition timing will not stop.

R16. If the Contestants choose to restart or modify their Robot, the Contestant of the Red/Blue Team should raise his hand to the Referee and announce, “Red/Blue Team requests Restart”. After the Referee responds, “Agree Red/Blue Team Restart”, the Robot can be taken out by Contestants for restart or modification.

Penalty for this behavior: Violation.

R17. Teams should not modify the robot in competition area other than starting area, loading area.

Penalty for this behavior: Violation. Out of Area, on the floor is not competition area and not violate this rule.

R18. Robot should be completely in the starting area when start or restart during the whole competition.

Penalty for this behavior: Violation.

Wireless Remote-Control Operation

R19. Contestant can only use Bluetooth controller in manual stage.

Penalty for this behavior: The team can be disqualified from single match if serious.

Robot Enters Wrong Mission Area

R20. In automatic stage, robot should not completely in the alliance team independent mission area or manual mission area. In manual stage, robot should not complete or partially in the automatic mission area.

R21. In automatic stage, robot should not completely in alliance team’s independent mission area. Otherwise, the behavior will trigger the regulation of entering wrong mission area.

Penalty for this behavior: Violation.

Contestants should apply for removal immediately when it happens. The team can be disqualified from single match if serious.

Violation Due to Contact with the Robot

R22. During the competition, with the exception of obtaining restart permission from

the Referee, Contestants are strictly prohibited from directly contacting Robots. Only observer can contact robot which is completely in loading area. Operator cannot contact robot without referee's permission.

Penalty for this behavior: Violation. The team can be disqualified from single match if serious.

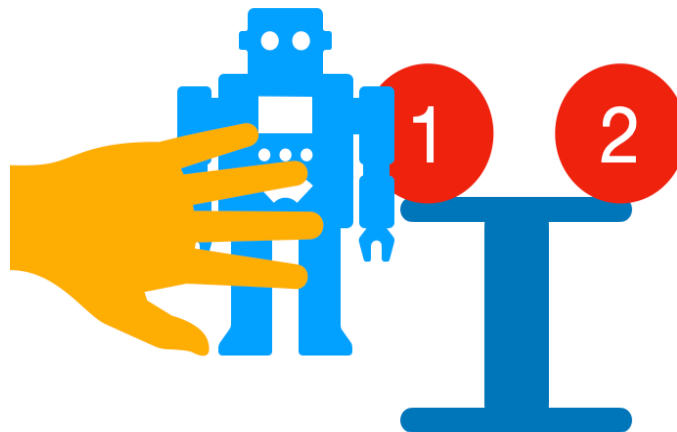
Violation Due to Contact with the Props

R23. During the competition, except for the designated area in the manual stage, the Contestants are strictly prohibited from directly contacting the props.

Penalty for this behavior: Violation. The prop will be invalid and removed from arena by referee.

Indirect contact: When contestant contact with robot, the robot and prop have physical contact. This situation is Indirect contact.

E.g., Contestant touch robot as shown in the figure. The contestant is indirect contact with red ball 1 and red ball 2. The red ball 1 and red ball 2 are invalid and will be removed.



Deliberately Damage Alliance Team Prop

R24. During the competition, any teams should not deliberately let alliance team's scoring prop invalid.

Penalty for this behavior: The team can be disqualified from single match and the single match will be finished with the rest team.

**Deliberately pressing or hitting the Arena**

R25. During the competition, contestant should not deliberately press or hitting the arena for scoring advantage or affect alliance team performance.

Penalty for this behavior: Violation

Props Enter Starting Area

R26. If the Robot moves any prop Completely in or Partially in the Starting Area and affecting the start or restart of Robot, the prop will not be taken out by any person during the competition. Any penalty relative to this corresponding prop will count as usual regardless whether it's located at Starting Area.

Props Leaving Arena Violation

R27. In the whole process of single match, scoring prop should not leave the arena.

Otherwise, the prop is invalid and removed from the arena.

Referee Picks Robot

R28. If the Robot cannot be reached by the Contestants, they can ask the Referee for help. The responsibility for any kind of impact due to the Referee's touch should be undertaken by the Team itself.

Violation Due to Mentoring

R29. During the whole process of the competition, the team should not have any external mentoring.

Penalty for this behavior: Warning for the first time, violation for the second time.

The team can be disqualified from single match if serious.

Egregious Behaviors

R30. It will be regarded as Egregious Behaviors if a Team or a person related with the Team incurs into, but not limited to, any of the following circumstances. In case of Egregious Behaviors happens, the Referee has the right to disqualify a Team for one or all Single Match.

- Impolite behaviors (abuse, bad words, unnecessary physical contact).
- Seriously affecting the competition and the safety of the audiences. Interfering the process of competition.
- Seriously violating the spirit of competition (e.g., cheating).



- Repeated violations or ignoring the Referee's warning.

Abnormal Situation

R31. Including but not limited to following situation:

- Potential Safety Risk: The competition venue emerges problems that might affect the safety of Teams or Robot.
- Damage of Arena or Prop: The props or arena are damaged accidentally, and the competition cannot continue.
- Re-competition: Referees have the right to discuss and determine if a Re-competition is necessary according to the actual situation.

The abnormal situation caused by the Team themselves such as low battery life, failure of Robot's parts etc. will not lead to Re-competition.

MAKE X



7. Appeal and Arbitration

7.1 Results Confirmation

Results Confirmation

When a single match ends, captains of both teams need to confirm the results with the referees and then sign the score sheet. Both teams shall not have any objection to the results of this single match after their signatures.

Dispute Settlement

If have any objection to the results and referee's explanation, they can reject to sign the score sheet. Instead, they need to write clearly about the situation on the remarks part of the score sheet.

7.2 Appeal Procedure and Valid Appeal Period

Appeal Procedure

Appeals should be lodged within the “valid appeal period” by the prescribed procedure and follow the civil participation spirit. The captain of the team needs to fill in the Appeal Form, then cooperates with the Arbitration Commission to investigate the actual situation. Both sides will be required to arrive at the designated place if the Arbitration Commission requires. During the investigation, the captain of the appeal team must be present, and only captains or contestants of both teams can be present. The Arbitration Commission has the right to communicate with the appealing party alone, avoiding the mentor, the parents of the contestants, their relatives, or friends. The appellant should express facts clearly and objectively, not being over-emotionally.

Valid Appeal Period

Normally, the appeal should be lodged within 30 minutes after the end of the competition. Please check the Program Brochure for a specific effective appeal period before the competition. The appellant and the respondent must be present at the designated place on time.

Appeal Response

Normally, the Arbitration Commission responds to the appeal after the end of the competition on the same day or before the start of the competition on the next day.

7.3 Invalid Appeal

Overdue Appeal

Appeals that are not lodged within the "valid appeal period" will be considered invalid and inadmissible. If the appellant fails to be present on time or leaves without any reason during the investigation, the appeal will be considered invalid. If the respondent fails to be present on time, the Arbitration Commission will directly determine the arbitration result and render it as a final result.

Appellants out of Stipulation

The appellants must be the participating contestant and the appeal of another person is inadmissible. The Arbitration Committee will caution the offending team if parents, mentors, or other persons out of the stipulation participate in the arbitration process without the permission of the Arbitration Committee.

A disqualification will be given for multiple invalid warnings.

Vague Appeal's Requests

If the Arbitration Commission is unable to understand the appeal or conduct the normal investigation due to emotion factor of the appealing party, the offending party will receive a verbal warning.

A disqualification will be given for multiple invalid warnings.

Uncivil Appeal

Neither side shall make uncivil behavior nor offensive action and remarks.

A disqualification will be given for multiple invalid warnings.

7.4 Arbitration Procedure

Arbitration Procedure

The Arbitration Commission consists of the chief referee, the arbitration consultant, and the competition technical director. The Arbitration Commission is responsible for



accepting the appeals and conducting arbitration investigations, to ensure the smooth progress of the competition and the fairness and justice of the competition results. The playback videos and photographs of any competition may be inaccurate due to the shooting angle, which is only used as reference but not arbitration evidence.

Arbitration Results

The arbitration results can be divided into “maintaining the original result of the match” or “re-match” , and the two teams shall not appeal again. If the arbitration result is a "re-match", the two teams shall have a re-match according to the time and arena stipulated in the Appeal Form. If either team fails to reach the arena within 5 minutes after the beginning of the match, the team shall be deemed to quit the match.

Additional Remarks

The Arbitration Commission determines the final arbitration result, and neither side shall dispute the result of the appeal anymore.

MAKE X

8. Statement

The official language for MakeX is Chinese. English or other language translations are prepared to facilitate the Team's preparation process. All documents translated to English are for reference only.

The MakeX Robots Competition Committee reserves the final interpretation of MakeX Robots Competition - Rules Guide for Zero Carbon.

8.1 Rules Explanation

In order to ensure a fair competition and high-quality competition experience, MakeX Robotics Competition Committee has the right to update and complement this Rules Guide regularly, issue and implement the latest version before the competition.

During the competition, all matters not stated in the Rules Guide shall be decided by the referee team.

This Rules Guide is the basis for refereeing, and the referee team has the right of adjudication during the competition.

8.2 Disclaimer

All Contestants in 2022 MakeX Robotics Competition should fully understand that safety is the most important issue for the sustainable development of MakeX Robotics Competition. To protect the rights and interests of all Contestants and organizers, according to relevant laws and regulations, all Contestants registered for the MakeX 2022 Robots Competition Starter Zero Carbon, should acknowledge and abide by the following safety provisions:

Contestants should take adequate safety precautions when constructing the Robots, and all parts used for constructing the Robots should be purchased from legal manufacturers.

Contestants should ensure that the structural design of the Robots takes into account the convenience of the inspection and actively cooperate with the host of the

competition.

When modifying and using the parts with potential safety hazards for the Robots, it must conform to the national laws, regulations and quality & safety standards. Those operations should be manufactured and operated by persons with relevant professional qualifications.

During the competition, the Teams should ensure that all the actions such as construction, testing and preparation will not do harm to their own Team and other Teams, Referees, staff, audiences, equipment and arenas.

In the process of construction and competition, if any action that may violate the national laws, regulations or standards occur, all consequences will be borne by the Contestants themselves.

The competition kits and parts sold and provided by the supporter, MakeX Robotics Competition Committee, should be used in accordance with the instructions. MakeX Robotics Competition Committee will not be responsible for any injury or loss of property caused by improper use.

The official language for MakeX is Chinese. English or other language translations are prepared to facilitate the team's preparation process. All documents translated to English are for reference only.

8.3 Copyright Declaration

MakeX Robotics Competition Committee reserves the copyright of this Technical Guide. Without the written consent or authorization from MakeX Robotics Competition Committee, any entity or individual may not reproduce, including but not limited to any network media, electronic media or written media.

Appendix 1. Awards and Annual Points

According to competition scale and team number, the competition will be classified into Points Race/Regional Competition, National Competition, Intercontinental Competition, and World Championship. Each team can voluntarily sign up for all kinds of Points Race all year round to accumulate the annual points. The accumulation of annual points is based on the Team Number. The plan of annual points for MakeX Starter is as follows:

Teams who participate in the single Points Race can obtain annual points = (total point in all qualification round + total score of the best single match in world championship) * competition type coefficient

In each Points Race, the annual points that one team can obtain are competition rank coefficient multiply sum of total points of Qualification Round and Best points of Championship Round.

Competition	Rank Coefficient
Points Race Regional Competition	Sum of Scores*0.01
National Competition	Sum of Scores*0.02
Intercontinental Competition	Sum of Scores*0.03

Teams that have won the champion, runner-up, second runner-up and other awards can obtain additional annual points. For the details of award list, please refer to **2022 MakeX Awards Guide**.

Category	Awards	Regional /Points Race	National	Intercontinental
Starter	Champion	15	30	45
	Runner-up	10	20	30
	Second runner-up	5	10	15
	Innovative Design	-	5	10

	Award			
	Engineering Notebook Award	-	5	10
Excellence Award	Outstanding Mentor Award	-	-	-
	Promotion Ambassador Award	-	5	10
	Technology Sharing Award	-	5	10
	MakeX Spirit Award	-	-	10

Take a 4+1 Points Race as an example(4 rounds in Qualification, 1 rounds in Championship), if team X10000 wins the championship and all the match results show as below:

Qualification Round 1	Qualification Round 2	Qualification Round 3	Qualification Round 4	Total Points in Qualification Round
300	200	400	350	1250
Total Points in Single Championship				
500				

*Annual points that team X10000 can obtain from this competition = (1250+500)

*0.01+15 = 32.5

Appendix 2. Engineering Notebook

Guideline

2022 MakeX Robotics Competition

Engineering Notebook Guideline

***Instruction:**

1. The value of engineering notebook: It helps the team establish files and record the whole learning process. Therefore, it is necessary to record engineering notebook during the entire preparation for the competition.

2. Engineering notebook submission: Teams can use online documents or handwriting. No matter which way to use, each team must submit a paper version onsite.

Paper engineering notebook: As the Challenge & Premier programs require the assessment process, 1 copy of the paper version shall be submitted by each team to the judges onsite. If there is no assessment process (Starter & Explorer), each team will need to submit 1 copy of the paper version to the staff at the inspection area. Teams that cannot submit the original engineering notebook should prepare their own copies.

3. An engineering notebook will be required for the evaluation of all technical awards. Please refer to the Competition Guide for the evaluation criteria.

Basic Requirements for Cover

The team's name, team number, and competition program must appear on the cover of the engineering notebook.

Basic Requirements for Contents

1. Clear content

Creating content brings convenience for the judges to review and quickly find the corresponding section.

2. Process records (Required)

Every improvement of the robots should be recorded from prototype design, construction, to the debugging. Keep pictures of all manuscripts, design drawings, calculation processes, circuit diagrams, etc., and insert them into the engineering notebook in the form of pictures.

- 1) Schedule of robot building progress
- 2) Design inspiration/sketch
- 3) Technical principle (it can be disassembled into different parts)
- 4) Production step by step (with clear pictures)
- 5) Problems encountered and solutions

Examples of problems:

What technical failures did you encounter? Why did you fail? How did you solve the problems finally?

What efforts have you made for the robots? What improvements have been achieved?

Does your project progress schedule go as planned? What accidents or delays have occurred? How to fix it?

Have there been any disputes among the team members and how to settle them in the end?

3. Projects summary

- 1) The structure and function of the project (with pictures and text enclosed)
- 2) The technical innovations of the project
- 3) Competition strategies for scoring and defense

4. Team introduction

- 1) A brief biography of each team member and their role on the team
- 2) Culture displaying (logo, team flag, slogan, posters, T-shirt, etc.)
- 3) Excellent achievements sharing (Stories)

5. Feelings and other things you want to share (optional)

- 1) Achievement in the competition (Technical)
- 2) Growth in the competition (Spiritual)
- 3) Suggestions for competition



Appendix 3. MakeX Starter Robot Self-Check List

MakeX Starter Robot Self-Check List (Zero Carbon)			
Safety of Robot			
No.	Items	Specific Requirements	Status
1	High-power Equipment	Dangerous high-power equipment is not allowed to be used by the Teams during the competition and the preparation of the competition.	
2	Energy Storage Device	If robot is using any energy storage device for operation, safety must be ensured at the first place.	
3	Safety and Protection	Any structures that may hurt human during the operation must be protected with appropriate manners.	
4	Damage of Arena	Any robot operation must not damage the arena.	
5	Forbidden Materials	Robot must not use flammable gas, fire hazard materials, hydraulic structures, mercury content parts, explosive materials, dangerous counterweight, structures may cause entangle with another robot, sharp edge parts, liquid or sticky materials or any electrical leakage device or materials.	
Number, Size and Weight of Robots			
No.	Items	Specific requirements	Status
6	Number of Robots	Only one Robot is allowed to compete in each point race or 2020-2021 MakeX World Championship. Any kinds of replacement of the Robot are not allowed after Inspection.	



7	Size of Robots	In the whole match, the length and width must not exceed 280mm, and height 300mm.	
8	Weight of Robots	In the whole match, the weight must not exceed 2.5kg.	
Parts of Robot			
No.	Items	Specific Requirements	Status
9	Mainboard	Processor: Xtensa® 32-bit LX6 Dual-Core Communication Mode: Console Mainboard to Extension Board: Digital Signal: Smart Servo Input PWM: DC Motor Input.	
10	Sensor	Computer Vision Sensor: View angel: 65 degrees, Valid focus: 4.65 ±5% mm, Refresh rate: 60fps Working distance: best in 0.25-1.2m Power Source: 3.7v lithium battery or 5v mBuild Power module Power range: 0..9w-1.3w Ultrasonic sensor: Voltage: DC 5v Working distance: 5-300cm Error: ±5% Line Follower: Voltage: DC 5V Working height: 5mm-15mm	Type and quantity not limited. Robot must not use any interference device and affects other robot.
11	Motor/Servo Motor	180 Encode Motor, TT motor, Highspeed TT motor, MS-1.5A smart servo motor can be used with maximum 6 in total.	
12	Wireless Control	Bluetooth Controller: Frequency: 2402-2480MHz, Antenna Gain: 1.5dBi, Working Current 15ma, Bluetooth Version: BT4.0 Bluetooth Module: Frequency: 2402-2480MHz, Antenna Gain: 1.5dBi, Power: ≤4dBm, Working Current: 15mA	
13	Robot Chassis	No limit in robot chassis	
14	Self-made Parts	Teams can use following material in self-made parts: 3D printing parts, cardboard, wood, acrylic, rubber band, etc. Self-made parts must not shown any	



		LOGO or brand of manufacturer.	
15	Mechanical Parts	Teams can use self-made mechanical parts by 3D printing or laser cutting. Teams must not use commercial structures with mature design, including but not limit to multi-DOF robotic arms or hands.	
16	Batteries	18650 Lithium-ion batteries, Configuration: 3.7V 2500mAh Output: 5V 6A	

MAKE X



Appendix 4. MakeX Starter Score Sheet

<h1 style="margin: 0;">MAKE X</h1> <p style="margin: 5px 0;">2022 MakeX Robotics Competition Zero Carbon-Scoring Form</p> <p style="margin: 5px 0;">Match Info: Qualification Round ____ (Arena No.) ____ (Match No.)</p> <p style="margin: 5px 0;">Alliance Info: Red Team No. ____ Blue Team No. ____</p>										
Independent Mission Score					Alliance Mission Score					Remark
Scoring Team	Prop	Points/Prop	Amount	Score	Scoring Team	Prop	Points/Prop	Amount	Score	
Red Team Score	Small Ball	30			Alliance Mission Score	Green Area	30			
	Cube	30				Sorting of Small Ball	10			
	Big Ball	50				Sorting of Red/Blue Cube	30			
	Sum					Team Marker	30			
Blue Team Score	Small Ball	30			Sum					
	Cube	30								
	Big Ball	50								
	Sum									

Penalty	
Red Team	Blue Team
Violation Deduction (-20)	

Final Score		
Team	Red Team	Blue Team
Independent Mission Score	Sum of Red Team	Sum of Blue Team
Alliance Mission Score	Alliance Scoring	
Penalty		
Final Score		
Automatic Stage Time	Minutes	Seconds
Manual Stage Time	Minutes	Seconds
Total Match Time	Minutes	Seconds

Signature		
Team	Red Team	Blue Team
Representative	(Please confirm the scoring before sign)	(Please confirm the scoring before sign)
Referee	(Please confirm the scoring before sign)	(Please confirm the scoring before sign)
Date		

*Form used by referee only

MAKE X

Appendix 5. Competition Resources

Competition resources include but are not limited to official resources provided by the committee, such as Competition Guide, Equipment Instructions, Rules Videos, etc.

The contestants are obliged to keep abreast of the update of competition resources before the competition, and any problems caused by the players' failure to keep abreast of the updates shall be borne by the players themselves. All official competition resources will be updated in MakeX Website <https://www.makex.cc/en>.

MakeX Robotics Competition Committee will revise and improve the Rules Guide with the progress of the competition and the new version will be announced in MakeX Website <https://www.makex.cc/en>. The contestants and mentors can download the latest version in MakeX

Website Download <https://www.makex.cc/en/information/download>.

MakeX Official Website: <https://www.makex.cc/en>.

Any Feedback & Question Please Sent to:

makex_overseas@makeblock.com



Edited By MakeX Robotics Competition Committee

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RULES GUIDE MAKEX STARTER